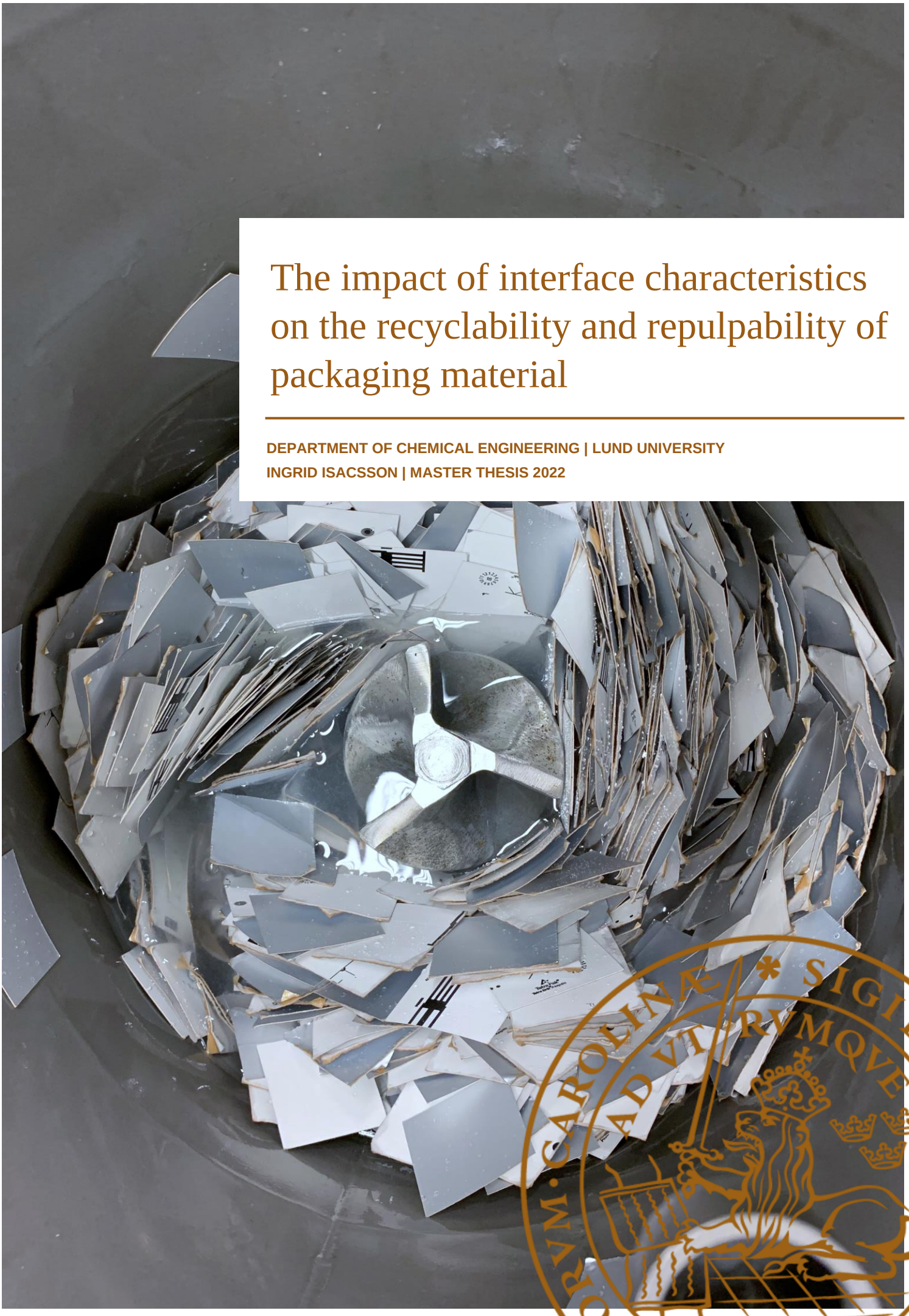

The impact of interface characteristics on the recyclability and repulpability of packaging material

DEPARTMENT OF CHEMICAL ENGINEERING | LUND UNIVERSITY
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The impact of interface characteristics on the recyclability and repulpability of packaging material

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Popular Science summary

Have you noticed that the food products you buy often are kept in packages that claim to be recyclable? But how recyclable are they actually?

Paper-based packages used as beverage containers consist of many different layers with different materials, paperboard, plastics and aluminum foil. The layers all have different functions and together protect the product from the outside environment and give the package its strength and rigidity. These material layers need to be separated from each other during the recycling process to facilitate the recycling of the individual materials. It is however very difficult to recycle beverage cartons, as specialized recycling mills are required, and not all of the specialized mills recycle all material layers.

In 2019, 59.1% of all paper and paperboard consumed in the world was made from recycled material, 64.9% of the energy needed for on-site production was coming from renewable resources and 52.6% of the wood used for the pulp production came from sustainable-managed forests[1]. However, the average recycling rate for beverage cartons was only 51% in in Europe in 2019[2] and 36.1% in Sweden in 2017[3].

The fibers in the packages are of great importance regarding the recyclability of beverage cartons as they can be recycled multiple times into other fiber-based products. Tetra Pak® is researching alternative material layers to increase the amount of fibers in their packages, and are especially looking to exchanging the aluminum layer with a fiber-based barrier. Three different packaging materials were studied in this thesis to see if the recyclability differs between material with fiber-based barriers compared to material with aluminum, and if the pulping environment can be changed to increase the recyclability.

The study showed that an increased temperature during the pulping increased the recyclability of the studied materials, and that all fibers in the material influence the recyclability and therefore need to be considered when constructing new materials. Out of the tested materials the aluminum material had the best recyclability, but one of the materials with fiber-based barrier seemed promising to work with and develop further.

Beverage cartons are recyclable, but more work needs to be done regarding the recycling process and in turn increase the packaging material recyclability.

[1] International Council of Forest and paper Associations, "ICFPA 2020-2021 Sustainability Progress Report," [Online]. Available: https://icfpa.org/wp-content/uploads/2021/04/ICFPA-2021_Final-Draft_19-04-2021.pdf. [Accessed 15 07 2020].
[2] The Alliance for Beverage Cartons and the Environment (ACE), "BEVERAGE CARTON Recycling Facts and figures," Palurec GmbH, 09 2021. [Online]. Available: https://www.beveragecarton.eu/wp-content/uploads/2021/10/ACE-Recycling_BROCHURE_September-2021.pdf. [Accessed 15 07 2022].
[3] Institut für Energie- und Umweltforschung Heidelberg (ifeu), ”Comparative Life Cycle Assessment of Tetra Pak® carton packages and alternative packaging systems for liquid food on the Nordic market,” ifeu, Heidelberg, Germany, 2017.

Abstract

The world is slowly moving towards a more environmentally friendly mindset and many companies, such as Tetra Pak® have followed this lead by producing more environmentally friendly products and developing better materials with less environmental impact. To accommodate these requirements, it is important that the package is recyclable. For a carton this is defined by the repulpability, i.e., the ability of the material to disintegrate and the fibers to disperse.

Cartons consist of several layers containing different materials, such as plastics, cellulose and a barrier (that usually consists of aluminum foil). Together they give the package all of the wanted properties. The parts of the material that consists of fibers need to be separated from the polymers and aluminum during the repulping in order to be able to be repulped and thereafter further recycled. This thesis examines the method and repulpability and investigates the influence of interface characteristics on the recyclability of three materials, packaging material A, B and C (C has an aluminum barrier and A and B have fiber-based barriers). Different parameter settings, such as temperature, rotor speed, pre-soaking, moisture content and pH have also been investigated during the repulping process using the three forementioned materials.

The pulp was analyzed visually by making paper sheets out of the pulp, and quantitatively by doing further test on the pulp after the repulping to determine its quality. It was found that different parameters influenced the repulping time as well as the fiber flake content. The drainability was mostly influenced by the different properties of the materials, and the fibers in reject and flake content were influenced by both material properties and parameter settings.

Based on the results, a higher temperature than 43°C should be used when running the repulping trials, as it decreases the repulping time, and with it, energy consumption of the pulper. Material C gave the best recyclability out of the tested samples, and material A was the best alternative regarding the recyclability out of the two materials with fiber-based barriers. Material A would therefore be interesting to use for further research and development of recyclable material.

Keywords: Tetra Pak ®, Recyclability, repulpability, packaging material, fiber-based barrier

Sammanfattning

Världen rör sig sakta men säkert mot ett mer miljövänligt tankesätt och många företag, så som t.ex. Tetra Pak®, går åt samma håll genom att producera produkter och utveckla material som är bättre för miljön. För att en förpackning ska vara miljövänlig är det viktigt att den går att återvinna, och det är särskilt viktigt för fiberdelarna i pappersförpackningar att lossna och sönderdelas till enkilda fibrer i återuppslagningsprocessen. Återvinningsbarheten är ett mått på hur bra förpackningarna kan åstadkomma detta.

Pappersförpackningar som används för vätskebaserade produkter består av flera olika lager som i sin tur innehåller plaster, cellulosa och en barriär (vanligtvis aluminum). Tillsammans ger de förpackningen dess egenskaper och hjälper till att skydda produkten från yttre miljöfaktorer. De delar av förpackningen som består av fibrer måste separeras från de övriga materiallagren under återuppslagningen för att senare kunna bli till återvunnen pappersmassa. I detta examensarbete undersöks återvinningsbarheten av pappersförpackningar samt påverkan av materialegenskaperna på återvinningsbarheten. Tre olika material, A, B och C (där C har en barriär av aluminium och A och B har en fiberbaserad barriär) undersöktes i kombination med fem olika parametrar (temperatur, hastighet, blötläggning innan återuppslagning, fukthalt och pH) för att ta reda på hur återvinningsbarheten påverkas.

Pappersmassan från de återuppslagna förpackningsmaterialen analyserades visuellt genom att göra pappersark och kvantitativt genom att göra flera tester på den färdiga massan. Det visade att de olika parametrarna påverkade främst återuppslagningstiden, men också mängden fiberflak. Torkningstiden påverkades mest av de olika materialegenskaperna och fibermängden som sitter knar på plasten samt fiberflak påverkades av en kombination av båda.

Resultaten visade att det är fördelaktigt att använda en högre temperatur än 43°C under återuppslagningen då detta ledde till kortare återuppslagningstid, som i sin tur också gav en lägre energiförbrukning. Material C hade bäst återvinningsbarhet av de tre testade materialen, medan material A var det bästa materialet av de två som hade en fiberbaserad barriär gällande recycling. Material A vore därför intressant att undersöka och utveckla mer då det är ett steg på väg i utvecklingen mot mer återinningsbara förpackningar.

Nyckelord: Tetra Pak ®, Återvinningsbarhet, förpackningsmaterial, pappersförpackningar, fiberbaserad barriär

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1. Background

People are becoming more aware of the eco-friendliness of the products they buy as the world is slowly moving towards a more environmentally friendly mindset. Many companies have followed this lead by producing more environmentally friendly products which is done partly by developing better materials with less environmental impact. Tetra Pak® is one of the companies that is working on changing the materials used in their packages to other, more sustainable options. Another important aspect of a package is the recovery of the inherent materials and the ability to recycle them. The recyclability of a carton package is defined by the repulpability, i.e., the ability of the material to disintegrate and the fibers to disperse.

The aim of this thesis was to investigate repulpability using established methods in the field and study the influence of interface characteristics on the recyclability.

1.1 Scope

- To develop quantitative methods for the repulpability.
- To study material properties influencing recyclability.
    - Impact of layer composition and moisture levels on repulping time.
- To investigate repulping settings influencing recyclability
    - Impact of pH, temperature, rotor speed and pre-soaking on repulping time.
- To get familiarized with the recyclability evaluation procedure.
    - Practical experience from the other instruments used in Tetra Pak® lab.
    - Learn about the connection between the analytical and industrial implications.
    - Learn about existing global standards

1.2 Tetra Pak®

Tetra Pak® was founded in 1951 by Ruben Rausing in Lund and has since then evolved into a world leading company within the packaging industry. Tetra Pak® is operating in more than 160 countries and was selling over 192 billion packages in 2021.

Tetra Pak's ambition regarding recycling is "a world where all packages are collected, recycled and never become litter". Tetra Pak® approaches this goal from a few different directions, including designing the packages and the packaging material for easier recycling and increasing the knowledge and capacity of recyclability solutions, as well as increasing consumer awareness of recycling and recyclability and supporting the carton collection and sorting for recycling in all markets [1].

1.3 Recycling and repulping

The Ellen Macarthur Foundation defines full recyclability as at least 95% of the total weight of the package is recycled, not including energy recovery. A maximum of 5% contaminants are allowed in the package as long as they don't interfere with the recycling process [2] [3]. As of today, most sorting of waste material globally is done manually. Automatic sorting is mostly common in Europe and in the US but is slowly getting introduced in other countries [4]. One type of automatic sorting is using near infra-red (NIR) technology as a basis for detection [5]. The technique uses light at wavelengths of 780 - 2526 nm and analyzes the reflectivity of objects in the waste stream [6]. At the above-mentioned wavelengths, materials

such as polymers or paper have different characteristics, and the NIR technology is able to distinguish between different kinds of polymers and cellulose based materials and is thus able to sort the material into different categories. Packages that consist of a combination of sortable material (e.g., polymers), such as paper-based beverage cartons, can also be analyzed and sorted using the same NIR technology. Materials that do not have specific characteristics in infrared wavelengths cannot be sorted using NIR [5]. Some cases, such as with cartons containing metallics or black pigments, can cause issues with the automatic sorting due to detection errors using the NIR technology. Hence, packaging materials that contain these compounds will not be recyclable [4].

The repulping process is a major part in the beverage carton (made up of mostly cellulose) recycling process as cellulose is the easiest material to recycle in these kinds of packages. During the repulping, the paperboard in Tetra Pak® beverage cartons get exposed to water which separates the fibers from the protecting layers in the packaging material with minimal damage. The fibers are then washed and can be reused in new fiber-based materials [7].

Many parameters need to be considered when analyzing the recycled cartons; some of the more important ones are the fiber yield and the repulping time. The fiber yield is the ratio between the recovered fibers from the recycling process and the total fiber content of the package (available fiber yield). Sometimes, the fiber yield can also be referred to as the ratio of fibers obtained of the total package, i.e., including the plastic layers (total fiber yield). The available fiber yield should be as high as possible as it shows how much of the fibers in the packaging material can be recycled [4].

The repulping time is the time from the addition of the package to the recycling mill and until the fibers are separated from the other layers in the package and fully disintegrated. The repulping time can vary between different recycling plants and for different packages. The goal when developing new packaging materials is to minimize the repulping time as much as possible [4]. The fiber length also has an impact on the recyclability, as the fiber length decreases with every recycling round, and short fibers cannot be used for certain applications such as new packages.

1.4 Abbreviations

Abbreviations used in this thesis are defined in Table 1.

Table 1. Abbreviations.

Symbol	**Abbreviated term**
FiR	Fibers in Reject
HC	High Consistency
HDPE	High density polyethylene
LDPE	Low density polyethylene
LLDPE	Linear low density polyethylene
NaOH	Sodium hydroxide

NIR	Near infra-red
PE	Polyethylene
RH	Relative Humidity
UBC	Used beverage carton

1.5 Definitions

Definitions used in this thesis are described in Table 2.

Table 2. Definitions [4].

Term	**Description**
Carton	Type of package primarily made from paperboard
Available fiber yield	% of recovered fiber-based on the fiber content of the package
Fibers in Reject	% of fibers left on the PolyAl after the repulping
kWh	Kilowatt hours
mAh	Milliampere hours
PolyAl	Material that is left of the package after the fibers are recovered, such as PE, Aluminum, caps and closures
Primary fibers	Non recycled fibers from cellulose
Repulpability	Ability of the material to disintegrate and the fibers to disperse
Secondary fibers	Recycled fibers from cellulose
Total paper content	Total content of paper in the package
Wet strength	Tensile strength ratio between wet/dry board

2. Theory

2.1 Packaging materials

Beverage cartons consist of layers of different materials that together give the package its wanted characteristics. A typical Tetra Pak® package has layers consisting of plastics, a barrier, and cellulose and are arranged in a certain order illustrated in Figure 1 and Table 3. The industry defines PolyAl as the sum of all plastic and aluminum layers in the package, especially the laminate, barrier and internal polymers. In this thesis definitions in Table 3 will be used for the remainder of this report.

The different layers in the packaging material protect the product inside from external environmental factors with properties such as resistance to grease and moisture as well as against oxygen and light.

Tetra Pak® is researching and developing new material combinations for beverage packaging with the focus of decreasing the use of aluminum and polymers. This change of materials will decrease the environmental impact of the cartons as a whole.

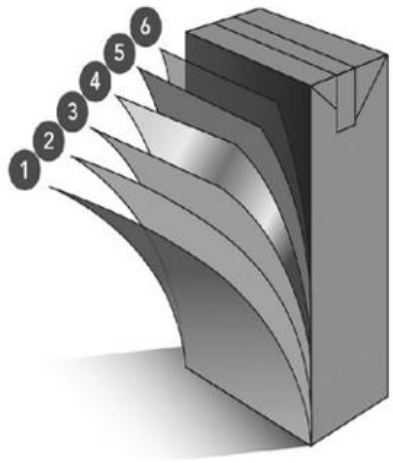

Figure 1. A typical package from Tetra Pak® illustrating the different material layers [8].

Table 3. The Materials and layers making up a beverage carton.

Nbr	Material	Layer
1	Polymer	Decor
2	Cellulose	Paperboard
3	Polymer	Laminate
4	Barrier	PolyAl
5	Polymer	
6	Polymer	

2.1.1 Décor layer

The décor layer is a polymer layer on the outside of the PM where information about the packaging content is usually printed. Parts of the print is used in the filling machine to define where one package ends, and the next package starts and is therefore very important in the manufacturing process. The layer is water resistant and provides the paperboard protection from external environmental factors.

2.1.2 Paperboard

The paperboard gives the package its strength and stiffness and is enclosed on both sides by polymers that provide the paperboard protection against humidity and also keeps the liquid sealed inside [9]. Paperboard can consist of both primary or secondary fibers, where primary (virgin) fibers are fibers that are directly produced from wood and have not undergone a recycling cycle, while secondary (recovered) fibers, have been through at least one recycling cycle and are derived from paper and cardboard waste. It is important to note that not all fibers, primary or secondary, are substitutable with each other, and not all fibers are recyclable due to the nature of their previous use. Fibers cannot be recycled indefinitely, as each cycle decreases the quality of the fibers [10].

Primary fiber properties depend on the source of wood. Fibers from fir or pine trees are longer and therefore provide a structure that is stronger and tougher compared to fibers from other types of trees (such as birch or chestnut) which are shorter. Primary fibers from fir or pine trees are 3-4 mm long and approximately 30 μm wide [10].

Primary fibers are extracted from wood through mechanical and/or chemical pulping. During mechanical pulping, the wood is grinded and crushed, and the generated heat softens the lignin (which holds the fibers together) and the fibers separate. Fibers extracted through mechanical pulping are hard and stiff as the lignin is kept in the material. This treatment results in a high yield and low-density paper sheets. On the contrary, chemical pulping separates the fibers by dissolving non-cellulose components, such as lignin and hemicellulose. The resulting yield is lower, but produced fibers are longer and therefore stronger, which in turn produces more flexible paper sheets. Fibers extracted through chemical pulping can be bleached in order to remove residual non-cellulosic components, thereby producing a purer cellulosic material [10].

Fibers used in paperboard packages can either be bleached or non-bleached, where bleached fibers are white while non-bleached fibers are brown. During the bleaching process, lignin is removed from the pulp, which gives bleached paperboard a lighter color than non-bleached paperboard. Due to its lighter color, bleached paperboard is often used for surfaces that will be printed, however, non-bleached pulp might be used in parts of paperboard that are not visible to the end consumer [10].

Secondary fibers are created from wastepaper or paperboard, and the quality of the fibers depends on how the original fibers were produced and used by the consumer. The length, and therefore the quality of the secondary fibers is reduced after each repulping cycle [10].

Manufacturers of paper or paperboard produce products with different properties depending on the final use of the paper or paperboard. One important parameter of packaging material is the surface strength which indirectly determines the adhesion between the different layers in the material. Good adhesion is crucial for the package to work properly. Some of the properties, such as the strength, depend strongly on the moisture content of the paper or

paperboard and is therefore always measured on samples that have been conditioned at RH 50% and 23°C [11].

2.1.3 Laminate

The laminate is a polymer layer that is positioned between the paperboard and the barrier in the packaging material. It is mainly used as a glue between the two layers, but also acts as another layer of protection [9].

Polyethylene (PE) is part of the polyolefin group, which is a class of synthetic polymers made from natural gas or petroleum, and it consists of long alkanes with single bonds between carbon and hydrogen, yielding the following common chemical formula $(C_2H_4)_n$. Polyolefins made their first commercial presence in the 1930s, but the production didn't start to rise until the 1950s when a series of catalysts were produced (Ziegler-Natta catalysts), which made it possible to produce these polymers at low a cost [12].

The laminate, as well as the other polymer layers in PM can be made from different kinds of polymers depending on the wanted end-use. However, these polymers usually consist of low-density polyethylene (LDPE), which is made from ethylene. The branched structure of this polymer ensures that the molecules cannot pack very closely, resulting in a flexible polymer with low density. The melting point of LDPE is about 110°C [13]. Another PE that is used in cartons is linear low-density polyethylene (LLDPE), which is stronger and has a higher resistance against perforation than LDPE [9]. LLDPE is made by copolymerizing ethylene and 1-butylene together with small quantities of hexene and octene. The copolymerization results in polymers with a linear backbone and short uniform branches [13].

Polymers can be recycled through mechanical or chemical recycling. During mechanical recycling, the polymers are grinded, reprocessed and then compounded. This does not change the chemical structure of the polymers, and the processability of LDPE does not change significantly after 40 extrusion cycles. During chemical recycling the polymers are turned back into their hydrocarbon components and are thereafter repolymerized into the wanted polymer structures. Chemical recycling leads to a less pure polymer mixture. When comparing the two different recycling methods, mechanical recycling is more reliable and cheaper than chemical recycling [14].

2.1.4 Barrier

The barrier in PM has the main task of protecting the product from external environmental factors, such as moisture, light and oxygen, and in some cases, even against fat [9]. The most common used barrier material is aluminum, but other alternatives, such as fiber-based barriers, are currently being researched.

Packaging material that has a fiber-based barrier instead of an aluminum barrier has a higher fiber content and could thus theoretically give a higher total fiber yield during the recycling. It is however not known how well the fibers can be recovered and how easy it is to separate the fibers from the PolyAl.

Pure aluminum can be recycled an infinite number of times, as it can be remelted and remolded independently of the previous use, and it takes only 5% of the energy used to make new aluminum to recycle. However, depending on how easy or difficult it is to extract the aluminum from the previous product, there might be some loss of material in the long run, and thus approximately 75% of the aluminum ever produced is still in use today [15].

2.1.5 PolyAl

The PolyAl is the layers of polymer and aluminum that extend between the barrier and the inside of the package. Together they hinder the product from contaminating the PM and protects it from moisture, light and oxygen [9]. The PolyAl is separated from the fibers during the repulping process and can thus be further recycled.

2.2 Recycling steps and analysis

2.2.1 Pulping

The recycling of packaging material is started with the repulping step, where packages or packaging materials are treated in order to produce pulp. During the repulping, the packaging material is mixed with a certain amount of water at a certain temperature and for a certain amount of time; these parameters are chosen based on the kind of fibers to be repulped and the type of end product [16]. At the end of the repulping, two different fractions are obtained: the pulp and the cleaned PolyAl.

2.2.2 Paper sheets

Paper sheets are made to visually check the quality of the pulp. When the pulp does not undergo full disintegration, the sheets will show the contaminants as visible fiber flakes. Parts of the PolyAl could also contaminate the pulp. A fully disintegrated pulp leads to uniform paper sheets without contaminating fiber flakes, but it might still contain parts of the PolyAl if they have not been properly removed during the filtering steps. Figure 2 shows a picture of a paper sheet contaminated with fiber flakes (A) and one made from fully disintegrated pulp (B). The sheets are analyzed visually by using both front light and back light. The different light sources facilitate analyzing the sheets as some contaminants can be better seen with light from behind (PolyAl) and some from the front (fiber flakes).

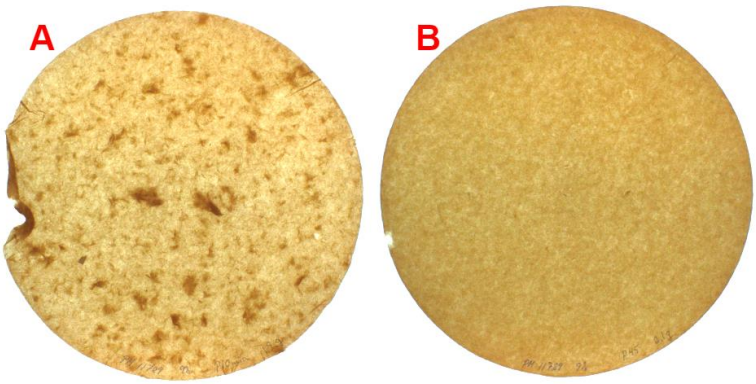

Figure 2. Two examples of paper sheets made from non-disintegrated (A) and disintegrated (B) pulp.

2.2.3 PolyAl quality

An important value in regard to the recyclability of the PolyAl is the ability to be separated from the fibers (Figure 3). Only pure PolyAl pieces can be further recycled in specialized paper mills, and it is thus important to know how well the pieces are purified after a certain amount of repulping time. Recovering the cellulose is important for the recycling mills as they can sell the collected cellulose to facilities using recycled cellulose to make new paper-based materials. Therefore, they are more likely to recycle material with a large fiber content.

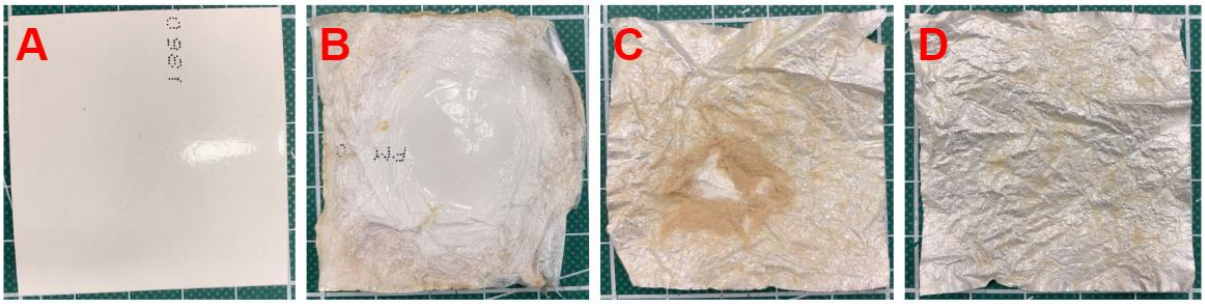

Figure 3. PolyAl from material C pictured after 0 (A), 10 (B), 15 (C) and 20 (D) minutes in the pulper.

The quality is also assessed by checking the number of PolyAl pieces with significant tears after the pulping step. A low number of tears is favorable as it indicates that less parts and pieces have come off of the PolyAl that can contaminate the pulp.

2.2.4 Fine screening

After the repulping process, the pulp is run through a fine screen that separates the fiber flakes from the free fibers. The fine reject (fibers stuck on the screen) gives an indication of the recyclability of the pulp; fiber flakes get stuck on the screen while free fibers pass through. By drying and weighing the fine reject, the fiber yield (percentage flakes) can be calculated. The fiber yield should be below 20% after 20 minutes of pulping in a standard disintegrator to be considered recyclable according to PTS [17]. A standard disintegrator is not comparable to the HC pulper used in this thesis (it takes longer time to repulp packaging material with the HC pulper) but the values give an indication of if the fiber flake content from the PM is in the right range.

2.2.5 CSF - Canadian Standard Freeness

CSF is a method to test the drainability of the pulp, which is directly related to the drying time. The CSF is the volume, called drainability, of water exiting through the side-pipe (see Figure 4) and is temperature dependent. Deionized water at 20°C has a CSF of approximately 880-890 ml [18], the exact value differs between manufacturers. This is the highest CSF a liquid can reach, and for a pulp, the value should be around 400-500 ml. A high drainability indicates that the fibers do not swell, and the pulp can be dried faster, which in turn decreases the energy requirements [18].

Figure 4. Schematic picture of the CSF setup

2.2.6 Fiber classifying

After the repulping step, the fibers can be sorted and classified based on their length. This gives an indication of how harsh the repulping has been on the fibers and the amount of fibers that can be reused and recycled.

2.3 Environmental impact

The production of paper and paperboard requires energy, wood, water among other resources. In 2019, 65% of the energy needed for on-site production was coming from renewable resources, 53% of the wood used for the pulp production came from sustainable forestry and 32 m^3 of process water was discharged per ton of pulp, which was a decrease of 13% since 2005. In 2019, a total of 59% of all paper and paperboard consumed in the world was made from recycled material [19].

In the pulping and repulping processes water is used for everything from separating and washing to refining and diluting the fibers before they can be used (or reused) as paper and paperboard. The water used in the recycling processes is mostly recycled and used more than once to decrease the amount of wastewater. When the process water is deemed unfit for reuse, it is classified as wastewater and is cleaned according to local regulations before it is released back into the environment [20].

To be able to decrease the environmental impact of paperboard packages, in production or during waste handling and recycling, some aspects are important to keep in mind. The packaging material can be optimized by changing the material or the composition of the sheets, or by reducing the total weight of the package. The different material sheets in the package should also be easily separated during the recycling process to ease further recycling of all components [20].

Cartons require a longer repulping process than other types of paper-based packages, such as cardboard boxes, toilet roll centers etc. due to the different layers in the packaging material. Traditional paper mills repulp the paper material 2-4 minutes, which is far too little time for cartons to separate into the different materials. Beverage cartons are therefore recycled in specialized recycling mills, where either single separation process or full separation process can be used [21]. There are around 20 paper mills specialized for beverage carton repulping in Europe, distributed according to Figure 5 [22].

In the single separation process the cartons are washed and pulped for approximately 20 minutes until the fibers have separated from the aluminum and polyethylene layers. The pulp is then screened to remove any contaminants and is then further processed into new paper-based products. In the full separation process, a continuation of the single separation process is done, i.e., the aluminum and the polyethylene layers are detached from each other. This is done through pyrolysis, where the mixture is heated until the polymers evaporate and the aluminum is recovered. The process can also be done through delamination, where an organic solvent is used to chemically separate the polyethylene and aluminum. The polymer and aluminum mixture which is separated from the fibers in the single separation process is called PolyAl and includes the different layers as well as any caps and closures [21].

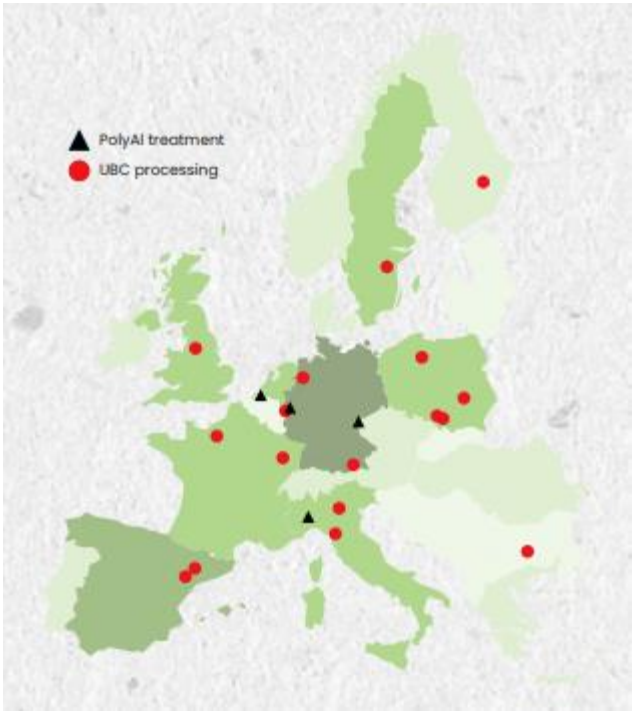

Figure 5. Recycling mills in Europe. The red dots show the used beverage carton (UBC) processing paper mills, and the black triangles show the facilities for PolyAl treatment [22].

Zero Waste Europe has studied the carton recycling process in four EU countries, Sweden, UK, Germany and Spain, where the specialized recycling mills all use the single separation process. The repulped fibers are further recycled, but the PolyAl fragments are often used as an energy source instead of it being recycled, or, in some cases, it is used in the cement production to improve its characteristics. A few facilities also collect the PolyAl mixture for further separation and recycling. On average in Europe, a carton package consists of 75% of paperboard, 21% of polymer and 4% of aluminum. This indicates that in the cases of the PolyAl fraction going directly to incineration, only 75% of a beverage carton can be recycled at most [21]. However, due to fiber losses (fiber length decreases) and package losses during collection and sorting, the average recycling rate for beverage cartons according to The Alliance for Beverage Cartons and the Environment (ACE) was only 51% in 2019 in Europe [22]. It is difficult to assess the recycling rate for beverage cartons in Sweden due to that the cartons are not collected and processed separately from other types of paper-based packaging. However, a few studies have been made on the recycling rate of Sweden [21], one of them made by ifeu, Institut für Energie und Umweltforschung Heidelberg. The commissioned report for Tetra Pak® International SA suggested that the total recycling rate for beverage cartons was 36.1% [23] in Sweden in 2017.

The facility Palurec GmbH in Germany is one of the few sites in Europe that collects the PolyAl mixture after the repulping process and uses it for further recycling. The mixture is separated into aluminum, HDPE (mostly caps and closures) and LDPE. After the separation, aluminum can be used as an admixture for castings, the HDPE can be processed further into non-food packaging products, and the LDPE is made into pellets for extrusion processes [24].

3. Material and methods

3.1 Materials

3.1.1 Packaging material

The packaging material is described in Table 4. The ID is used for further identification in the thesis. PM A and B differ from C by the type of barrier, and PM A and C differ from B by the paperboard manufacturer.

Table 4. The packaging material used in the thesis.

Packaging material	Barrier properties	Paperboard	ID
PM A	Fiber-based barrier	Board manufacturer 1	A
PM B	Fiber-based barrier	Board manufacturer 2	B
PM C	Al-foil barrier	Board manufacturer 1	C

3.1.2 Lab equipment

All equipment used in this thesis is Tetra Pak® in-house capacity if nothing else is mentioned.

A lab scale pulper, mimicking industrial high consistency pulpers, was used for the pulping. The fiber classifications were made with a Bauer McNett classifier with screens sets with mesh numbers 14, 28, 48, and 100. A Somerville classifier with a 0.15 screening plate was used for the fiber flake content assessment. The hand sheet machine used for making the sheets had dryers set at 94°C, 9.5 bars and 7 minutes. The ovens used for drying samples from the pulp and PolyAl were set at 105°C and 65°C. The moisture analyzer (VWR) was used at Lund University. Deionized water was used for the CSF analysis and NaOH stock solution (50 wt%) for the repulping with higher pH.

3.2 Methods

The calculations were made using excel, see Appendix C, and the figures were plotted in Minitab. The FiR and the CSF calculations are not added to Appendix C due to confidentiality.

A flow sheet for the pulping and analysis process can be seen in Figure 6.

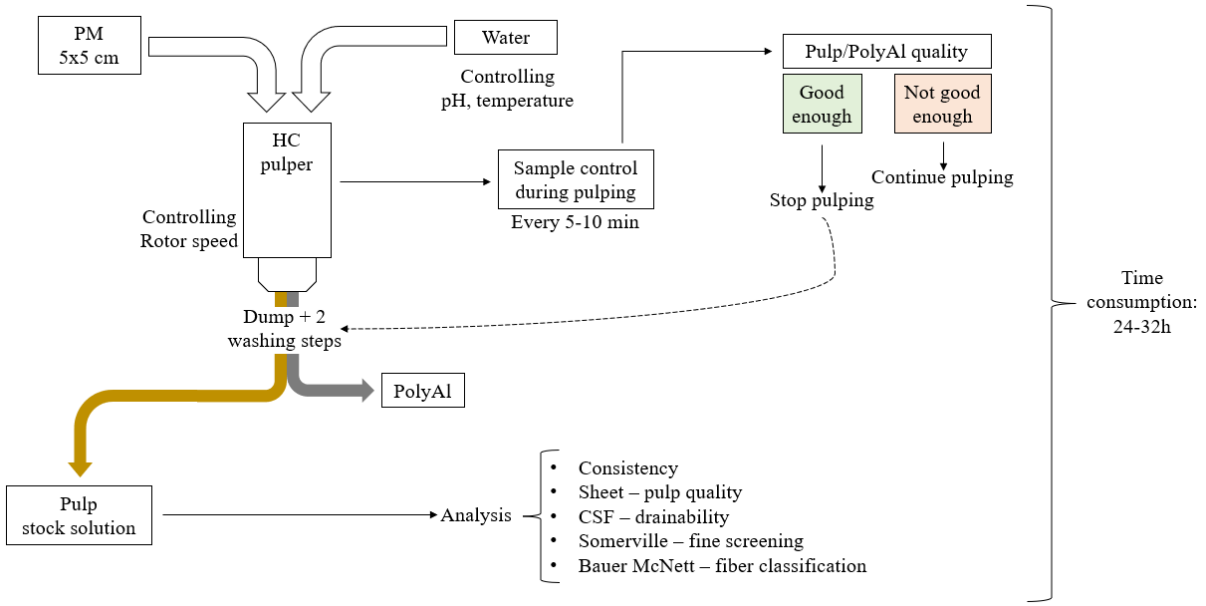

Figure 6. Flow chart of the repulping process and the following analysis.

The standard setting parameters for the repulping process at Tetra Pak® were 43°C, 750 rpm, 5x5 cm packaging material pieces, normal tap water and no pre-soaking of material. These settings were changed one at a time in this thesis, and the results were investigated to observe the effect of different parameters on the pulp. The pulper could be filled both automatically and manually, and either method was used depending on which parameters were tested in order to facilitate the handling.

During the pulping process the pulper was stopped at 2.5, 5 and 7.5 minutes to push down any material that got stuck on the wall, and every 5-10 minutes (starting at 10 minutes) both pulp and PolyAl pieces were collected and analyzed. The pulp was used to make paper sheets which in turn were used to evaluate the pulp quality. The PolyAl pieces were visually checked for delamination. The pulping process (using the High Consistency Pulper) continues until both the pulp and the PolyAl have sufficient quality for recycling. When the pulp and PolyAl quality was sufficient, the remaining mixture left in the pulper was removed through the side cover. The pulper was cleaned before the mixture was put back into the pulper for the dumping and washing steps, which separates the pulp from the PolyAl. During these steps, the pulp was in total diluted with about 100 l of water distributed over the washing steps and had an approximate consistency of 0.7-1%. The pulp was used for further testing and analysis. The PolyAl pieces were collected and later checked for delamination.

The samples A and B were compared with each other by treating them using different parameters, as defined below.

- Temperature during the repulping
- Pre-soaking before the repulping or no pre-soaking
- pH during the repulping
- Moisture content pre repulping
- Rotor speed of the repulping

Sample C was compared with samples A and B, however only at a certain set of parameters due to lack of time. Some tests had already been performed on PM B. The conclusions from those tests were added and compared with the results obtained in this thesis.
The temperature during the pulping was controlled only with the water temperature during the filling of the pulper. The temperature cannot be controlled during the pulping and was dependent on the friction and the stopping times during sample collection. The temperature usually increases a few degrees during the pulping due to this. The temperature was set to 43°C, 35°C and 55°C during the trials.

Two pulping runs were made with pre-soaked PM. The PM was soaked in water for 16 hours before the pulping was started. The material was weighed before and after the soaking in order to be able to add the correct amount of water into the pulper and get the desired initial concentration.

The pH was changed for two pulping runs, one was set to pH 10, and the other to pH 12. The pH stock solutions were prepared beforehand and added carefully to the pulper before the PM was added. After the addition of the material, the process was operated as previously described. Tap water was used for all other repulping experiments and had a pH of approximately 7.8 - 8.3.

The moisture content was measured before each recyclability experiment using samples from the same PM that were used in the repulping experiments. The moisture content was calculated according to 3.2.8 Moisture content. The moisture content of the soaked samples was measured before the soaking process. Two batches of samples were kept at RH 80% and 35°C for a few days to increase the moisture content.

The rotor speed of the pulping was controlled using the software of the pulper. The parameter was set to 750 rpm for all runs except two, where the velocity was set to 900 rpm and 1100 rpm.

3.2.1 High Consistency Pulper (HC)

The pulper used for the pulping step in this thesis was a High Consistency Pulper (HC pulper), mimicking HC Pulpers from the industry, see Figure 7. The HC pulper was downscaled to lab size and held approximately 60 l of water. After the pulping process, the pulp was saved in a large tank (Figure 8) and was used for further analysis.

Figure 7. The high consistency (HC) Pulper.

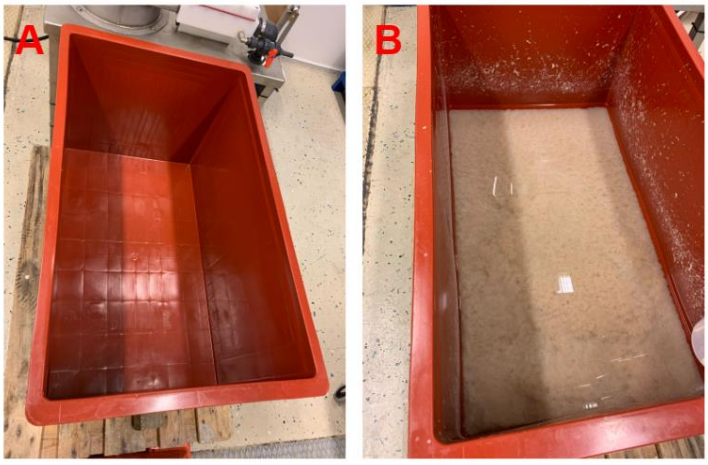

Figure 8. The tank used for the pulp stock after the pulping in the HC pulper.

The amount of dry packaging material was measured to get the wanted consistency for the pulping step. The consistency was in this case interchangeable with the concentration. The theoretical consistency (assuming oven dry material) was calculated according to Equation 1, where m_{PM} was the mass of packaging material and m_{water} was the mass of water added to the pulper.

Equation 1 $$Theoretical\ Consistency = \frac{m_{PM}}{m_{PM}+m_{water}} \times 100$$

3.2.2 Visual pulp quality - sheet making

During the repulping process, the quality was visually determined for the pulp. A sample was acquired every 5-10 minutes and turned into a paper sheet. The sheets were made using a hand sheet machine with dryers set at 94°C, 9.5 bars and 7 minutes. The sheets were made to weigh 2 g ± 0.2 g in order to be comparable. The sheets were visually inspected for any

defects, such as fiber flakes, pieces from the décor or PolyAl and other contaminants (see Figure 2). The pulping was stopped when the sheets were uniform and without any fiber flakes if the PolyAl quality also was sufficient.

The amount of pulp needed to make a sheet of 2 g was calculated using Equation 2, where *Q* was the quantity of wet pulp needed and *Consistency* was either the theoretical consistency (for the sheets made during the pulping) or the consistency from Equation 6 (for the sheets made after the pulping). In case the sheet did not reach the wanted weight, due to that the consistency was incorrect, the adjusted quantity of pulp could be calculated according to Equation 3, where Q_2 was the adjusted quantity of needed wet pulp, *Q* was the previous calculated quantity and m_{sheet} was the weight of the previous hand sheet.

Equation 2 $$Q[g] = \frac{2[g] \times 100}{Consistency}$$

Equation 3 $$Q_2 = \frac{2[g] \times Q}{m_{sheet}}$$

3.2.3 PolyAl quality - Fibers in Reject

The PolyAl quality was checked continuously during the pulping to determine when the pulping should be stopped. The quality was assessed by taking out 25 intact PolyAl pieces every 5-10 minutes from the pulper, which were gently washed to remove loose fibers. Fibers or laminate parts that were not easily removed were kept on the PolyAl. The pulping was considered sufficient when only 1 to 2 PolyAl pieces still had the laminate stuck on the fiber-based barrier. The PolyAl pieces used for the FiR determination should not have any tears in order to eliminate the weight differences caused by missing material.

The PolyAl pieces were dried overnight in an oven at 65°C, after which the samples were weighed. The *Fibers in Reject* was calculated according to Equation 4 and Equation 5, where m_{Fiber} was the fiber weight, m_{PolyAl} was the total weight of the dried PolyAl (all 25 pieces), $m_{Theoretic}$ was the theoretical weight of the non-fiber layers of the PolyAl and m_{Total} was the total theoretical weight of the PolyAl, laminate and décor layer.

Equation 4 $$m_{Fiber} = m_{PolyAl} - m_{Theoretic}$$

Equation 5 $$Fibers\ in\ Reject\ [\%] = \frac{m_{Fiber}}{m_{Fiber} + m_{Total}} \times 100$$

3.2.4 Consistency

Two 2 l samples were collected from the dumped pulp for use in the consistency calculations. The samples were taken while the pulp was thoroughly mixed in order to be certain that the samples were representative of the whole pulp. A Büchner funnel was prepared with a filter (⌀110 mm) with a known weight. Approximately 400 g of pulp from the collected samples was weighed and the pulp was transferred to the Büchner funnel. The collected fibers were left on the filter paper to dry in an oven at 105°C for at least 2 hours before they were weighed. The consistency was calculated according to Equation 6, where m_{Total} was the total mass of the filter paper and the fibers after drying, $m_{Filter\ Paper}$ was the weight of the clean filter paper and m_{Pulp} was the weight of the pulp suspension. Three consistency measurements were made on the dumped pulp after every experiment.

Equation 6 $$Consistency\ [\%] = \frac{m_{Total} - m_{Filter\ Paper}}{m_{Pulp}} \times 100$$

Two paper sheets were also made from the collected samples and treated as per 3.2.2 Visual pulp quality - sheet making.

3.2.5 Somerville fine screening

The fine screening equipment used in this thesis was a Somerville fractionator (Tetra Pak® in-house capacity) using a plate with slots that were 0.15 mm wide and 45 mm long.

The weight of wet pulp corresponding to 10 g of oven dry material was calculated according to Equation 7, where the consistency was the consistency calculated in Equation 6. The Somerville fine screening was run twice with two different samples from the dumped pulp. The fine reject was collected for both rounds, but only the first accept was kept for visual analysis. The fine reject was passed through the Büchner funnel, dried and weighed. The percentage of fiber flakes (fine reject) was calculated using Equation 8, where $m_{Fine\ reject}$ was the weight of the fine reject.

Two paper sheets were made from the accept and evaluated as per 3.2.2 Visual pulp quality - sheet making.

Equation 7 $$Target\ weight\ Somerville\ [g] = \frac{10\ [g] \times 100}{Consistency\ [\%]}$$

Equation 8 $$Fiber\ flakes\ [\%] = \frac{m_{Fine\ reject}}{10\ [g]} \times 100$$

The available fiber yield was calculated according to Equation 9, where *A[%]* was the content of fibers passing the Somerville fractionator, FiR was the calculated *Fibers in Reject* (Equation 5) which was calculated at the end of the process and *F[%]* was the total content of fibers in the packaging material.

Equation 9 $$Available\ fiber\ yield\ [\%] = \frac{A[\%] \times (100 - (FiR \times (1 - F[\%])))}{100}$$

3.2.6 Fiber classification

In this thesis the Bauer McNett classifier (Tetra Pak® in-house capacity) was used to divide the repulped fibers into different lengths. The fiber classifier works by letting the pulp pass through a series of screens with a decreasing mesh size, where the larger fibers were collected at the beginning and the smaller fibers at the end.

A set of screens was prepared for four tanks/vats set to 14, 28, 48, 100. The numbers correspond to pore sizes as seen in Table 5. A certain amount of pulp, corresponding to 10 g of oven dried fibers, was loaded into the Somerville fractionator where the water was led into the first vat. After 20 minutes, the water was drained and the residue from each vat was dried on filter paper and weighed.

Table 5. The mesh number and the corresponding pore size, as well as the classification of brown fibers.

Mesh	Pore size [mm]	Classification: Brown fibers (un-bleached)
14	1.18	Long fibers
28	0.6	
48	0.3	Short fibers
100	0.15	
>100	-	Fines

3.2.7 CSF - drainability

The CSF setup can be seen in Figure 4, where the pulp/water suspension was loaded into the top beaker and drained through the funnel below. Depending on the water flow; the filtered water will either flow out through the bottom drain or the side drain.

The drainability was measured using samples collected from the clean pulp. The amount of sample needed for the drainability measurement was calculated in accordance with Equation 10, where the *Consistency* referred to the consistency calculated in Equation 6. The 1 l pulp and deionized water mixture was passed through, and the water exiting through the side pipe was measured with a measuring cylinder, and the collected fibers were passed through the Büchner funnel and dried in the oven and weighed.

It was important to be precise when measuring the amount of wet pulp for the CSF analysis (corresponding to 3 g oven dry material), as well as having a constant temperature of 20°C ± 2°C, due to possible influence of both parameters on the measured CSF. The measured CSF value was adjusted using the actual amount of pulp and temperature using Equation 12, where CSF_{Adj} was the adjusted CSF, CSF_M was the measured CSF, T_M was the measured temperature and C_T was the theoretical consistency [18]. The theoretical consistency was calculated according to Equation 11, where m_{pulp} was the weight of the pulp before dilution with distilled water (to a total mass of 1000 g), and *Consistency [%]* was the consistency calculated in 3.2.4 Consistency.

Equation 10 $$Target\ weight\ CSF\ [g] = \frac{3\ [g] \times 100}{Consistency\ [\%]}$$

Equation 11 $$C_T = \frac{m_{pulp} \times Consistency\ [\%]}{1000}$$

Equation 12 $$CSF_{Adj}[ml] = CSF_M[ml] + (C_T - 0.003) \times 10000 \times (0.9137 + 0.02774 \times CSF_M - 0.00003 \times CSF_M^2) - (T_M - 20) \times (0.5163 + 0.01819 \times CSF_M - 0.000021 \times CSF_M^2)$$

3.2.8 Moisture content

The moisture content was calculated on samples that were stored in the same conditions as the samples used for the pulping. The samples were cut into circular 1 dm^2 pieces. They were weighed, dried in an oven at 105°C for 2 hours and finally weighed again. Using the acquired measurements together with the PolyAl weight; the moisture content can be calculated according to Equation 13; where m_{wet} was the weight of the packaging material before drying, m_{dry} was the weight of the packaging material after drying and m_{PolyAl} was the theoretical

PolyAl weight per dm^2. It was assumed that the moisture content of the samples used in the pulping process were the same.

The moisture content was taken into account when calculating the consistency in the pulper as per Equation 16. In Equation 14, Equation 15 and Equation 16, m_{wet} was the weight of the packaging material that was used for the pulping, v was the percentage of paperboard in the packaging material and m_{water} was the mass of the water used for the pulper.

Equation 13 $$Moisture\ [\%] = \frac{m_{wet} - m_{dry}}{m_{wet} - m_{PolyAl}}$$

Equation 14 $$Dry\ paperboard\ weight = m_{wet} \times v \times (1 - Moisture\ [\%]_{Average})$$

Equation 15 $$PolyAl\ weight = m_{wet} \times (1 - v)$$

Equation 16 $$Real\ consistency\ [\%] = \frac{Dry\ paperboard\ weight + PolyAl\ weight}{m_{wet} + m_{water}}$$

3.2.9 Robustness

A robustness test was done in order to test the operator influence on the results of the consistency test. Three operators collected three 2-liter samples, each, from the same pulp stock solution and made 3 consistency tests from each sample. The consistency was calculated according to 3.2.4 Consistency.

3.2.10 Energy consumption

The energy data from the pulping process was extracted from the HC Pulper software at the end of the pulping trials. The goal was to study the influence of different parameter settings on the energy consumption. The data was calculated as electrical charge (in mAh) and was converted to kWh by using Equation 17, where U was the voltage. In this case U was 400 V.

Equation 17 $$kWh = \frac{Electric\ charge \times U}{10^6}$$

3.2.11 Drying

Two small samples from PM A and PM B were dried using a moisture analyzer with a set temperature and moisture content to get the time it takes for the PM to dry from the initial free moisture content to the final moisture content. The free moisture content (Xt) was calculated according to Equation 19, where m_i was the initial sample weight, $M[\%]$ was the Moisture content and m_f was the final sample weight. The moisture content $M[\%]$ was calculated according to Equation 18, where m_t was the weight at a specific time.

Equation 18 $$M[\%] = \frac{m_i - m_t}{m_i} \times 100$$

Equation 19 $$Xt = \frac{m_i - \frac{M[\%] \times m_i}{100} - m_f}{m_f}$$

4. Results and discussion

Only one test was carried through per parameter change due to limited time, however two runs were done with the standard parameters for PM C.

4.1 High Consistency Pulper (HC)

The tested parameters resulted in different repulping times, according to Table 6. Notable is that some of the trials were stopped too early or too late; did not pass the 3% threshold or passed the threshold 5 minutes before stopping (see Figure 13, Figure 14 and Figure 15). The standard parameter trial with PM B, as well as the 900 rpm trial with PM B were stopped too early and the 1100 rpm trial with PM B and the RH 80% trial with PM B were stopped too late.

The tests indicated that PM A had a shorter repulping time than PM B. It also showed that the pulping process was influenced by all the parameters. The repulping time for PM C was different from PM A and B. The reason for the longer repulping time of PM A and B compared to PM C was that A and B have a fiber-based barrier between the laminate and the PolyAl. To be able to repulp the fiber-based barrier, the laminate needs to separate from the barrier. This step was not needed when an al-foil barrier was used. The only material that could be repulped in PM C was the paperboard, and thus the pulping could be stopped before the laminate separated from the PolyAl. PM with fiber-based barrier was thus considered done pulping when the laminate had separated from the barrier and the PolyAl, and PM with aluminum barrier was considered done pulping when the paperboard was sufficiently repulped. Figure 9 shows the difference between a piece of PolyAl with and without laminate, respectively.

The parameters that had the most impact on the repulping time (Table 6) were the temperature and the rotor speed; where a higher temperature than the standard setting (55°C) led to a decreased pulping time of ~10 minutes and an increased velocity (1100 rpm) led to a decreased repulping time of ~15 minutes. One thing that was noted while running the 1100 rpm pulping was that it resulted in a larger amount of PolyAl pieces with significant tearing compared to the pulping trial with normal parameters. This was an unwanted feature as the tears may lead to contaminated pulp. These results indicated that it would be beneficial to increase the temperature to decrease the repulping time. It would also be interesting to look further into the rotor speed parameter to see how many PolyAl pieces end up with significant tears at different velocities and maybe find a velocity where the torn amount was not too large.

One thing to keep in mind regarding the temperature was that it could only be controlled while filling the pulper at the start of the experiment. During the pulping, the temperature usually increased due to the friction in the pulp and PolyAl mixture, which might have influenced the repulping time results. The temperature recorded was the starting temperature.

Table 6. The repulping time for the different packaging materials at the different parameters.

Packaging material	Temperature [°C]	Pre-soaking [h]	Rotor speed [rpm]	Time in 80% RH [days]	pH	Repulping time [min]
A	43	0	750	0	Neutral	45
	43	0	750	**4**	Neutral	40
	43	**16**	750	0	Neutral	40
	55	0	750	0	Neutral	35
B	43	0	750	0	Neutral	50
	43	0	750	0	**10**	60
	43	0	750	0	**12**	55
	43	0	750	**4**	Neutral	60
	43	0	**900**	0	Neutral	50
	43	0	**1100**	0	Neutral	45
	43	**16**	750	0	Neutral	55
	35	0	750	0	Neutral	65
	55	0	750	0	Neutral	45
C	43	0	750	0	Neutral	20

Figure 9. PM with (A) and without (B) the laminate intact on the PolyAl.

4.2 Visual pulp quality - sheet making

The pulp quality increases with the pulping time. For PM A and B the pulp quality was acceptable after 20-30 minutes, but the run was still on-going due to the low PolyAl quality. The pulping was stopped after 20 minutes for PM C with acceptable quality of both pulp and PolyAl. Below are examples of sheets photographed from above and below; Figure 10, Figure 11 and Figure 12 show the results from PM A, B and C, respectively. One can clearly note that the 10-minute sheets all have dark spots when photographed with light from below. The dark spots are fiber flakes, which shows that there were still non-disintegrated fibers from the paperboard in the pulp. After 20 minutes, one can see that the sheets were uniform (except for a few white spots) which indicated that the fiber flakes from the paperboard had been

disintegrated. The larger white spots that can be seen in some sheets are parts of the décor or another polymer layer that accidentally got picked from the pulper when checking the pulp quality. The sheets from PM A and B also show some smaller light fiber flakes at 30 minutes, which originated from the fiber-based barrier. The fiber-flakes from the barrier were not as many, or as large as the flakes from the paperboard and thus disintegrate much faster.

The laminate seems to be the most important factor considering the pulp quality of PM A and B. A wanted feature for the laminate was to easily separate from the PolyAl in order to simplify the contact of the fiber-based barriers with water. This could be achievable by decreasing the adhesion of the laminate to the PolyAl, for example by changing the polymer.

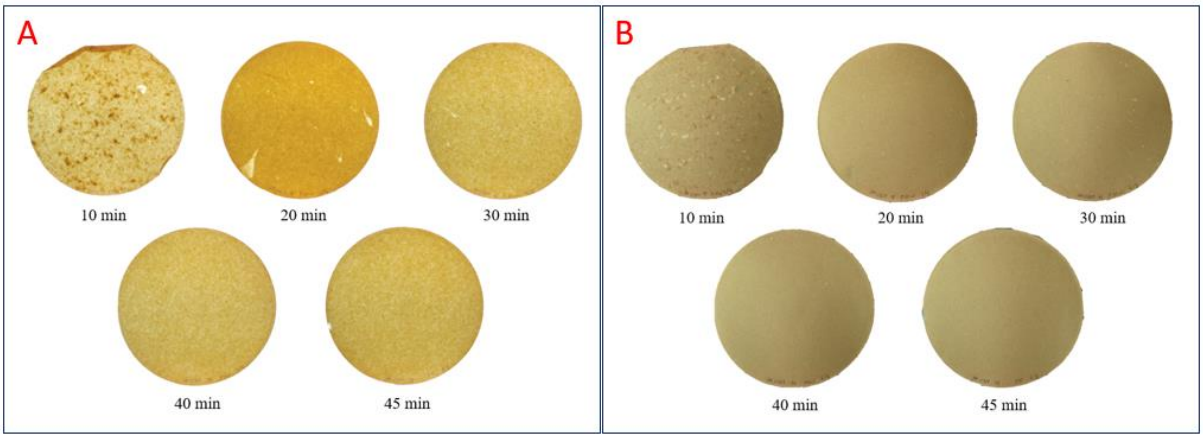

Figure 10. Sheets made from PM A run with standard parameters, taken at 10, 20, 30, 40 and 45 minutes of pulping. Photographed with light from behind (A) and from the front (B).

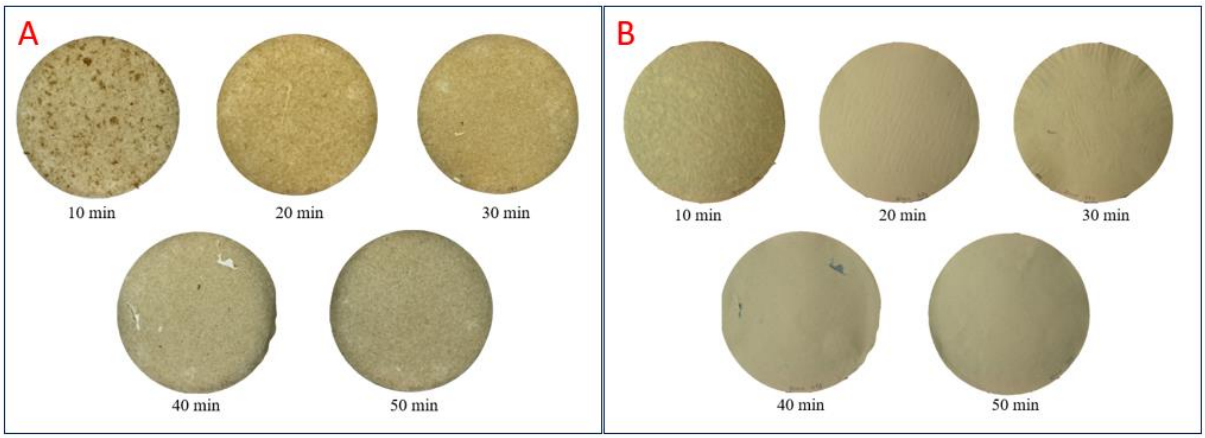

Figure 11. Sheets made from PM B run with standard parameters, taken at 10, 20, 30, 40 and 45 minutes of pulping. Photographed with light from behind (A) and from the front (B).

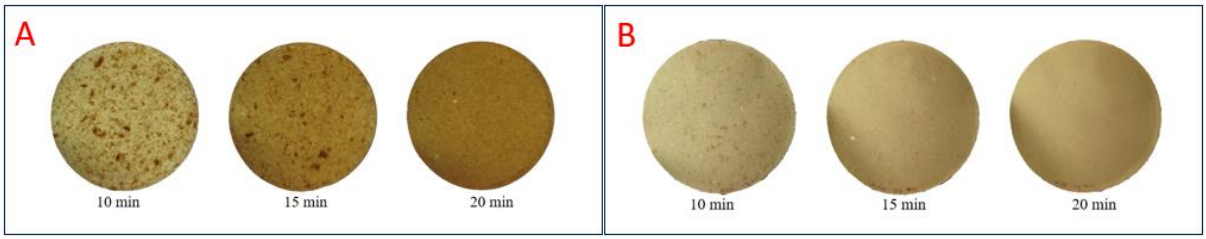

Figure 12. Sheets made from PM C run with standard parameters, taken at 10, 15 and 20 minutes of pulping. Photographed with light from behind (A) and from the front (B).

4.3 PolyAl quality - Fibers in Reject

The percentage of fibers remaining on the PolyAl pieces was defined as the fibers in reject (FiR), which were plotted over time for the PM A trials in Figure 13, the PM B trials in Figure 14 and the PM C trials in Figure 15. At less than 3% fiber content, the quality was considered acceptable. One can note in Figure 14 that two experiments were stopped too early (the 900 rpm and the 43°C trial) as the curves did not cross the 3% threshold. In the same figure two trials were stopped too late (the 1100 rpm and the RH 80%) as the curves crossed the threshold five minutes before stopping. However, due to the difficulty of taking out representative samples it is hard to say this with certainty. A solution to decrease the risk of taking out a non-representative sample could be to take out a larger amount of samples for the FiR analysis. Although this needs to be considered together with the time consumption of the analysis, as it would take longer time to wash, dry and weigh a larger amount of samples.

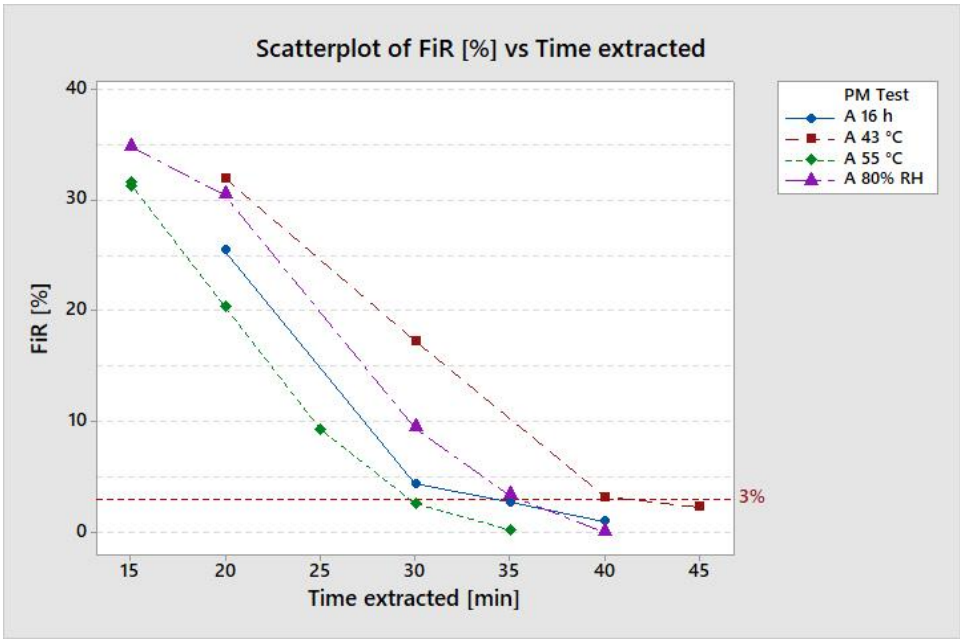

Figure 13. Fibers in reject plotted against time for the different runs with the material A. The 3% marks when the PolyAl quality is sufficient to stop the run.

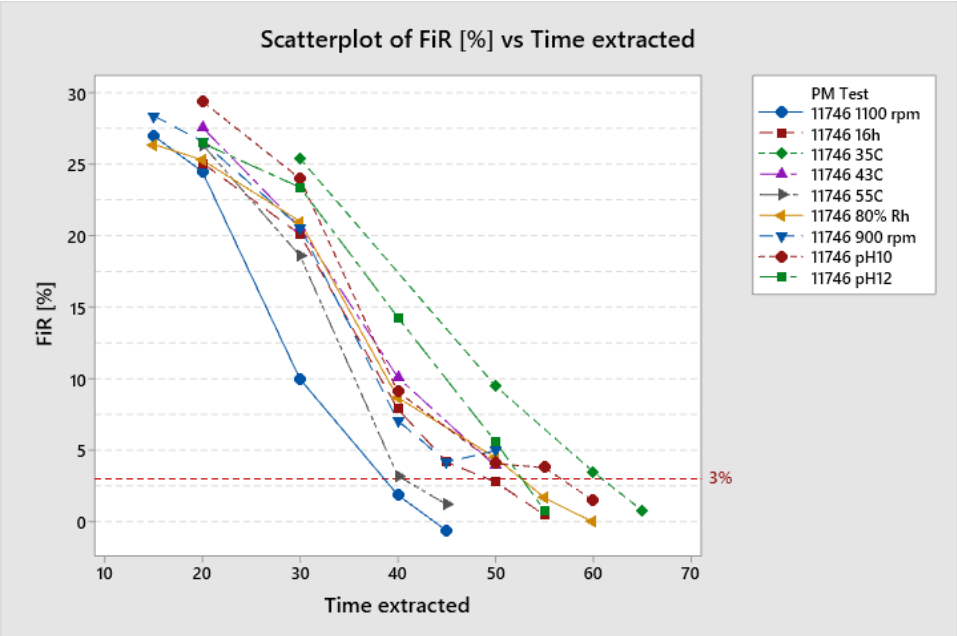

Figure 14. Fibers in reject plotted against time for the different runs with the material B. The 3% marks when the PolyAl quality is sufficient to stop the run.

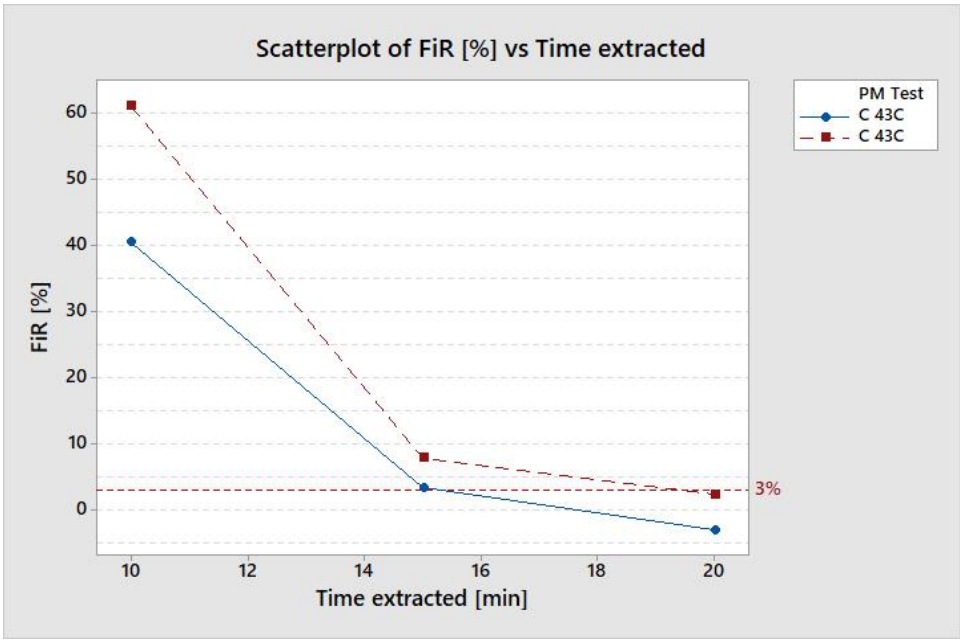

Figure 15. Fibers in reject plotted against time for the different runs with the material C. The 3% marks when the PolyAl quality is sufficient to stop the run.

Note that the threshold of 3% was reached earlier for PM A compared to PM B, thereby matching the data from Table 6. The increased temperature (to 55°C) and increased rotor speed (to 1100 rpm) had the biggest impact on the repulping time. Note that the two trials with PM C did not have overlapping curves, even though all parameters were the same. This was likely due to the difficulty of taking out samples that were representative for the total mixture.

However, the FiR curves showed that the results were material dependent. This observation indicated that it should be possible to fit a curve for each material and thus use the resulting curve to predict the repulping time. This was however outside of the scope for this thesis and left for future work.

In some of the trials there was a large number of torn PolyAl pieces, which had to be discarded for the FiR analysis and this influenced the time spent on the analysis. To determine if the weight differs enough to make a significant difference between torn and non-torn PolyAl pieces, a test was done for each sample (A, B and C series). A large number of PolyAl pieces were checked for tears after the finished pulping and were then dried and weighed one on one. Figure 16, Figure 17 and Figure 18 show how the PolyAl weight differs between the individual pieces as well as between the torn and whole pieces for materials A, B and C. The graphs are plotted as density vs weight, which makes the area of each bar representing the proportions of the sample observations that falls within that weight.

A 2-sample T-test was made for each one of the tests, which indicated that there was no significant difference at $p < 0.05$ between torn and whole pieces for PM A and C, while there was a significant difference at $p < 0.05$ between torn and whole pieces for PM B. This difference might be due to that fewer fiber residues were stuck on the (teared and non-teared) PolyAl from PM B and thus were not influencing the weight. Another explanation could be that the weight of the different material layers in PM B varied much less compared to the weight of the materials in PM A and C. However, because the difference between torn and whole pieces was minor (even for PM B) it probably did not influence the weighing of the PolyAl for the FiR calculations.

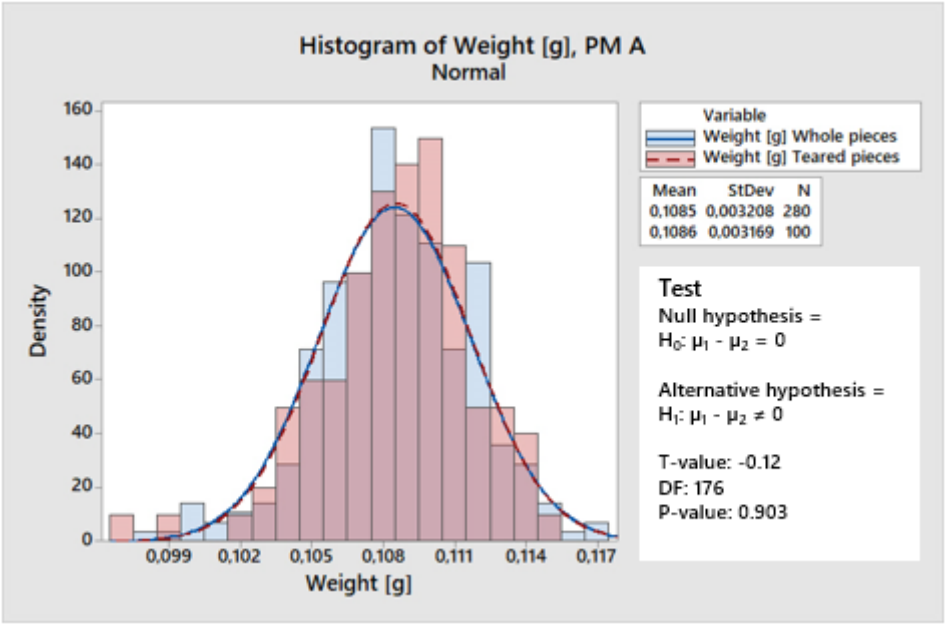

Figure 16. Histogram of the weight distribution between teared and non-teared PolyAl pieces for material A. The T-test indicates that there was no significant difference between teared and non-teared pieces at $p < 0.05$. The y-axis is the density, which makes the area of each bar representing the proportions of the sample observations that fall within the bin.

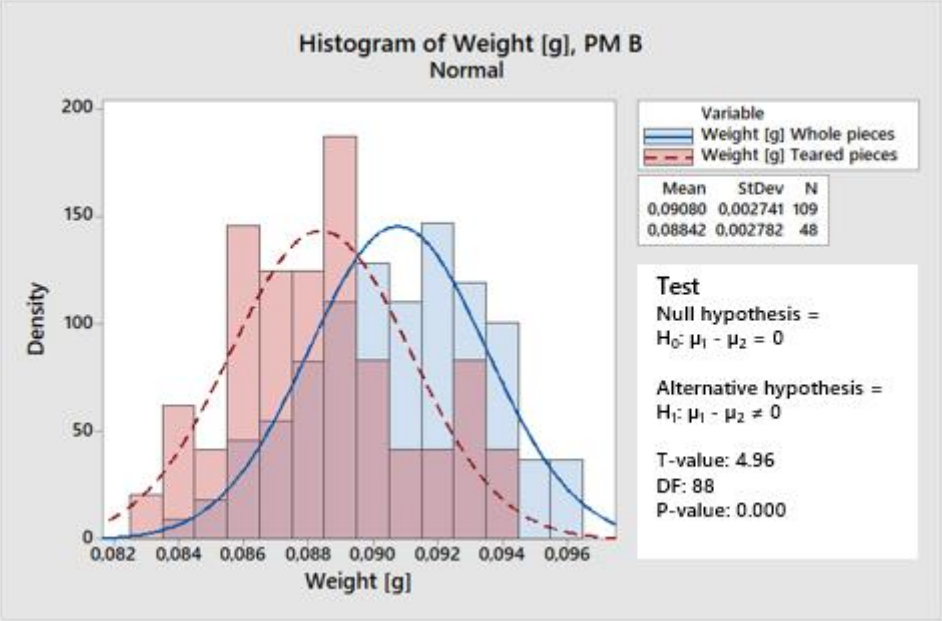

Figure 17. Histogram of the weight distribution between teared and non-teared PolyAl pieces for material B. The T-test indicates that there was a significant difference between teared and non-teared pieces at $p < 0.05$. The y-axis is the density, which makes the area of each bar representing the proportions of the sample observations that fall within the bin.

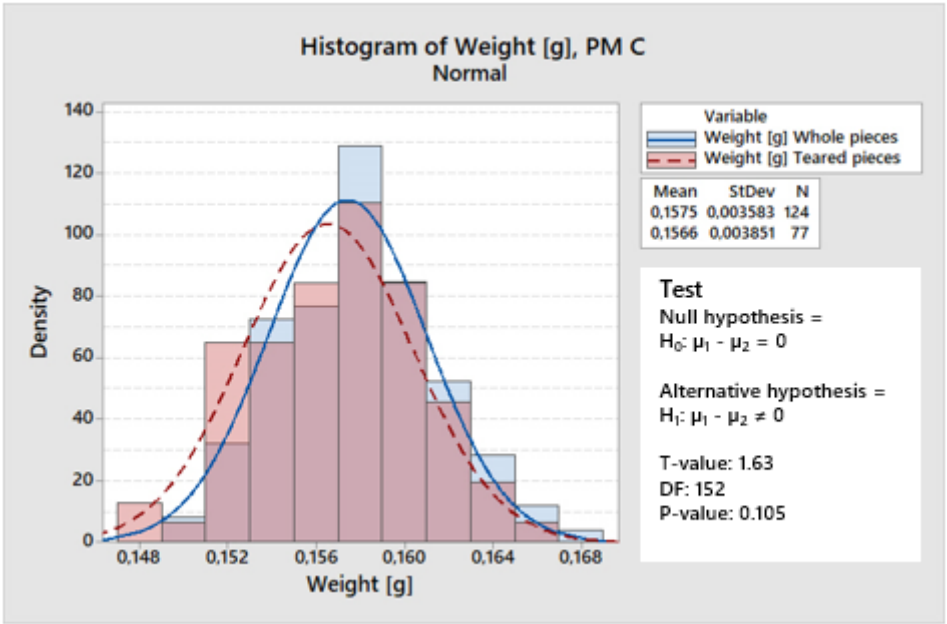

Figure 18. Histogram of the weight distribution between teared and non-teared PolyAl pieces for material C. The T-test indicates that there was no significant difference between teared and non-teared pieces at $p < 0.05$. The y-axis is the density, which makes the area of each bar representing the proportions of the sample observations that fall within the bin.

4.4 Somerville fine screening

The percentage of fiber flakes for the PM A, B and C can be viewed in Figure 19. The results show that the percentage of flakes was the highest for material B regardless of what parameter was tested, and that the percentage of flakes for material A was the lowest. The parameter settings had an influence on the percentage of fiber flakes, especially the increased moisture content (RH 80%) which increased the flake content in PM B and less in PM A. It was difficult to determine how each parameter influenced the flake content as only one pulping trial and two Somerville trials were made per setting. It would be interesting to make more tests with the same settings to see if one can notice a trend.

The percentage flakes was calculated after the runs were done, at 40-60 minutes for PM A and B and at 20 minutes for PM C. The percentage of flakes should be below 20% after 20 minutes in the standard disintegrator in order to be considered recyclable [17]. The HC Pulper was not directly comparable with the standard disintegrator, however the flake content was still at very low values. PM C, which was stopped after 20 minutes of pulping, was below this threshold. It was difficult to know if PM A and B would be below the threshold, as the pulping was stopped at a later stage, however, both were below the threshold at the time the process was stopped.

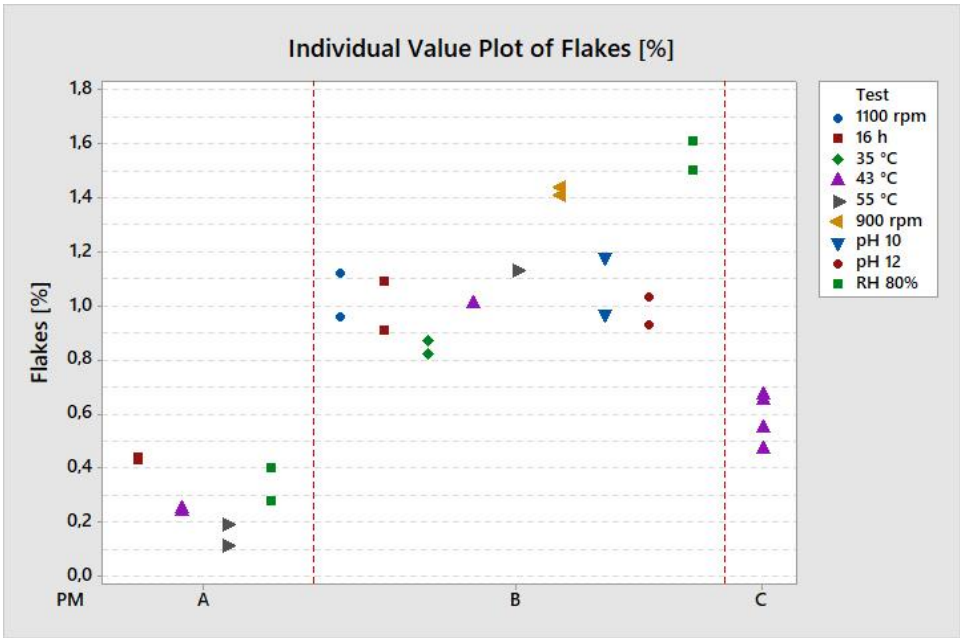

Figure 19. Percentage flakes for material A, B and C with the different parameters.

The available fiber yield (1.3 Recycling and repulping, Equation 9) for the different runs is plotted in Figure 20. It shows that all trials resulted in very high available yield at 97-95.5%. This indicated that all samples have a good fiber yield and thus could be recycled (Table 6).

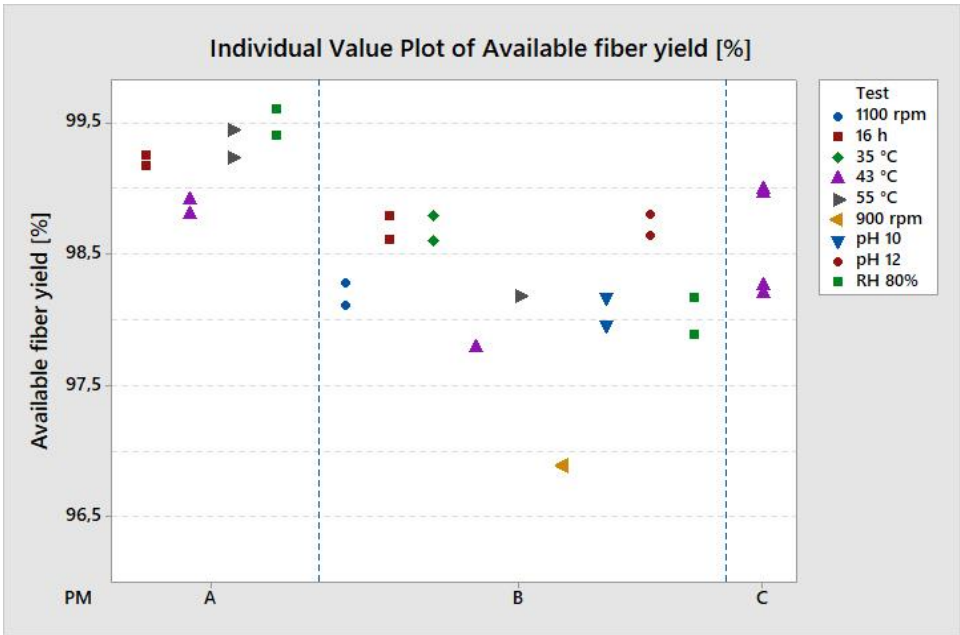

Figure 20. The calculated available fiber yields.

4.5 Fiber classification

Fiber classification through the Bauer McNett (Tetra Pak® in-house capacity) was done on PM C, but not on the other two materials due to time limitation. 11 BMC runs were made with PM C, pulped at standard parameter settings, the results can be seen in Figure 21. Using Table 5 combined with the results from Figure 21 give a weight % of 49.70 long fibers and 29.46 short fibers, as well as 20.84 weight % fines (Table 7). The high weight % of long fibers indicated that the fibers were of high quality, which increases the possibility of reusing the fibers after the pulping.

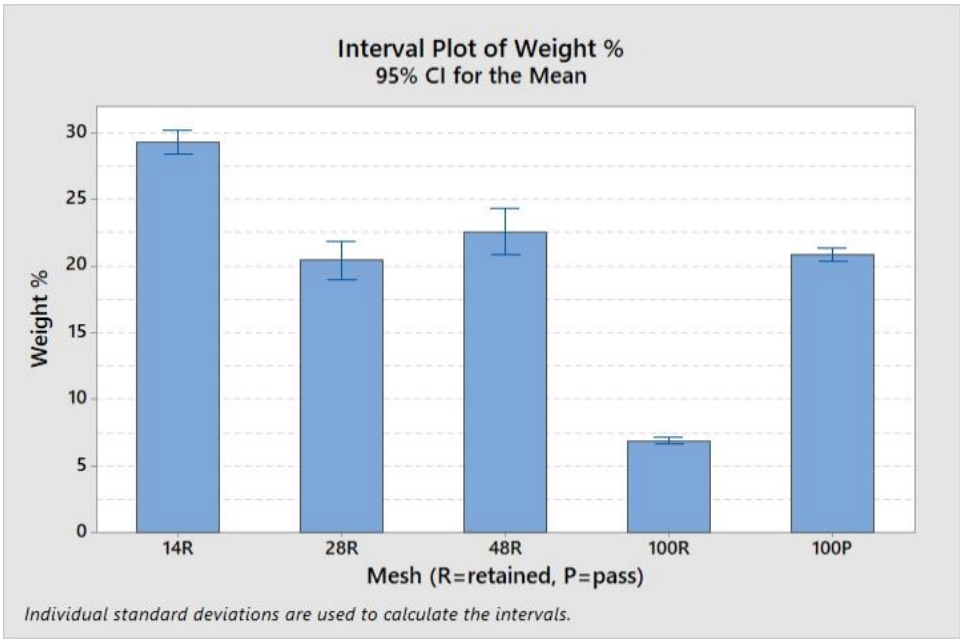

Figure 21. Bar chart of the weight % fibers retained in respective mesh. The weigh % at 100P is the percent fibers that passed the last mesh. R = retained, P = pass.

Table 7. Weight % of long and short fibers as well as fines from the fiber classification tests with PM C.

Mesh	Mean weight %	Classification	Total Weight %
14R	29.28	Long fibers	49.70
28R	20.42		
48R	22.56	Short Fibers	29.46
100R	6.90		
100P	20.84	Fines	20.84

4.6 CSF – drainability

The drainability measurements for PM A, B and C cannot be shown due to confidentiality. Example results of two hypothetical samples, here named PM E and F are therefore shown in Figure 22. A higher CSF indicates that that pulp sample has a shorter drying time, which is preferred by paper manufacturers when producing new paper-based products from recycled fibers. CSF tests were run with PM A, B and C that showed that the tested parameters did not have any significant influence on the CSF, and that the difference in CSF between the samples was due to the different fibers used in the material. PM C had a higher CSF than PM A, which was higher than PM B. Both the paperboard and the fiber-based barrier influenced the drainability.

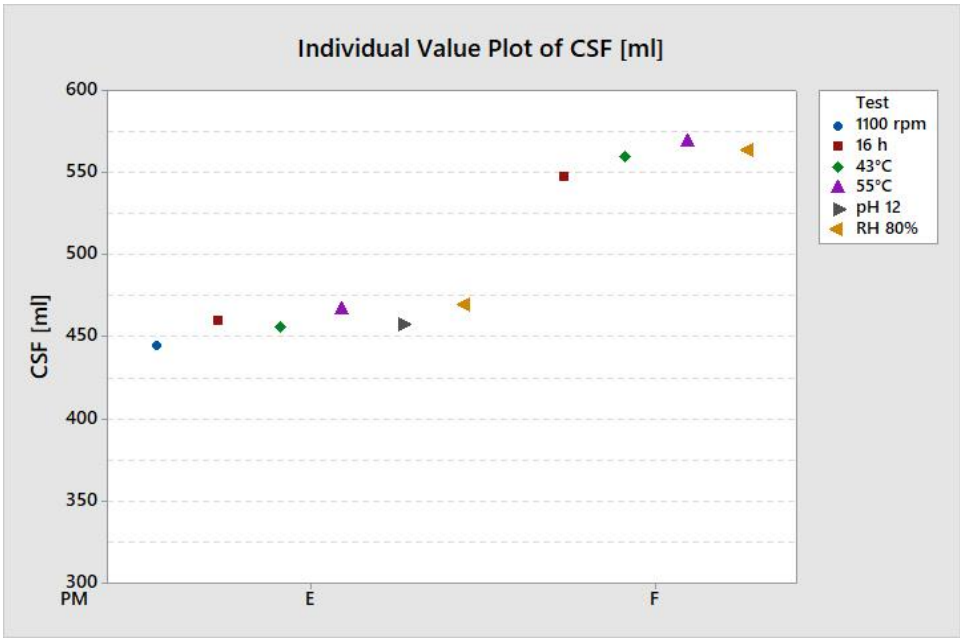

Figure 22. An example of the drainability values for two hypothetical materials, PM E and F.

4.7 Moisture content

The moisture content was plotted in Figure 23. The tests are presented in chronological order, and it looks like the moisture content increased over time. The analysis was unfortunately un-conditioned which made it difficult to control the environment, and it is likely that the moisture content shifted over time. However, the other analyses indicate that a normal

moisture content (6.5-7.5%) did not influence the repulpability. Only the tests with a moisture content of around 11.30% had an impact on the flake content.

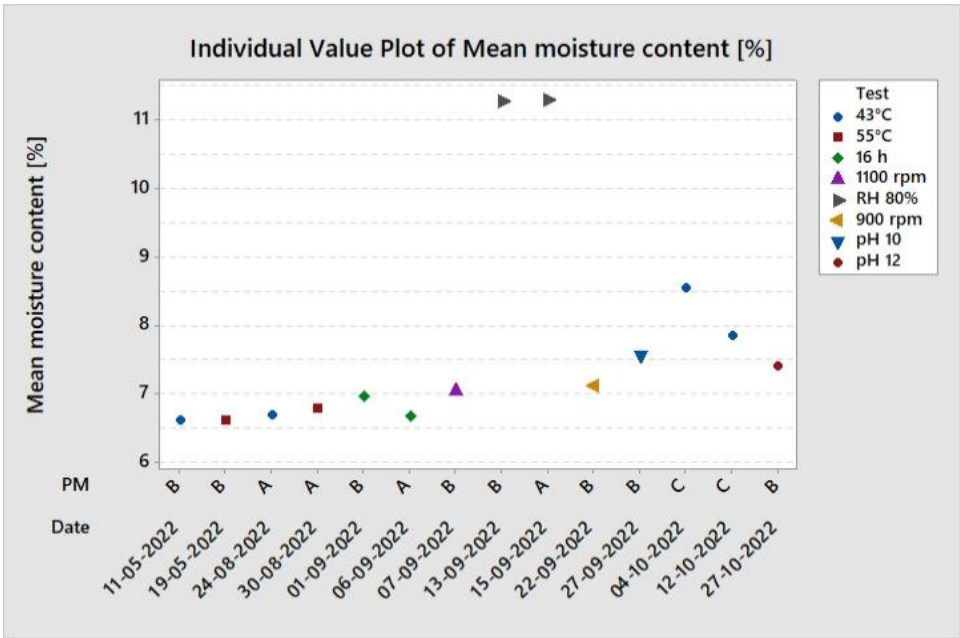

Figure 23. Mean moisture content for the samples and tests done sorted by the pulping date.

4.8 Robustness

The results from the robustness trial are visualized in Figure 24. The results (Figure 24) show that the consistency differed between the three operators as well as within the measurements from each person. This showed that the consistency measurements were not reliable, and it was thus difficult to know if the consistency was correct. The difficulty in taking out a representative sample for the consistency measurements from the pulp was due to the inhomogeneous mixing of the pulp stock solution. One way of working around this problem could be to use an automatic mixer.

The consistency was used when calculating a few of the other characteristic values, and it was therefore difficult to compare the different trials. The consistency was used for CSF, Somerville (fine screening) and Bauer McNett (fiber classification) calculations. These values should therefore be interpreted with caution.

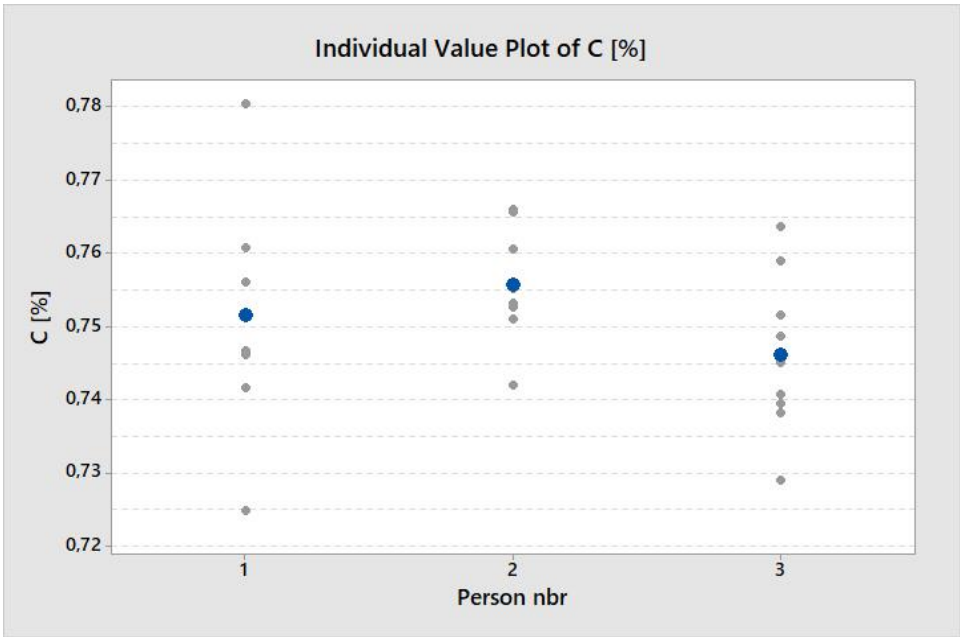

Figure 24. Measured consistency (C [%]) from the same stock solution. The measurements were done by three different persons that each made 9 individual consistency measurements.

4.9 Energy consumption

The energy data was extracted from the HC Pulper software after the pulping, as ampere vs time. Unfortunately, some of the data had been overridden, so it was not possible to retrieve all of the data. A typical plot for the energy consumption data is shown in Figure 25 for PM C. For more energy data plots, see Appendix A. Ampere vs time plot was relatively constant while the pulper was running and dropped down to zero when the pulper was stopped (at 2.5, 5 and 7.5 min to push down any material stuck to the walls, and at 10, 15 and 20 min to take out sample material for sheet and FiR analysis). The time plotted in the x-axis does not correspond to the time mentioned previously (stops at 2.5, 5, 7.5, 10, 15 and 20 minutes), but it is showing the time consumption in real time for the specific run. There was a higher current usage sometimes right when the pulper was stopped and started, which were caused by the collapse of the magnetic field in the motor when turned off. This did not influence the energy consumption overall as the changes were very short.

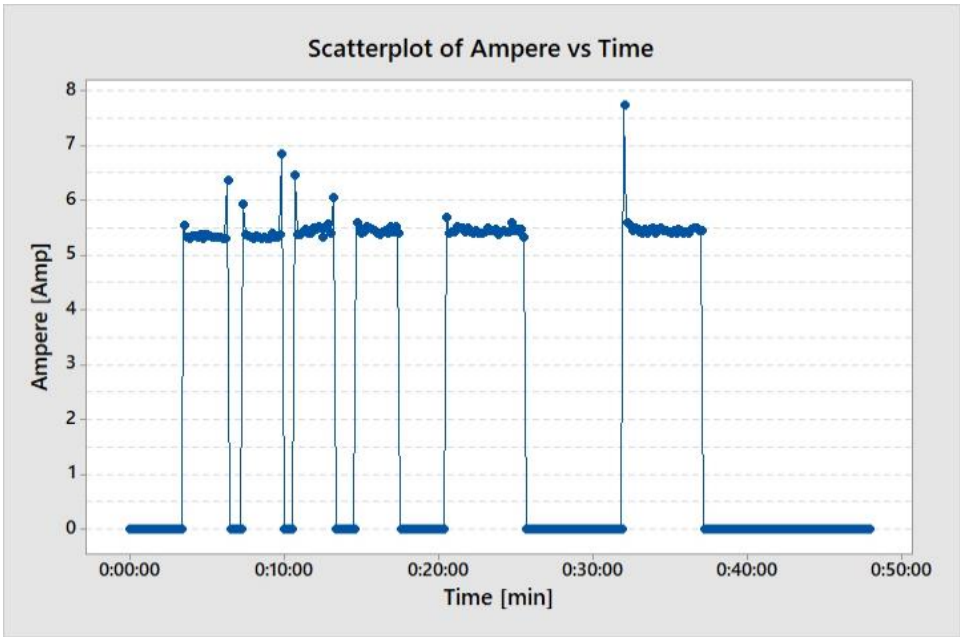

Figure 25. A typical curve for energy consumption plotted as ampere over time. This curve was from a run with PM C. Ampere went down to zero every time the pulper was stopped to push down any material that stuck to the walls (stops at 2.5, 5 and 7.5 min) and to take out samples for sheets and FiR analysis (after 10, 15 and 20 min).

The energy curves were also plotted without the extreme values, removing the higher peaks and the lower dips. A typical curve with the extreme values removed can be seen in Figure 26. For more energy data plots used for the area calculations see Appendix B. During the first ~1000 seconds of the graph the viscosity of the PM mixture was increasing as more and more fibers were freed into the water, which leads to the increasing current curve. At a certain stage, the viscosity was constant, which leads to a relatively constant current curve. The energy charge measured in mAh can be calculated as the area under the curve and converted to energy consumption measured in kWh. The values for the retrieved curves can be viewed in Table 8. Note that the energy consumption was relatively similar between the runs for the first 20 minutes, independently of which PM was used and what parameters were tested. There was also a correlation between a long repulping trial and a higher energy consumption, although the values varied a bit at long repulping times. From an energy consumption point of view, a shorter repulping time is desirable.

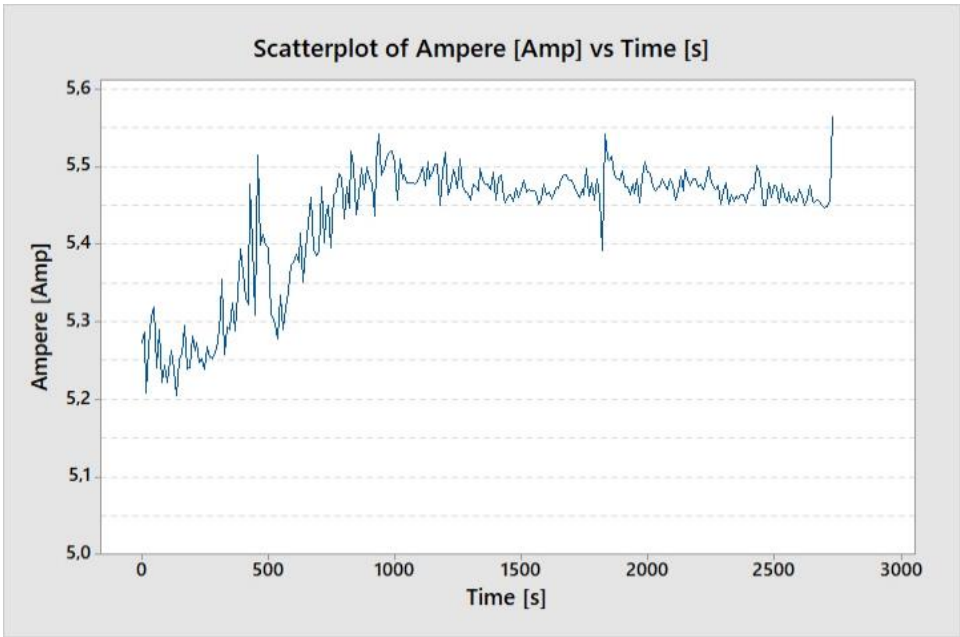

Figure 26. A typical curve for the energy consumption plotted as ampere over time, with the extreme values removed.

Table 8. Energy consumption values in mAh and kWh for the retrieved pulping runs.

PM	Test	Pulper run time [min]	Energy charge/ Energy consumption during the whole run		Energy charge/Energy consumption during the first 20	
			mAh	kWh	mAh	kWh
A	43°C	45	4121	1.65	1795	0.72
A	RH 80%	40	3691	1.48	1811	0.72
A	16 h	40	3688	1.48	1820	0.73
A	55°C	35	3157	1.26	1811	0.72
B	pH 10	60	4494	1.80	1834	0.73
B	pH 12	55	5048	2.02	1804	0.72
B	RH 80%	60	5570	2.23	1818	0.73
B	900 rpm	50	3674	1.47	1825	0.73
B	1100 rpm	45	4210	1.68	1830	0.73
B	16 h	55	5148	2.06	1825	0.73
B	35°C	65	5940	2.38	1791	0.72
C	43°C	20	1837	0.73	1837	0.73

4.10 Drying

The free moisture content (Xt) was plotted against time in Figure 27 to get two free moisture content curves, one for PM A and the other for PM B. One can note that both curves start at a Xt of about 15 g H_2O/g dry material, and that PM A finished drying after 8.3 hours while PM B finished after 9.8 hours. This confirmed the results from the CSF, where the lower CSF for PM B compared to PM A indicated that it should have a longer drying time.

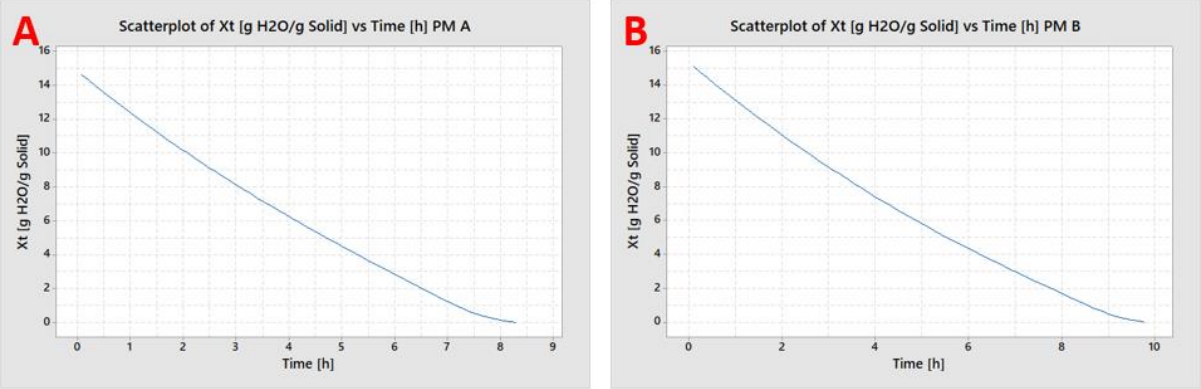

Figure 27. The drying rate curves for PM A (A) and PM B (B) plotted as the free moisture content against the time.

5. Conclusion

The repulping time was influenced both by the parameter settings as well as the material properties. PM C had the shortest repulping time of 20 minutes, while PM B had the longest (at 45-65 min). The results also indicated that higher temperatures and velocities decreased the repulping time, however, a higher velocity also led to more torn PolyAl pieces, which in turn led to contaminated pulp, thereby decreasing the pulp quality. The longer repulping time for material with fiber-based barriers (PM A and B in this case) was due to the laminate needing longer processing time in order to separate from the barrier. The energy consumption was not influenced by the tested parameter settings, but a longer repulping time also led to a higher energy consumption, and it is thus desirable to have a shorter repulping time.

It was proved to be very difficult to take out a representative sample of PolyAl from the pulp and PolyAl mixture. This made it difficult to determine if the pulping was done or not. To decrease the risk of taking out non-representative samples in the future, more than 25 pieces of PolyAl should be sampled.

Overall, the fiber flake content decreased with the repulping time and was below 2% for all samples after the repulping was considered done. This indicates that the materials are recyclable when repulped for the tested times. Further trials should be done on PM A and B to evaluate the fiber flake content after 20 minutes of pulping. The different parameter settings had an influence on the flake content, especially the higher moisture content, which had a negative influence. More trials should be done with interesting parameter settings, such as temperature and rotor speed, in order to observe the impact of these parameters on the fiber content. A relatively normal moisture content did not impact the results.

The drainability differed between the three samples, PM A, B and C, where PM C had the highest CSF and PM B the lowest. The drainability results for PM A and B were further confirmed with a drying test, which showed that it took 8.3 hours to dry PM A and 9.8 hours to dry PM B in a moisture analyzer at 45°C. The parameter settings did not influence the drainability, which was only affected by the fibers in the material. Both the fibers from the paperboard and from the barrier had an impact on the drainability, which indicated that the fiber quality (length, bonding, structure) from both needs to be considered when creating a new packaging material.

Considering the results, a higher temperature should be used when running the repulping trials as it decreases the repulping time. PM C had the best recyclability out of the tested samples, and PM A seems to be the best alternative out of the two materials with fiber-based barriers and would be interesting to use for further research and development. To be able to decrease the repulping time for the material with fiber-based barrier, one focus point should be the adhesion of the laminate to the PolyAl, as a decreased adhesion might lead to a faster repulping time.

Another important aspect that should be considered when analyzing the results from the drainability-, flake content-, and fiber classification tests is that there was a variability (between operators and within one operator) in the consistency measurements that might influence the results. The variability was probably due to the inhomogeneous mixing in the pulper which in turn gave non-representative samples. A better way of mixing should therefore be investigated, and the calculations based on the consistency should be used with caution.

6. Future work

In the future, further research on the impact of temperature and rotor speed on the repulping should be done in order to gain more knowledge about the impact of these parameters and to better be able to control the conditions. A question that would be interesting to answer regarding the temperature is: if there is a favorable temperature, above and below which, the repulping time is longer. This could give an indication of where the ideal repulping temperature is and if it differs between different materials. Regarding the rotor speed, it would be interesting to know if there is an ideal velocity that does not tear the PolyAl significantly while still decreasing the repulping time. A way to predict the repulping time of a material could be to fit a curve to the FiR measurements of this material, as they follow the same pattern. Once the curve is fitted it should be possible to approximately predict when the pulping would be done, which would be less time consuming.

More research is needed on the laminate used in materials with a fiber-based barrier, as it would be beneficial to use a laminate that easily separates from the PolyAl during the repulping process. A laminate with a lower adhesion to the PolyAl might be the way to go in order to increase the repulpability of material with fiber-based barriers.

One issue while sampling PolyAl for the FiR analysis is that it is difficult to take out a representative sample. The risk of taking out non-representative samples could be reduced by taking out more than 25 pieces for the analysis. However, this must be taken into consideration together with the time consumption of the analysis.

A fiber flake content analysis should be done with PM A and PM B after 20 minutes of pulping, to see if they would come under the 20% fiber flake threshold, and it would be interesting to know the fiber length distribution of PM A and PM B compared to the result of PM C.

The consistency measurement data varies a lot due to the unhomogenized pulp stock solution. The risk of taking a non-representative sample for the consistency measurements may be reduced if the pulp is mixed in an automatic mixing setup.

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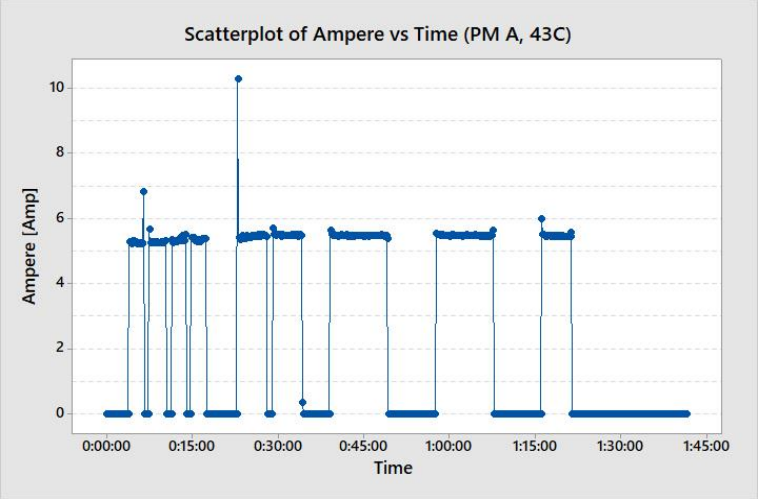
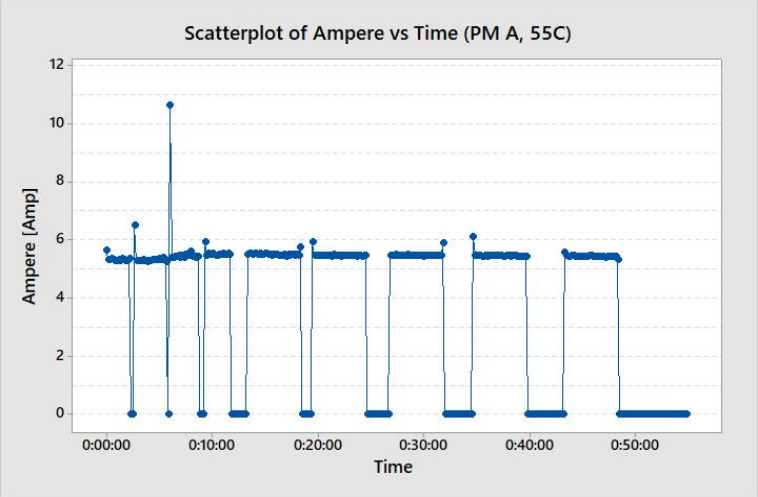
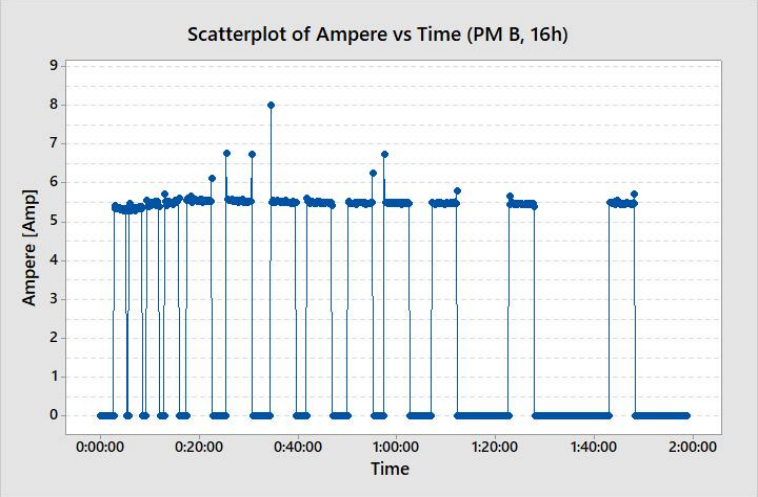
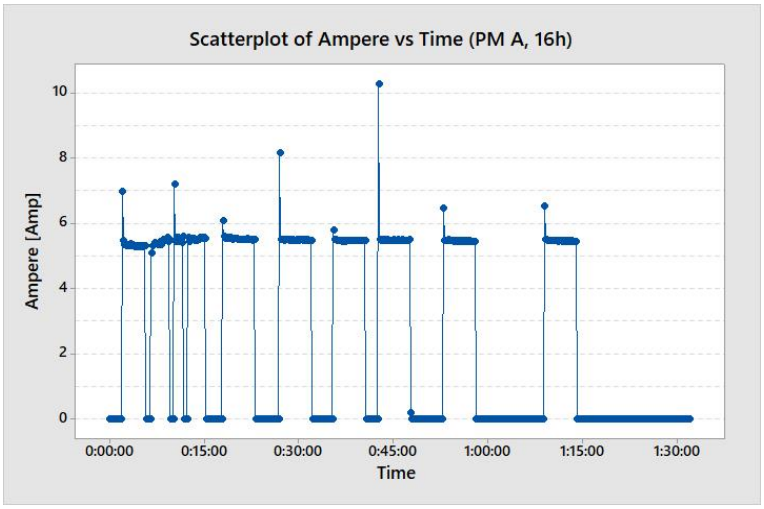
Appendix A

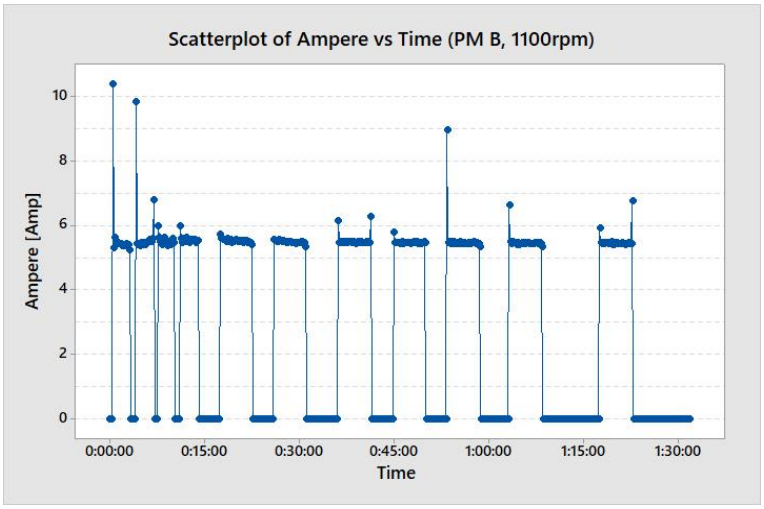
The collected energy graphs for the pulping runs.








Scatterplot of Ampere vs Time (PM A, 16h)
Ampere [Amp]
10
8
6
4
2
0
0:00:00
0:15:00
0:30:00
0:45:00
1:00:00
1:15:00
1:30:00
Time


Scatterplot of Ampere vs Time (PM B, 1100rpm)
Ampere [Amp]
10
8
6
4
2
0
0:00:00
0:15:00
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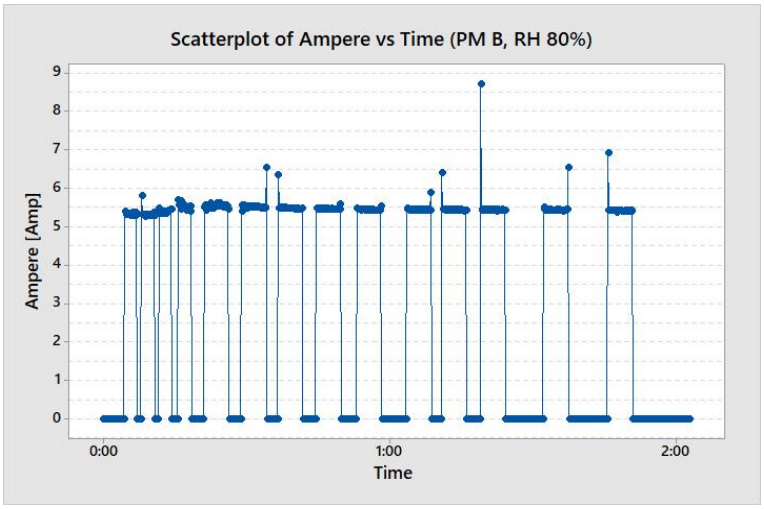
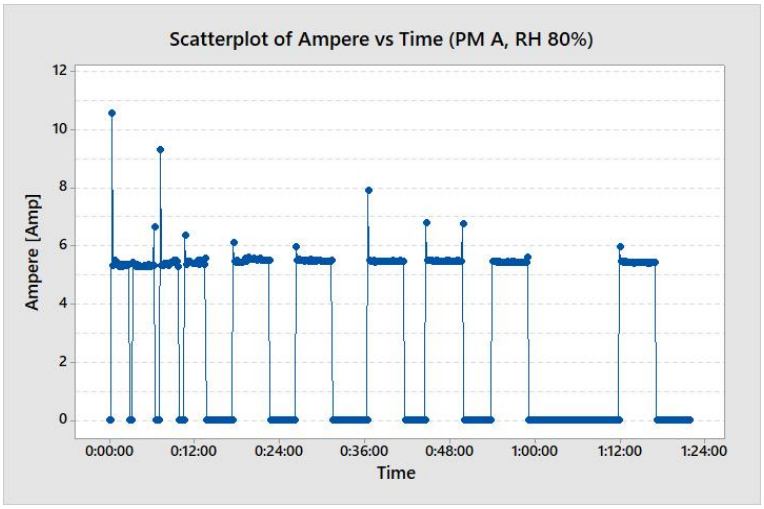
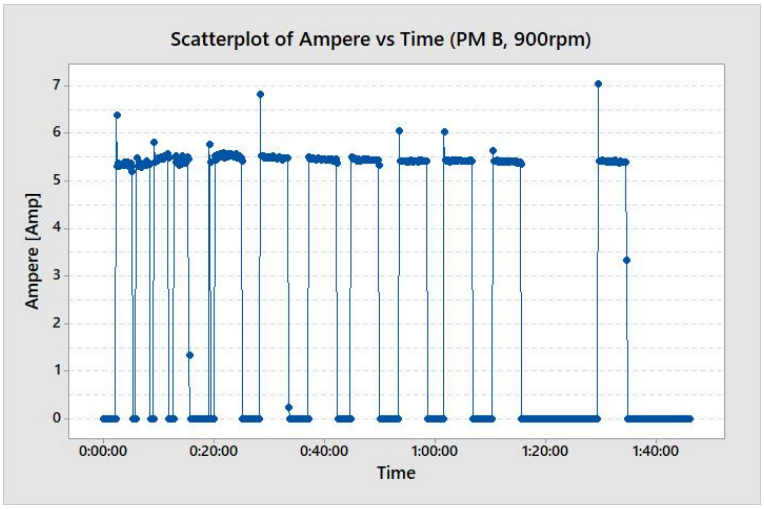
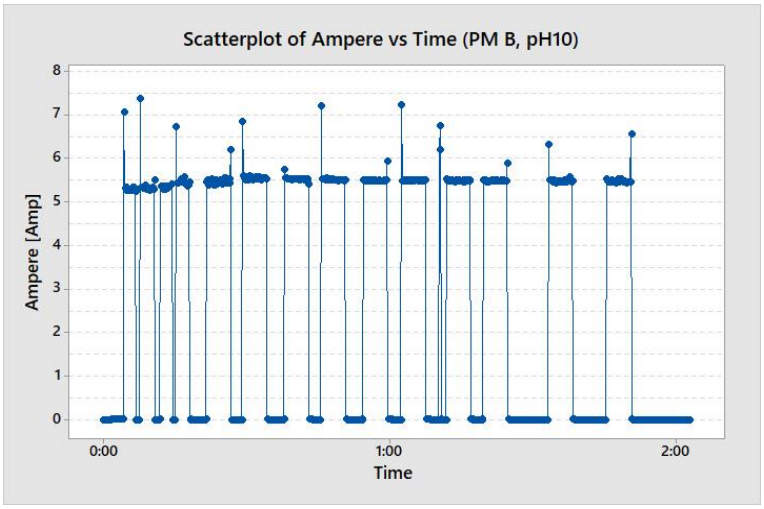
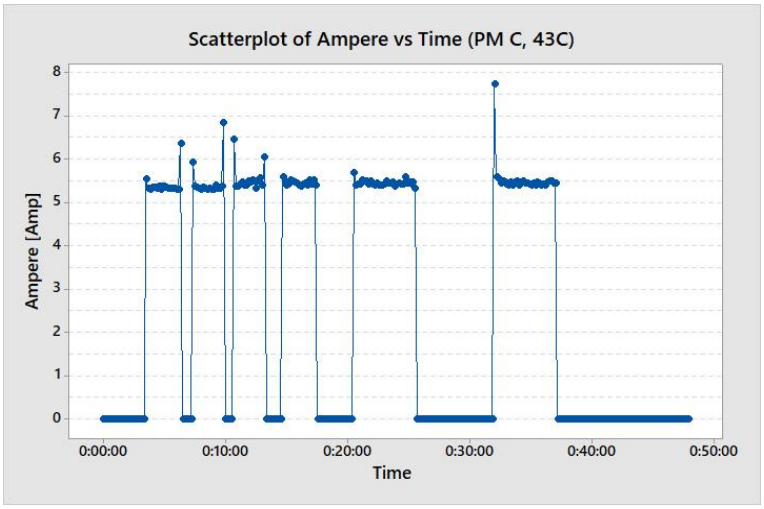
0:45:00
1:00:00
1:15:00
1:30:00
Time

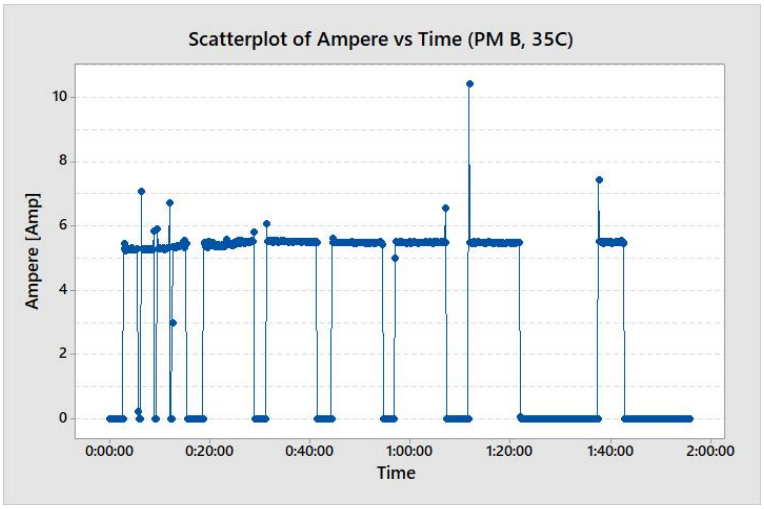

Scatterplot of Ampere vs Time (PM B, RH 80%)
Ampere [Amp]
9
8
7
6
5
4
3
2
1
0
0:00
1:00
2:00
Time

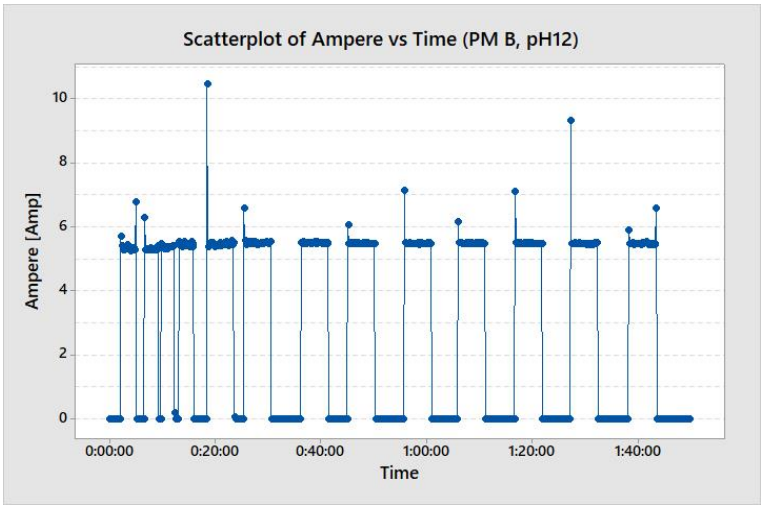

Scatterplot of Ampere vs Time (PM A, RH 80%)
Ampere [Amp]
12
10
8
6
4
2
0
0:00:00
0:12:00
0:24:00
0:36:00
0:48:00
1:00:00
1:12:00
1:24:00
Time


Scatterplot of Ampere vs Time (PM B, 900rpm)
Ampere [Amp]
7
6
5
4
3
2
1
0
0:00:00
0:20:00
0:40:00
1:00:00
1:20:00
1:40:00
Time


Scatterplot of Ampere vs Time (PM B, pH10)
Ampere [Amp]
8
7
6
5
4
3
2
1
0
0:00
1:00
2:00
Time

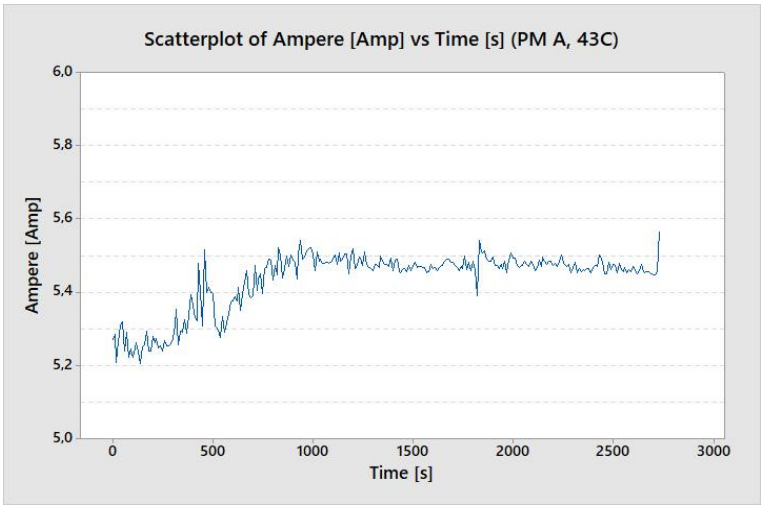

Scatterplot of Ampere vs Time (PM C, 43C)
Ampere [Amp]
0
1
2
3
4
5
6
7
8
0:00:00
0:10:00
0:20:00
0:30:00
0:40:00
0:50:00
Time

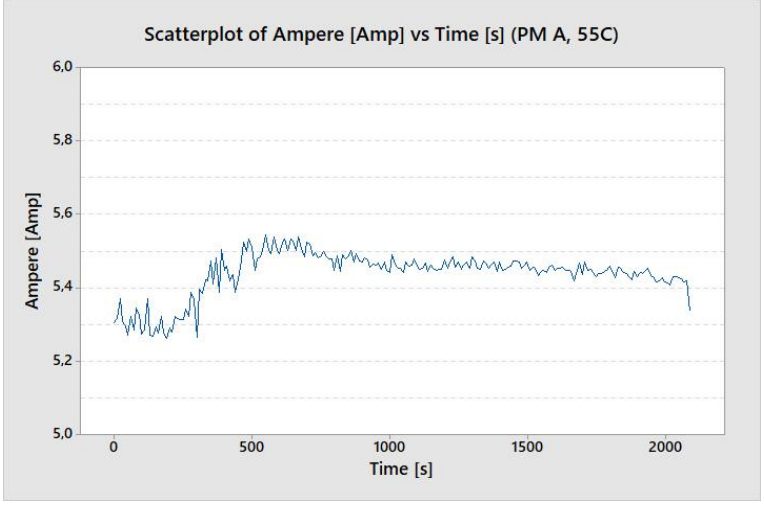

Scatterplot of Ampere vs Time (PM B, 35C)
Ampere [Amp]
0
2
4
6
8
10
0:00:00
0:20:00
0:40:00
1:00:00
1:20:00
1:40:00
2:00:00
Time

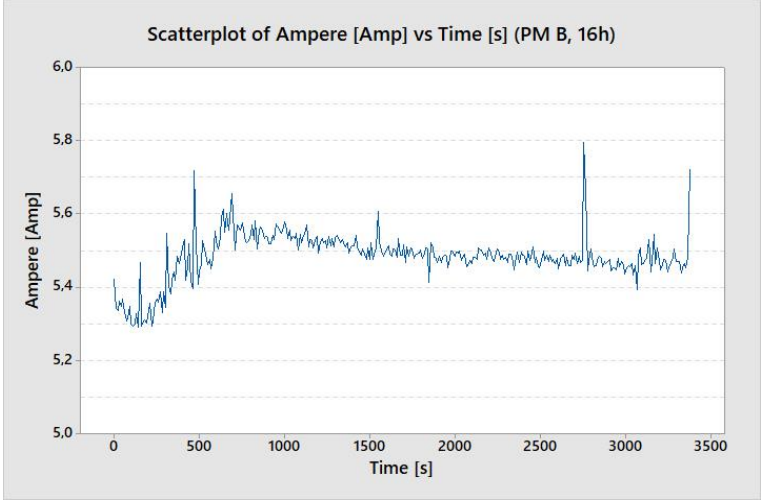

Scatterplot of Ampere vs Time (PM B, pH12)
Ampere [Amp]
0
2
4
6
8
10
0:00:00
0:20:00
0:40:00
1:00:00
1:20:00
1:40:00
Time

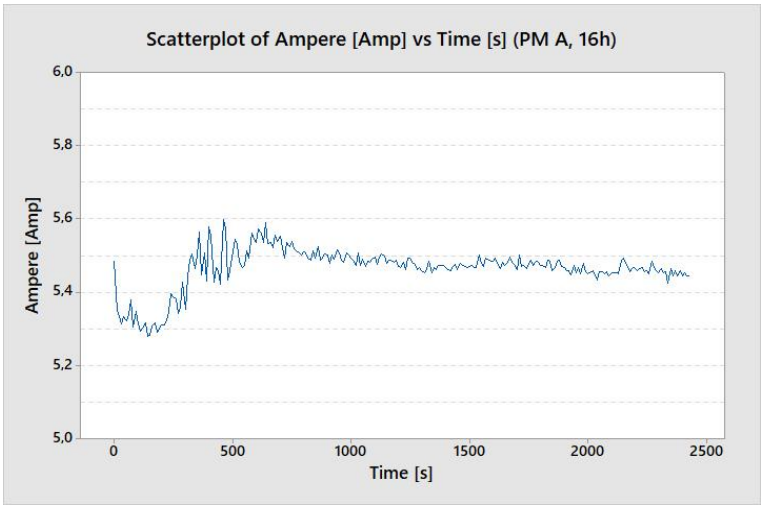
Appendix B

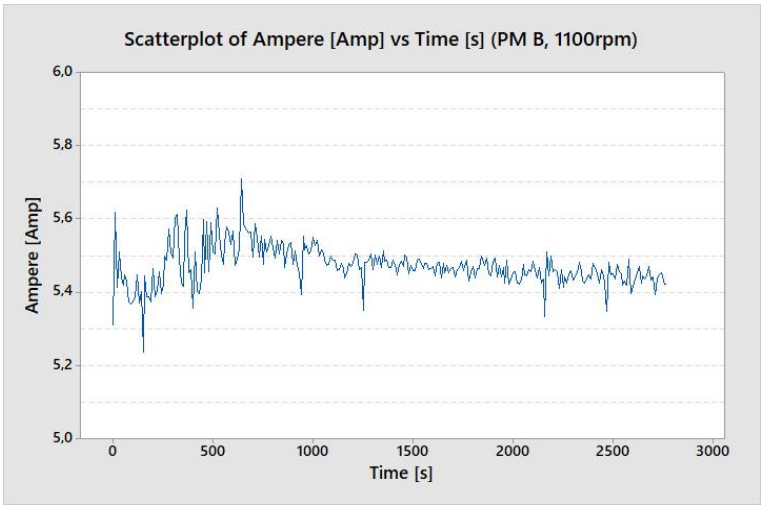
The energy plotted over time, disregarding any outliers and stopping values. The area under the curves is the energy consumption in Ampere seconds.

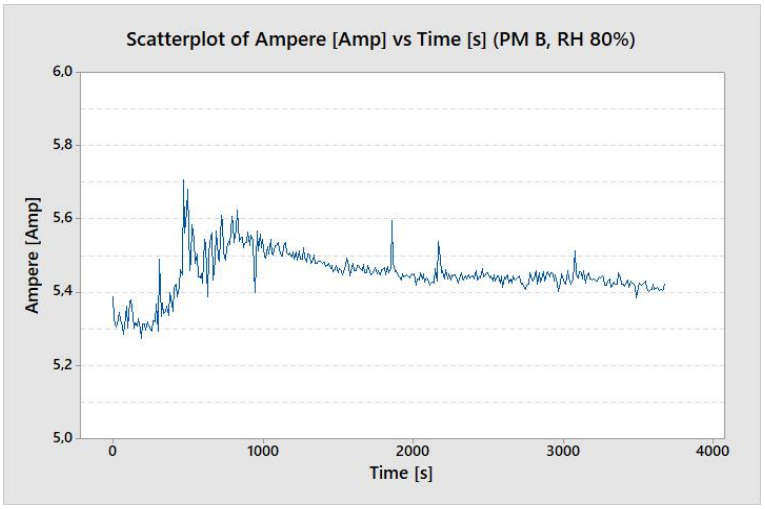


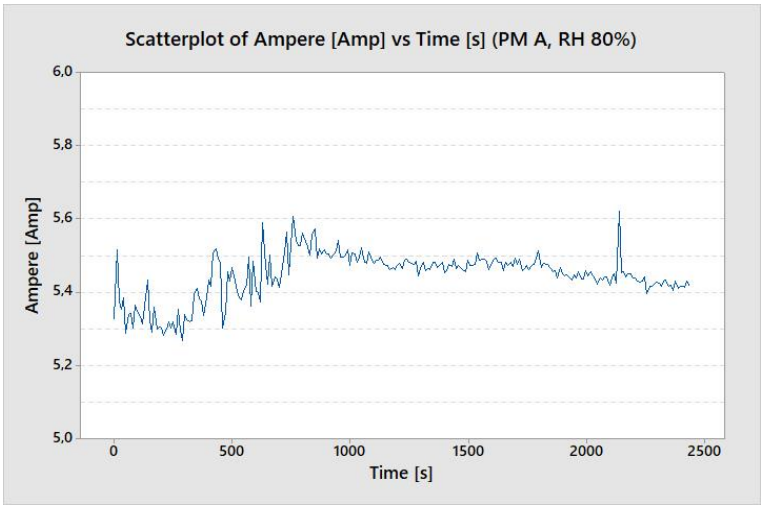


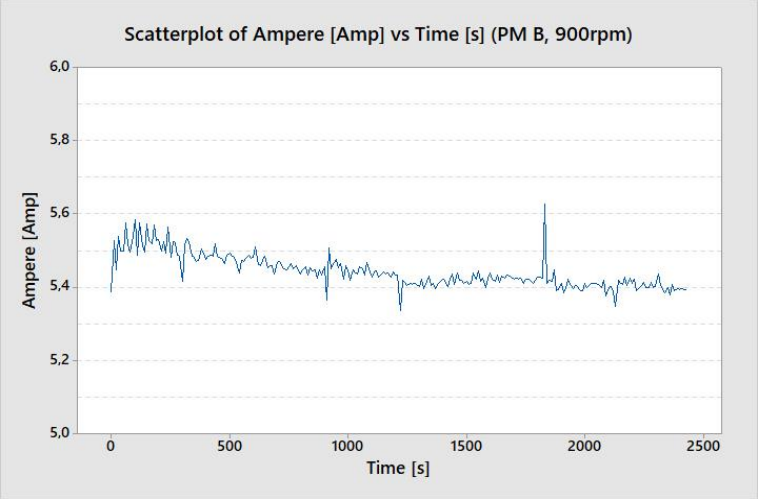


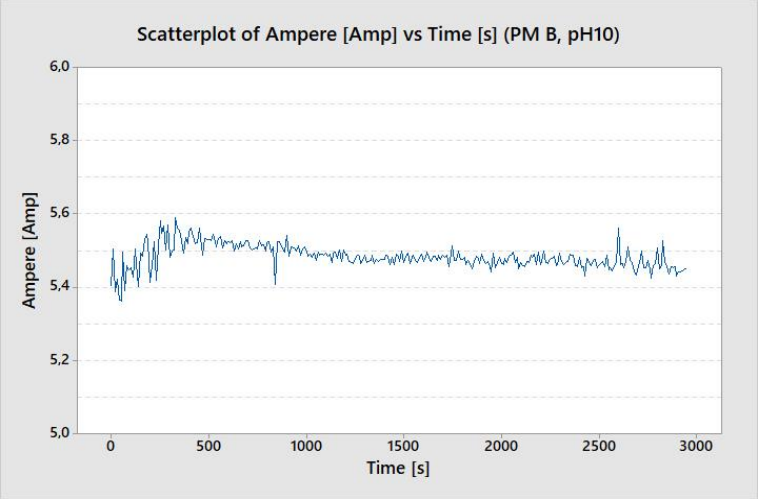

Scatterplot of Ampere [Amp] vs Time [s] (PM A, 16h)
Ampere [Amp]
6,0
5,8
5,6
5,4
5,2
5,0
0
500
1000
1500
2000
2500
Time [s]

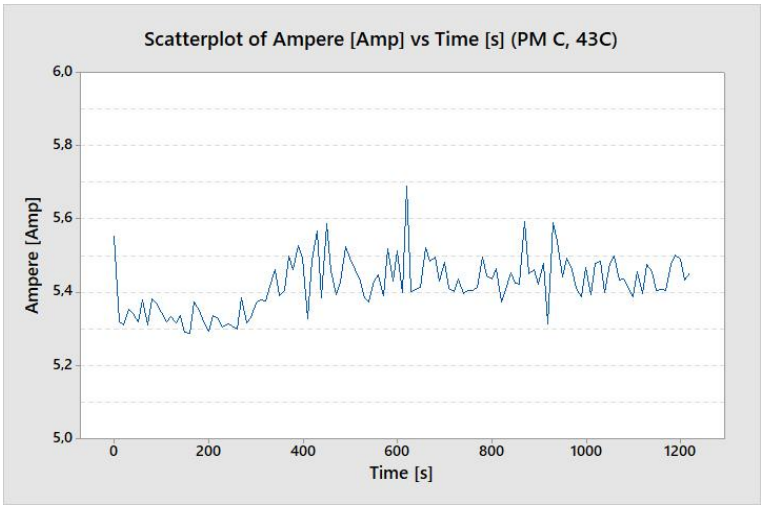

Scatterplot of Ampere [Amp] vs Time [s] (PM B, 1100rpm)
Ampere [Amp]
6,0
5,8
5,6
5,4
5,2
5,0
0
500
1000
1500
2000
2500
3000
Time [s]

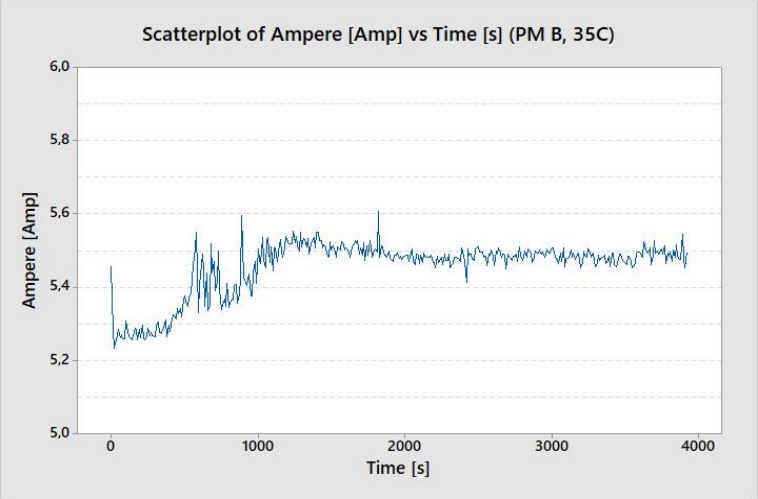

Scatterplot of Ampere [Amp] vs Time [s] (PM B, RH 80%)
Ampere [Amp]
6,0
5,8
5,6
5,4
5,2
5,0
0
1000
2000
3000
4000
Time [s]

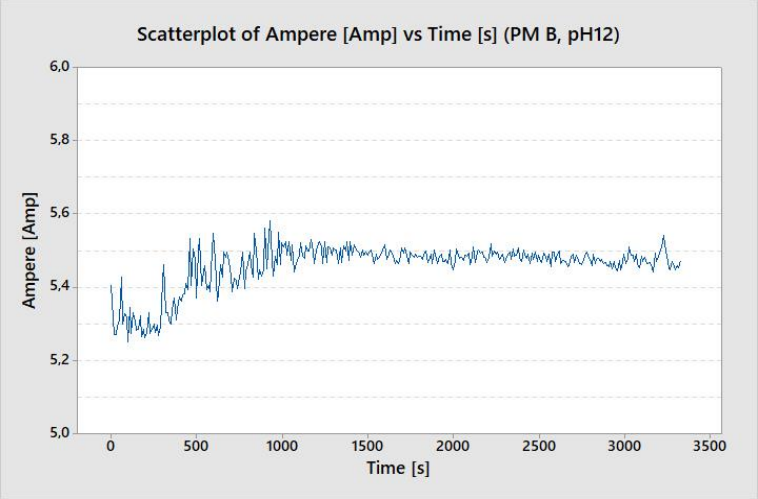

Scatterplot of Ampere [Amp] vs Time [s] (PM A, RH 80%)
Ampere [Amp]
6,0
5,8
5,6
5,4
5,2
5,0
0
500
1000
1500
2000
2500
Time [s]


Scatterplot of Ampere [Amp] vs Time [s] (PM B, 900rpm)
Ampere [Amp]
6,0
5,8
5,6
5,4
5,2
5,0
0
500
1000
1500
2000
2500
Time [s]


Scatterplot of Ampere [Amp] vs Time [s] (PM B, pH10)
Ampere [Amp]
6,0
5,8
5,6
5,4
5,2
5,0
0
500
1000
1500
2000
2500
3000
Time [s]


Scatterplot of Ampere [Amp] vs Time [s] (PM C, 43C)
Ampere [Amp]
6,0
5,8
5,6
5,4
5,2
5,0
0
200
400
600
800
1000
1200
Time [s]


Scatterplot of Ampere [Amp] vs Time [s] (PM B, 35C)
Ampere [Amp]
6,0
5,8
5,6
5,4
5,2
5,0
0
1000
2000
3000
4000
Time [s]


Scatterplot of Ampere [Amp] vs Time [s] (PM B, pH12)
Ampere [Amp]
6,0
5,8
5,6
5,4
5,2
5,0
0
500
1000
1500
2000
2500
3000
3500
Time [s]

Appendix C

A pdf of the excel file used for the calculations.

Dates and tests

Date	Material	Parameter setting
2022-05-11	B	43°C
2022-05-19	B	55°C
2022-08-24	A	43°C
2022-08-30	A	55°C
2022-09-01	B	16 h
2022-09-06	A	16 h
2022-09-07	B	1100 rpm
2022-09-13	B	RH 80%
2022-09-15	A	RH 80%
2022-09-22	B	900 rpm
2022-09-27	B	pH 10
2022-10-04	C	43°C
2022-10-12	C	43°C
2022-10-18	B	35°C
2022-10-27	B	pH 12

Consistency

Test	Date	Filter paper oven dry [g]	Filter paper + fiber pad, oven dry [g]	Initial pulp suspension [g]	C [%]	Average C [%]	StdDev C	Coefficient of variables
B	2022-05-11	1,04	3,713	392,4	0,681193			
		1,035	3,78	401,3	0,684027	0,673	0,017	2,52%
		1,028	3,64	399,8	0,653327			
B	2022-05-19	1,025	4,235	447,5	0,717318			
		1,029	4,095	420	0,73	0,722	0,007	0,94%
		1,034	3,655	364,3	0,719462			
A	2022-08-24	1,049	3,718	343,3	0,777454			
		1,042	4,781	473	0,790486	0,779	0,008	1,03%
		1,057	4,087	390,2	0,776525			
		1,063	4,098	393,3	0,771676			
A	2022-08-30	1,075	4,92	521	0,738004			
		1,054	5,19	559	0,739893	0,735	0,008	1,11%
		1,054	4,02	401	0,739651			
		1,075	4,09	417	0,723022			
B	2022-09-01	1,041	3,867	388,1	0,728163			
		1,041	4,385	447,1	0,747931			
		1,036	4,218	423,5	0,751358	0,742	0,009	1,21%
		1,044	4,149	418,5	0,741935			
		1,043	4,018	402,7	0,738763			
A	2022-09-06	1,033	4,093	398,9	0,76711			
		1,02	4,005	390	0,765385			
		1,028	4,212	414,5	0,768154	0,782	0,021	2,71%
		1,038	4,073	382	0,794503			
		1,031	4,33	405,9	0,812762			
B	2022-09-07	1,037	4,159	421	0,741568			
		1,049	4,144	414	0,747585			
		1,075	4,179	423	0,733806	0,744	0,010	1,41%
		1,056	4,113	401,9	0,760637			
		1,055	4,046	405,5	0,737608			
B	2022-09-13	1,05	3,742	387	0,695607			
		1,072	3,891	403,14	0,699261			
		1,077	3,743	394	0,67665	0,689	0,009	1,32%
		1,042	4,052	435,9	0,690525			
		1,048	4,056	439,8	0,683947			
A	2022-09-15	1,058	3,969	395,9	0,735287			
		1,048	4	390,2	0,756535			
		1,048	4,036	423,2	0,706049	0,733	0,021	2,87%
		1,042	3,95	404,7	0,718557			
		1,032	4,069	405,2	0,749506			
B	2022-09-22	1,056	3,642	402,8	0,642006			
		1,039	3,574	392,9	0,645202			
		1,054	3,617	401,1	0,638993	0,649	0,011	1,74%
		1,072	4,156	462,4	0,666955			
		1,047	4,109	468,2	0,653994			
B	2022-09-27	1,069	3,786	386,7	0,702612			
		1,046	4,081	425	0,714118			
		1,062	3,715	369,4	0,718192	0,717	0,011	1,50%
		1,055	4,077	412,5	0,732606			

		1,066	4,031	413,6	0,716876			
C	2022-10-04	1,04	4,029	416,21	0,718147			
		1,035	3,777	388,1	0,706519	0,713	0,015	2,13%
		1,035	4,093	418,18	0,731264			
		1,018	3,908	415,2	0,69605			
C	2022-10-05	1,054	3,909	399,12	0,715324			
		1,063	4,084	426,17	0,708872			
		1,077	3,782	382,25	0,707652	0,706	0,004	0,58%
		1,052	3,932	419,98	0,685747			
		1,052	3,845	392,94	0,710796			
B	2022-10-18	1,06	4,224	420,4	0,752617			
		1,052	3,967	376,4	0,774442			
		1,06	3,951	387,1	0,746835	0,760	0,011	1,50%
		1,056	4,025	386,5	0,768176			
		1,051	4,082	401	0,75586			
B	2022-10-27	1,051	4,24	417,4	0,764015			
		1,048	3,902	381	0,749081			
		1,04	3,953	390,9	0,745203	0,753	0,008	1,05%
		1,07	4,009	393,3	0,747267			
		1,053	4,07	398,4	0,757279			
Robustness	2022-08-30							
A1.1		1,05	4,101	401	0,760848			
A1.2		1,065	4,146	410	0,751463	0,764	0,015	1,93%
A1.3		1,047	4,465	438	0,780365			
A2.1		1,026	3,914	382	0,756021			
A2.2		1,046	3,805	372	0,741667	0,751	0,008	1,11%
A2.3		1,065	4,755	488	0,756148			
A3.1		1,054	3,526	341	0,724927			
A3.2		1,06	4,495	460	0,746739	0,739	0,012	1,68%
A3.3		1,066	3,842	372	0,746237			
B1.1		1,045	3,546	333	0,751051			
B1.2		1,059	4,544	455	0,765934	0,757	0,008	1,01%
B1.3		1,058	4,645	475	0,755158			
B2.1		1,072	4,144	414	0,742029			
B2.2		1,066	4,011	391	0,753197	0,754	0,012	1,57%
B2.3		1,071	4,769	483	0,765631			
B3.1		1,069	4,343	435	0,752644			
B3.2		1,055	4,82	495	0,760606	0,756	0,004	0,54%
B3.3		1,051	4,971	519	0,755299			
C1.1		1,042	3,997	387	0,763566			
C1.2		1,059	4,717	482	0,758921	0,754	0,012	1,59%
C1.3		1,033	3,611	348	0,740805			
C2.1		1,049	3,666	359	0,728969			
C2.2		1,064	4,108	405	0,751605	0,743	0,012	1,65%
C2.3		1,046	3,741	360	0,748611			
C3.1		1,037	3,724	364	0,738187			
C3.2		1,042	4,052	407	0,739558	0,741	0,004	0,50%
C3.3		1,049	4,417	452	0,745133			

Mängd pulp i CSF (3g):
445,8654
Mängd pulp i SV (10g):
1486,218
Mängd i paper sheet (2g):
297,2436

Somerville fine screening + Bauer McNett

Test	Date	W_{dry}, target [g]	W_{dry}, actual [g]	C [%]	Pulp suspension needed, R [g]	Pulp suspension, actual [g]	Filter paper, oven dry [g]
B (43C)	2022-05-11	10	10,04	0,68	1470,588	1476,6	1,019
B (55C)	2022-05-19	10	9,97	0,722	1385,042	1381	1,027
A (43C)	2022-08-24	10	9,95	0,7793	1283,203	1277,3	1,043
A (43C)	2022-08-24	10	10,04	0,7793	1283,203	1288,1	1,049
A (55C)	2022-08-30	10	9,64	0,7351	1360,359	1311,4	1,051
A (55C)	2022-08-30	10	10,06	0,7351	1360,359	1368,5	1,044
B (16h)	2022-09-01	10	10,34	0,7416	1348,436	1394,3	1,054
B (16h)	2022-09-01	10	9,99	0,7416	1348,436	1347	1,054
A (16h)	2022-09-06	10	10,66	0,7816	1279,427	1363,4	1,048
A (16h)	2022-09-06	10	10,59	0,7816	1279,427	1355,4	1,038
B (1100 rpm)	2022-09-07	10	9,64	0,7442	1343,725	1295	1,045
B (1100 rpm)	2022-09-07	10	10,17	0,7442	1343,725	1367	1,058
B (80% Rh)	2022-09-13	10	9,84	0,6892	1450,958	1427,3	1,051
B (80% Rh)	2022-09-13	10	9,98	0,6892	1450,958	1448,6	1,051
A (80% Rh)	2022-09-15	10	9,96	0,7332	1363,884	1358,1	1,054
A (80% Rh)	2022-09-15	10	9,87	0,7332	1363,884	1345,8	1,046
B (900 rpm)	2022-09-22	10	10,01	0,6494	1539,883	1541,4	1,082
B (900 rpm)	2022-09-22	10	10,06	0,6494	1539,883	1548,9	1,077
B (pH 10)	2022-09-27	10	10,00	0,7169	1394,895	1394,9	1,070
B (pH 10)	2022-09-27	10	10,07	0,7169	1394,895	1404,4	1,046
C (43C)	2022-10-04	10	9,96	0,7130	1402,525	1396,8	1,059
C (43C)	2022-10-04	10	10,00	0,7130	1402,525	1402,2	1,038
C (43C)	2022-10-04	10	10,08	0,7130	1402,525	1413,3	1,049
C (43C)	2022-10-05	10	9,92	0,7106	1407,261	1396,1	1,072
C (43C)	2022-10-05	10	10,01	0,7106	1407,261	1409,2	1,047
C (43C)	2022-10-05	10	9,94	0,7106	1407,261	1399	1,053
C (43C)	2022-10-05	10	9,88	0,7106	1407,261	1390	1,045
C (43C)	2022-10-05	10	10,04	0,7106	1407,261	1412,8	1,041
C (43C)	2022-10-12	10	10,00	0,7453	1341,742	1341,6	1,020
C (43C)	2022-10-12	10	9,88	0,7453	1341,742	1326	1,024
C (43C)	2022-10-13	10	9,82	0,7440	1344,086	1319,6	1,040
C (43C)	2022-10-13	10	9,98	0,7440	1344,086	1341,5	1,048
C (43C)	2022-10-13	10	9,67	0,7440	1344,086	1299,9	1,028
C (43C)	2022-10-13	10	10,02	0,7440	1344,086	1346,4	1,030
B (35C)	2022-10-18	10	9,82	0,7596	1316,482	1292,5	1,050
B (35C)	2022-10-18	10	10,02	0,7596	1316,482	1319,1	1,051
B (pH12)	2022-10-27	10	10,15	0,7526	1328,727	1348,7	1,071
B (pH12)	2022-10-27	10	9,82	0,7526	1328,727	1305,4	1,040

Filter paper + debris, oven dry [g]	Debris PolyAl, oven dry [g]	Flakes, dry weight (g)	Debris, dry weight [g]	Residue in SV [%]	Pass //0.15mm [%]	Wt% polymer in "Residue in SV [%]"	Wt to be added to coarse rejects [g]	Pass [g]
1,120	0,025	0,10	0,13	1,25	98,75	20%	0,93	9,91
1,140	0,040	0,11	0,15	1,53	98,47	26%	1,59	9,82
1,068	0,040	0,03	0,07	0,65	99,35	62%	1,72	9,89
1,073	0,030	0,02	0,05	0,5	99,46	56%	1,28	9,98
1,070	0,050	0,02	0,07	0,7	99,28	72%	2,10	9,57
1,055	0,040	0,01	0,05	0,5	99,49	78%	1,61	10,01
1,145	0,040	0,09	0,13	1,3	98,73	31%	1,58	10,21
1,163		0,11	0,11	1,1	98,91	0%	0,00	9,88
1,092	0,010	0,04	0,05	0,5	99,49	19%	0,40	10,60
1,081	0,020	0,04	0,06	0,6	99,41	32%	0,81	10,53
1,141	0,070	0,10	0,17	1,7	98,28	42%	2,97	9,47
1,170	0,080	0,11	0,19	1,9	98,11	42%	3,22	9,98
1,201	0,030	0,15	0,18	1,8	98,17	17%	1,16	9,66
1,212	0,050	0,16	0,21	2,1	97,89	24%	1,90	9,77
1,094	0,020	0,04	0,06	0,6	99,40	33%	0,81	9,90
1,074	0,010	0,03	0,04	0,4	99,61	26%	0,41	9,83
1,226	0,045	0,14	0,19	1,9	98,11	24%	1,61	9,82
1,218	0,050	0,14	0,19	1,9	98,10	26%	1,78	9,87
1,167	0,049	0,10	0,15	1,5	98,54	34%	1,93	9,85
1,164	0,050	0,12	0,17	1,7	98,33	30%	1,96	9,90
1,106	0,054	0,05	0,10	1,0	98,99	53%	2,13	9,86
1,105	0,037	0,07	0,10	1,0	98,96	36%	1,45	9,89
1,107	0,045	0,06	0,10	1,0	98,98	44%	1,75	9,97
1,137	0,043	0,06	0,11	1,1	98,91	40%	1,69	9,81
1,102	0,048	0,06	0,10	1,0	98,97	47%	1,87	9,91
1,116	0,017	0,06	0,08	0,8	99,20	21%	0,67	9,86
1,088	0,018	0,04	0,06	0,6	99,38	30%	0,71	9,82
1,082	0,039	0,04	0,08	0,8	99,20	49%	1,52	9,96
1,099	0,025	0,08	0,10	1,0	98,96	24%	1,02	9,89
1,093	0,029	0,07	0,10	1,0	99,01	30%	1,20	9,78
1,145	0,049	0,11	0,15	1,6	98,43	32%	2,04	9,66
1,110	0,023	0,06	0,09	0,9	99,15	27%	0,94	9,90
1,085	0,036	0,06	0,09	1,0	99,04	39%	1,52	9,58
1,108	0,027	0,08	0,11	1,0	98,95	26%	1,10	9,91
1,132	0,036	0,08	0,12	1,2	98,80	31%	1,53	9,70
1,138	0,014	0,09	0,10	1,0	98,99	14%	0,58	9,92
1,164	0,008	0,09	0,10	1,0	99,00	8%	0,33	10,05
1,143	0,011	0,10	0,11	1,2	98,84	10%	0,46	9,71

w_1	w_2	w_3	w_4	w_1	w_2	w_3	w_4	w_1
0,769	0,718	0,748	0,721	3,428	2,599	3,338	1,437	2,66
0,746	0,738	0,734	0,760	3,636	2,514	3,160	1,425	2,89
0,730	0,730	0,736	0,742	3,778	2,598	3,159	1,432	3,05
0,741	0,746	0,727	0,766	3,437	2,881	3,032	1,452	2,70
0,741	0,753	0,733	0,781	3,760	2,929	2,716	1,439	3,02
0,736	0,754	0,764	0,747	3,643	3,038	2,661	1,397	2,91
0,752	0,763	0,765	0,750	3,498	2,801	3,013	1,495	2,75
0,739	0,765	0,735	0,744	3,691	2,959	2,724	1,472	2,95
0,744	0,741	0,765	0,741	3,632	2,642	3,216	1,423	2,89
0,760	0,726	0,749	0,754	3,835	2,398	3,076	1,369	3,08
0,729	0,750	0,748	0,753	3,595	2,964	2,574	1,403	2,87

w_2	w_3	w_4	w_5 (pulp lost)	R14	R28	R48	R100	P100
1,88	2,59	0,72	2,01	26,97	19,08	26,27	7,26	20,41
1,78	2,43	0,67	2,14	29,21	17,95	24,52	6,72	21,60
1,87	2,42	0,69	1,94	30,56	18,73	24,29	6,92	19,50
2,14	2,31	0,69	1,99	27,47	21,76	23,49	6,99	20,29
2,18	1,98	0,66	2,07	30,46	21,96	20,01	6,64	20,93
2,28	1,90	0,65	2,12	29,48	23,16	19,24	6,59	21,53
2,04	2,25	0,75	2,04	27,97	20,76	22,90	7,59	20,77
2,19	1,99	0,73	2,10	29,64	22,03	19,97	7,31	21,05
1,90	2,45	0,68	1,97	29,19	19,21	24,77	6,89	19,94
1,67	2,33	0,62	2,10	31,43	17,09	23,78	6,29	21,42
2,21	1,83	0,65	2,11	29,66	22,91	18,90	6,73	21,81

R14	R28	R48	R100	P100	Percentage fiber flakes [%]
					1,01
					1,13
					0,25
					0,24
					0,19
					0,11
					0,91
					1,09
					0,44
					0,43
					0,96
					1,12
					1,5
					1,61
					0,4
					0,28
					1,44
					1,41
					0,97
					1,18
26,84	18,99	26,15	7,23	20,31	0,47
29,01	17,83	24,36	6,68	21,45	0,67
30,38	18,62	24,15	6,88	19,39	0,58
27,29	21,61	23,34	6,94	20,15	0,65
30,29	21,83	19,90	6,60	20,82	0,55
29,29	23,01	19,11	6,55	21,39	0,63
27,85	20,67	22,80	7,56	20,68	0,43
29,52	21,94	19,89	7,28	20,96	0,41
28,96	19,06	24,57	6,84	19,78	0,79
31,21	16,97	23,62	6,24	21,27	0,69
29,34	22,66	18,69	6,65	21,58	1,05
					0,62
					0,57
					0,78
					0,82
					0,87
					0,93
					1,03

Moisture content

Date	PM	Wet [g]	Dry [g]	Moisture [%]	Avg Moisture [%]
2022-05-11 2022-05-19	B	2,8874	2,7425	6,56%	6,60%
		2,9033	2,753	6,76%	
		2,8795	2,7356	6,54%	
		2,9307	2,7827	6,58%	
		2,8874	2,7421	6,58%	
		2,9005	2,7544	6,58%	
2022-08-24	A	3,0786	2,9197	6,68%	6,68%
		3,0605	2,9048	6,60%	
		3,0546	2,8981	6,65%	
		3,0899	2,9295	6,71%	
		3,0626	2,903	6,76%	
2022-08-30	A	3,0676	2,8995	7,10%	6,78%
		3,0638	2,9013	6,88%	
		3,0374	2,8816	6,67%	
		3,0714	2,9106	6,78%	
		3,0582	2,9054	6,48%	
2022-09-01	B	2,8962	2,7456	6,80%	6,95%
		2,8839	2,7319	6,90%	
		2,898	2,7449	6,90%	
		2,8969	2,7386	7,14%	
		2,8924	2,739	6,93%	
		2,9223	2,7646	7,03%	
2022-09-06	A	3,057	2,909	6,28%	6,67%
		3,07	2,908	6,84%	
		3,051	2,892	6,77%	
		3,071	2,915	6,58%	
		3,049	2,888	6,86%	
2022-09-07	B	2,896	2,747	6,72%	7,03%
		2,895	2,74	7,00%	
		2,905	2,747	7,10%	
		2,881	2,724	7,13%	
		2,89	2,73	7,24%	
		2,915	2,759	6,98%	
2022-09-13	B	2,98	2,72	11,30%	11,28%
		2,99	2,73	11,26%	
		2,99	2,72	11,69%	
		2,98	2,73	10,87%	
		3	2,75	10,78%	
		2,96	2,7	11,40%	
		3	2,73	11,64%	
2022-09-15	A	3,154	2,883	11,05%	11,30%
		3,15	2,889	10,66%	
		3,162	2,895	10,85%	
		3,144	2,875	11,01%	
		3,167	2,873	11,92%	
		3,167	2,873	11,92%	

		3,168	2,879	11,71%	
2022-09-22	B	2,896	2,718	8,03%	7,11%
		2,892	2,732	7,23%	
		2,892	2,74	6,87%	
		2,871	2,724	6,71%	
		2,863	2,717	6,69%	
2022-09-27	B	2,902	2,734	7,56%	7,59%
		2,888	2,711	8,02%	
		2,908	2,742	7,45%	
		2,886	2,722	7,43%	
		2,913	2,742	7,66%	
		2,896	2,732	7,40%	
2022-10-04	C	2,703	2,541	8,34%	8,54%
		2,704	2,529	9,00%	
		2,722	2,556	8,46%	
		2,74	2,568	8,69%	
		2,723	2,558	8,41%	
		2,719	2,556	8,32%	
2022-10-12	C	2,716	2,554	8,28%	7,84%
		2,723	2,571	7,74%	
		2,718	2,572	7,46%	
		2,724	2,57	7,84%	
		2,727	2,58	7,47%	
		2,712	2,551	8,25%	
2022-10-27	B	2,917	2,743	7,78%	7,40%
		2,896	2,722	7,85%	
		2,877	2,728	6,78%	
		2,908	2,753	6,96%	
		2,873	2,71	7,43%	
		2,901	2,732	7,61%	

Energy data

A 43C

Temperature	Ampere	Time
40,56713	0	0:00:00
40,45862	0	0:00:10
40,42245	0	0:00:20
40,16927	0	0:00:30
39,92332	0	0:00:40
39,63397	0	0:00:50
39,42781	0	0:01:00
39,18186	0	0:01:10
38,99016	0	0:01:20
38,90335	0	0:01:30
38,80931	0	0:01:40
38,74783	0	0:01:50
38,66826	0	0:02:00
38,59592	0	0:02:10
38,5272	0	0:02:20
38,45486	0	0:02:30
38,37529	0	0:02:40
38,23785	0,002911	0:02:50
38,10402	0,002911	0:03:00
36,37153	0,002911	0:03:10
40,1114	0,002911	0:03:20
42,1658	0,002911	0:03:30
42,8096	0,002911	0:03:40
43,37746	0,002911	0:03:50
42,70833	5,272503	0:04:00
42,17665	5,28609	0:04:10
42,02112	5,208453	0:04:20
41,94517	5,26571	0:04:30
41,92347	5,30744	0:04:40
41,91985	5,319086	0:04:50
41,90538	5,241449	0:05:00
41,90176	5,290942	0:05:10
41,89091	5,22301	0:05:20
41,909	5,24436	0:05:30
41,92347	5,22204	0:05:40
41,94155	5,249213	0:05:50
41,94155	5,26377	0:06:00
41,94155	5,239508	0:06:10
41,94517	5,205542	0:06:20
41,94517	6,80874	0:06:30
41,89091	0	0:06:40
41,81134	0	0:06:50
41,74986	0	0:07:00
41,71368	0	0:07:10
41,64858	0	0:07:20
41,69199	5,661658	0:07:30
41,82943	5,251153	0:07:40

A 55C

Temperature	Ampere	Time
56,30425	5,637396	0:00:00
56,09809	5,304529	0:00:10
55,97873	5,317145	0:00:20
55,89916	5,37149	0:00:30
55,85576	5,309381	0:00:40
55,81236	5,295794	0:00:50
55,7798	5,272503	0:01:00
55,76534	5,321026	0:01:10
55,74725	5,284149	0:01:20
55,72555	5,346259	0:01:30
55,70385	5,32879	0:01:40
55,6713	5,274445	0:01:50
55,66768	5,28609	0:02:00
55,65321	5,369549	0:02:10
55,57364	0,002911	0:02:20
55,43982	0	0:02:30
55,34216	6,494311	0:02:40
55,47237	5,272503	0:02:50
55,47598	5,268622	0:03:00
55,47598	5,293854	0:03:10
55,45066	5,278327	0:03:20
55,44705	5,321026	0:03:30
55,4362	5,279297	0:03:40
55,4145	5,26377	0:03:50
55,40364	5,291913	0:04:00
55,38556	5,281238	0:04:10
55,36748	5,321997	0:04:20
55,36748	5,317145	0:04:30
55,34216	5,313263	0:04:40
55,34939	5,315204	0:04:50
55,33131	5,342377	0:05:00
55,32769	5,321997	0:05:10
55,33131	5,387988	0:05:20
55,32046	5,367609	0:05:30
55,32407	5,26571	0:05:40
55,24812	0	0:05:50
55,10344	10,64108	0:06:00
55,21556	5,397693	0:06:10
55,21918	5,386047	0:06:20
55,23727	5,420984	0:06:30
55,21195	5,418072	0:06:40
55,24812	5,474359	0:06:50
55,23727	5,409338	0:07:00
55,24812	5,481152	0:07:10
55,24088	5,387018	0:07:20
55,24812	5,504443	0:07:30
55,21918	5,448157	0:07:40

41,82943	5,257946	0:07:50	55,21918	5,458832	0:07:50
41,85836	5,294824	0:08:00	55,24812	5,621869	0:08:00
41,85474	5,239508	0:08:10	55,21918	5,419043	0:08:10
41,85113	5,240479	0:08:20	55,20472	5,435541	0:08:20
41,87645	5,281238	0:08:30	55,21918	5,387988	0:08:30
41,87283	5,26377	0:08:40	55,19748	5,420984	0:08:40
41,88368	5,273474	0:08:50	55,12514	0,002911	0:08:50
41,88368	5,247272	0:09:00	54,98409	0	0:09:00
41,91262	5,253094	0:09:10	54,85388	0	0:09:10
41,93793	5,239508	0:09:20	54,79962	5,922711	0:09:20
41,91985	5,268622	0:09:30	55,07089	5,4763	0:09:30
41,9307	5,255035	0:09:40	55,07813	5,522882	0:09:40
41,94878	5,253094	0:09:50	55,07813	5,49765	0:09:50
41,94517	5,259888	0:10:00	55,12514	5,532587	0:10:00
41,95963	5,275415	0:10:10	55,16854	5,509295	0:10:10
41,9741	5,311322	0:10:20	55,17578	5,448157	0:10:20
41,94878	0	0:10:30	55,18663	5,479211	0:10:30
41,85474	0	0:10:40	55,25174	5,484064	0:10:40
41,79326	0	0:10:50	55,26982	5,500561	0:10:50
41,71368	0	0:11:00	55,31322	5,543262	0:11:00
41,6956	0	0:11:10	55,32407	5,500561	0:11:10
41,61965	0	0:11:20	55,36386	5,491827	0:11:20
41,72454	5,354992	0:11:30	55,39641	5,53938	0:11:30
41,83666	5,257946	0:11:40	55,43258	5,502502	0:11:40
41,87283	5,293854	0:11:50	55,37833	0,002911	0:11:50
41,88368	5,289972	0:12:00	55,2228	0	0:12:00
41,89453	5,324908	0:12:10	55,08536	0	0:12:10
41,91985	5,288031	0:12:20	54,94791	0	0:12:20
41,94155	5,337524	0:12:30	54,82494	0	0:12:30
41,94517	5,393811	0:12:40	54,72728	0	0:12:40
41,95602	5,363727	0:12:50	54,61878	0	0:12:50
41,97772	5,330731	0:13:00	54,52835	0	0:13:00
41,98495	5,321997	0:13:10	54,43793	0,002911	0:13:10
42,01389	5,478241	0:13:20	54,60793	5,491827	0:13:20
42,03197	5,401575	0:13:30	54,92983	5,51997	0:13:30
42,03559	5,308411	0:13:40	55,10706	5,532587	0:13:40
42,02835	5,515118	0:13:50	55,18663	5,500561	0:13:50
41,98133	0,002911	0:14:00	55,23365	5,533557	0:14:00
41,91262	0	0:14:10	55,30599	5,525794	0:14:10
41,83666	0	0:14:20	55,28429	5,501532	0:14:20
41,76432	0	0:14:30	55,32769	5,53938	0:14:30
41,70284	0,002911	0:14:40	55,34578	5,508325	0:14:40
41,6522	5,398663	0:14:50	55,37471	5,484064	0:14:50
41,909	5,41225	0:15:00	55,3928	5,524823	0:15:00
41,99942	5,399634	0:15:10	55,4145	5,519	0:15:10
42,00304	5,395752	0:15:20	55,42896	5,487946	0:15:20
41,99219	5,309381	0:15:30	55,44705	5,494739	0:15:30
41,92708	5,303558	0:15:40	55,46513	5,481152	0:15:40
41,8656	5,296765	0:15:50	55,47237	5,484064	0:15:50
41,91262	5,278327	0:16:00	55,51215	5,49765	0:16:00

41,89453	5,334613	0:16:10	55,51215	5,483093	0:16:10
41,9958	5,289972	0:16:20	55,53024	5,479211	0:16:20
42,01389	5,318115	0:16:30	55,55555	5,479211	0:16:30
42,10431	5,340436	0:16:40	55,55555	5,447186	0:16:40
42,24899	5,374402	0:16:50	55,60257	5,486004	0:16:50
42,29962	5,377313	0:17:00	55,61343	5,443305	0:17:00
42,35388	5,387988	0:17:10	55,60981	5,488916	0:17:10
42,35749	5,377313	0:17:20	55,61343	5,478241	0:17:20
42,29239	0,002911	0:17:30	55,64959	5,486975	0:17:30
42,22005	0,002911	0:17:40	55,65683	5,502502	0:17:40
42,12601	0	0:17:50	55,68938	5,471447	0:17:50
42,06814	0	0:18:00	55,70747	5,491827	0:18:00
42,01751	0	0:18:10	55,71832	5,472418	0:18:10
41,98495	0	0:18:20	55,72555	5,755792	0:18:20
41,909	0	0:18:30	55,60981	0,002911	0:18:30
41,85836	0	0:18:40	55,46513	0	0:18:40
41,80411	0	0:18:50	55,32769	0	0:18:50
41,74986	0	0:19:00	55,2011	0	0:19:00
41,69199	0	0:19:10	55,08536	0	0:19:10
41,64858	0	0:19:20	54,966	0	0:19:20
41,59433	0	0:19:30	54,9877	5,925622	0:19:30
41,51476	0	0:19:40	55,32407	5,469507	0:19:40
41,49305	0	0:19:50	55,42896	5,481152	0:19:50
41,4388	0	0:20:00	55,47598	5,4763	0:20:00
41,40625	0	0:20:10	55,50492	5,456891	0:20:10
41,37008	0	0:20:20	55,54109	5,465625	0:20:20
41,34476	0	0:20:30	55,53747	5,462714	0:20:30
41,29412	0	0:20:40	55,56641	5,467566	0:20:40
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44,44444	0	1:10:30
44,38296	0	1:10:40
44,34317	0	1:10:50
44,28892	0	1:11:00
44,25637	0	1:11:10
44,2202	0	1:11:20
44,16956	0	1:11:30
44,11892	0	1:11:40
44,09722	0	1:11:50
44,27806	0	1:12:00
44,28892	0	1:12:10
44,23828	0	1:12:20
44,18764	0	1:12:30
44,13339	0	1:12:40
44,08275	0	1:12:50
44,0285	0	1:13:00
43,96701	0	1:13:10
43,91638	0	1:13:20
43,85851	0	1:13:30
43,81872	0	1:13:40
43,76809	0	1:13:50
43,72107	0	1:14:00
43,64873	0	1:14:10
43,62703	0	1:14:20

43,57277	0	1:14:30
43,5366	0	1:14:40
43,48235	0	1:14:50
43,42448	0	1:15:00
43,40278	0	1:15:10
43,34852	0	1:15:20
43,3232	0	1:15:30
43,29427	0	1:15:40
43,24725	0	1:15:50
43,22193	0,002911	1:16:00
43,20385	5,978998	1:16:10
43,94893	5,501532	1:16:20
44,27083	5,493768	1:16:30
44,40828	5,466595	1:16:40
44,49146	5,450098	1:16:50
44,56742	5,450098	1:17:00
44,61805	5,480182	1:17:10
44,66146	5,460773	1:17:20
44,69763	5,475329	1:17:30
44,73018	5,473389	1:17:40
44,75911	5,453009	1:17:50
44,7772	5,478241	1:18:00
44,80252	5,462714	1:18:10
44,83868	5,45495	1:18:20
44,86762	5,467566	1:18:30
44,8857	5,453009	1:18:40
44,92188	5,462714	1:18:50
44,95081	5,45592	1:19:00
44,97974	5,470477	1:19:10
44,98336	5,461743	1:19:20
45,00145	5,450098	1:19:30
45,034	5,458832	1:19:40
45,0557	5,4763	1:19:50
45,09549	5,456891	1:20:00
45,1208	5,453009	1:20:10
45,15697	5,456891	1:20:20
45,17867	5,45495	1:20:30
45,18591	5,451068	1:20:40
45,22931	5,446216	1:20:50
45,25463	5,448157	1:21:00
45,2691	5,456891	1:21:10
45,29441	5,565582	1:21:20
45,21484	0,002911	1:21:30
45,1208	0,002911	1:21:40
45,01591	0,002911	1:21:50
44,92911	0,002911	1:22:00
44,83868	0,002911	1:22:10
44,78082	0,002911	1:22:20
44,70486	0,002911	1:22:30
44,63614	0,002911	1:22:40

44,58912	0,002911	1:22:50
44,51316	0,002911	1:23:00
44,44444	0,002911	1:23:10
44,40466	0,002911	1:23:20
44,34317	0,002911	1:23:30
44,29977	0,002911	1:23:40
44,25998	0,002911	1:23:50
44,20211	0,002911	1:24:00
44,15147	0,002911	1:24:10
44,11531	0,002911	1:24:20
44,05382	0,002911	1:24:30
44,01041	0,002911	1:24:40
43,98148	0,002911	1:24:50
43,93084	0	1:25:00
43,88382	0	1:25:10
43,84404	0	1:25:20
43,81149	0	1:25:30
43,76447	0	1:25:40
43,7283	0	1:25:50
43,68128	0	1:26:00
43,62703	0	1:26:10
43,60532	0	1:26:20
43,5583	0	1:26:30
43,54022	0	1:26:40
43,4932	0	1:26:50
43,43895	0	1:27:00
43,41363	0	1:27:10
43,38469	0	1:27:20
43,33767	0	1:27:30
43,31597	0	1:27:40
43,28342	0	1:27:50
43,24363	0	1:28:00
43,21108	0	1:28:10
43,34129	0	1:28:20
43,31959	0	1:28:30
43,24002	0	1:28:40
43,16045	0	1:28:50
43,09534	0	1:29:00
43,01577	0	1:29:10
42,96875	0	1:29:20
42,90726	0	1:29:30
42,86386	0	1:29:40
42,79876	0	1:29:50
42,76258	0	1:30:00
42,70472	0	1:30:10
42,6794	0	1:30:20
42,64323	0	1:30:30
42,59259	0	1:30:40
42,57089	0	1:30:50
42,53472	0	1:31:00

42,50217	0	1:31:10
42,45153	0	1:31:20
42,42622	0	1:31:30
42,39728	0	1:31:40
42,36111	0	1:31:50
42,33941	0	1:32:00
42,30686	0	1:32:10
42,26345	0	1:32:20
42,2526	0	1:32:30
42,21643	0	1:32:40
42,19112	0	1:32:50
42,1658	0	1:33:00
42,14048	0	1:33:10
42,10793	0	1:33:20
42,06453	0	1:33:30
42,03921	0	1:33:40
42,02835	0	1:33:50
41,99942	0	1:34:00
41,98133	0	1:34:10
41,96687	0	1:34:20
41,93793	0	1:34:30
41,92708	0	1:34:40
41,89091	0	1:34:50
41,8656	0	1:35:00
41,84751	0	1:35:10
41,80411	0	1:35:20
41,77517	0	1:35:30
41,77517	0	1:35:40
41,74986	0	1:35:50
41,72454	0	1:36:00
41,70284	0	1:36:10
41,66666	0	1:36:20
41,65582	0	1:36:30
41,63411	0	1:36:40
41,59795	0	1:36:50
41,58709	0	1:37:00
41,56178	0	1:37:10
41,54369	0	1:37:20
41,51476	0	1:37:30
41,51476	0	1:37:40
41,48944	0	1:37:50
41,45327	0	1:38:00
41,44965	0	1:38:10
41,4171	0	1:38:20
41,39902	0	1:38:30
41,39902	0	1:38:40
41,35923	0	1:38:50
41,34838	0	1:39:00
41,32668	0	1:39:10
41,29051	0	1:39:20

41,28689	0	1:39:30
41,26157	0	1:39:40
41,23987	0	1:39:50
41,21455	0	1:40:00
41,18924	0	1:40:10
41,182	0	1:40:20
41,17115	0	1:40:30
41,13498	0	1:40:40
41,12775	0	1:40:50
41,10605	0	1:41:00
41,08073	0	1:41:10
41,04094	0	1:41:20
41,02647	0	1:41:30

B 16h

Temperature	Ampere	Time
45,45718	0,002911	0:00:00
45,38484	0,002911	0:00:10
45,30527	0,003882	0:00:20
45,21484	0,002911	0:00:30
45,12442	0	0:00:40
44,89294	0	0:00:50
44,70848	0	0:01:00
44,49146	0	0:01:10
44,19126	0	0:01:20
43,66319	0	0:01:30
43,4932	0	0:01:40
43,31236	0	0:01:50
43,14236	0	0:02:00
42,97598	0	0:02:10
42,7879	0	0:02:20
42,63599	0	0:02:30
42,57089	0	0:02:40
42,44791	5,420984	0:02:50
42,43345	5,342377	0:03:00
42,42622	5,337524	0:03:10
42,44791	5,362756	0:03:20
42,44791	5,34917	0:03:30
42,45515	5,366638	0:03:40
42,45153	5,334613	0:03:50
42,44791	5,30744	0:04:00
42,46962	5,315204	0:04:10
42,45153	5,347229	0:04:20
42,46962	5,300647	0:04:30
42,48047	5,293854	0:04:40
42,48409	5,299676	0:04:50
42,50217	5,32879	0:05:00
42,52387	5,291913	0:05:10
42,49132	0	0:05:20
42,45153	0	0:05:30
42,4009	0	0:05:40
42,41536	5,468536	0:05:50
42,4443	5,294824	0:06:00
42,44791	5,304529	0:06:10
42,46238	5,312293	0:06:20
42,46238	5,301617	0:06:30
42,466	5,337524	0:06:40
42,4877	5,356934	0:06:50
42,49855	5,293854	0:07:00
42,50217	5,308411	0:07:10
42,51664	5,359845	0:07:20
42,52025	5,367609	0:07:30
42,53472	5,359845	0:07:40

A 16h

Temperature	Ampere	Time
45,5259	2,91E-03	0:00:00
45,43186	2,91E-03	0:00:10
45,31973	2,91E-03	0:00:20
45,24739	2,91E-03	0:00:30
45,15697	2,91E-03	0:00:40
45,05931	2,91E-03	0:00:50
44,98336	2,91E-03	0:01:00
44,89656	2,91E-03	0:01:10
44,81699	2,91E-03	0:01:20
44,73018	2,91E-03	0:01:30
44,61805	2,91E-03	0:01:40
44,5638	2,91E-03	0:01:50
44,48785	6,97E+00	0:02:00
41,68475	5,49E+00	0:02:10
42,03921	5,35E+00	0:02:20
42,14771	5,33E+00	0:02:30
42,19835	5,32E+00	0:02:40
42,24899	5,33E+00	0:02:50
42,25622	5,32E+00	0:03:00
42,2743	5,34E+00	0:03:10
42,29239	5,38E+00	0:03:20
42,30686	5,31E+00	0:03:30
42,31047	5,35E+00	0:03:40
42,30686	5,31E+00	0:03:50
42,32494	5,29E+00	0:04:00
42,35388	5,30E+00	0:04:10
42,34664	5,32E+00	0:04:20
42,34303	5,28E+00	0:04:30
42,37196	5,28E+00	0:04:40
42,3792	5,31E+00	0:04:50
42,4009	5,32E+00	0:05:00
42,4009	5,29E+00	0:05:10
42,39728	5,30E+00	0:05:20
42,40813	5,31E+00	0:05:30
42,42983	5,31E+00	0:05:40
42,42983	0,00E+00	0:05:50
42,36473	0,00E+00	0:06:00
42,28516	0,00E+00	0:06:10
42,23452	0,00E+00	0:06:20
42,15495	0,00E+00	0:06:30
42,11878	5,08E+00	0:06:40
42,26345	5,32E+00	0:06:50
42,32494	5,35E+00	0:07:00
42,34664	5,40E+00	0:07:10
42,35749	5,39E+00	0:07:20
42,37558	5,38E+00	0:07:30
42,38281	5,34E+00	0:07:40

42,52749	5,387018	0:07:50	42,41175	5,36E+00	0:07:50
42,55642	5,330731	0:08:00	42,41898	5,43E+00	0:08:00
42,57089	5,388958	0:08:10	42,45153	5,35E+00	0:08:10
42,58174	5,345288	0:08:20	42,46238	5,44E+00	0:08:20
42,55642	0,002911	0:08:30	42,47324	5,49E+00	0:08:30
42,50579	0	0:08:40	42,49132	5,51E+00	0:08:40
42,43345	0	0:08:50	42,5094	5,46E+00	0:08:50
42,37558	0	0:09:00	42,53472	5,50E+00	0:09:00
42,32494	0	0:09:10	42,55281	5,56E+00	0:09:10
42,36111	5,546173	0:09:20	42,56004	5,45E+00	0:09:20
42,48047	5,402545	0:09:30	42,58897	5,51E+00	0:09:30
42,50217	5,381195	0:09:40	42,57813	0,00E+00	0:09:40
42,53472	5,419043	0:09:50	42,52025	0,00E+00	0:09:50
42,54557	5,440393	0:10:00	42,4443	0,00E+00	0:10:00
42,57451	5,418072	0:10:10	42,36473	0,00E+00	0:10:10
42,59983	5,485034	0:10:20	42,28877	7,20E+00	0:10:20
42,61068	5,464654	0:10:30	42,39366	5,43E+00	0:10:30
42,62876	5,478241	0:10:40	42,48047	5,58E+00	0:10:40
42,66131	5,507355	0:10:50	42,57089	5,55E+00	0:10:50
42,69748	5,530646	0:11:00	42,59983	5,43E+00	0:11:00
42,7011	5,418072	0:11:10	42,60706	5,47E+00	0:11:10
42,70472	5,453009	0:11:20	42,65408	5,46E+00	0:11:20
42,72642	5,519	0:11:30	42,66493	5,42E+00	0:11:30
42,75897	5,417102	0:11:40	42,7011	5,60E+00	0:11:40
42,79876	5,395752	0:11:50	42,61791	0,00E+00	0:11:50
42,75897	0	0:12:00	42,54195	0,00E+00	0:12:00
42,68301	0	0:12:10	42,48047	0,00E+00	0:12:10
42,61791	0	0:12:20	42,4009	0,00E+00	0:12:20
42,54195	0	0:12:30	42,34303	5,58E+00	0:12:30
42,47324	0	0:12:40	42,46962	5,43E+00	0:12:40
42,4009	0	0:12:50	42,57089	5,46E+00	0:12:50
42,4009	5,717944	0:13:00	42,61068	5,51E+00	0:13:00
42,59983	5,515118	0:13:10	42,69025	5,54E+00	0:13:10
42,66493	5,407397	0:13:20	42,75174	5,53E+00	0:13:20
42,63599	5,444275	0:13:30	42,7879	5,48E+00	0:13:30
42,61068	5,460773	0:13:40	42,82769	5,47E+00	0:13:40
42,7011	5,525794	0:13:50	42,88556	5,47E+00	0:13:50
42,79514	5,503473	0:14:00	42,91811	5,51E+00	0:14:00
42,7879	5,475329	0:14:10	42,99407	5,49E+00	0:14:10
42,82769	5,462714	0:14:20	43,03024	5,56E+00	0:14:20
42,86748	5,4763	0:14:30	43,08087	5,54E+00	0:14:30
42,90726	5,449127	0:14:40	43,12428	5,54E+00	0:14:40
42,9145	5,479211	0:14:50	43,1713	5,57E+00	0:14:50
42,89641	5,553936	0:15:00	43,19661	5,56E+00	0:15:00
42,92173	5,526764	0:15:10	43,26895	5,54E+00	0:15:10
43,01215	5,504443	0:15:20	43,24725	0,00E+00	0:15:20
43,04832	5,535498	0:15:30	43,15321	0,00E+00	0:15:30
43,14236	5,591784	0:15:40	43,05917	0,00E+00	0:15:40
43,18576	5,613135	0:15:50	42,95066	0,00E+00	0:15:50
43,11704	0	0:16:00	42,87109	0,00E+00	0:16:00

43,02662	0	0:16:10	42,79876	0,00E+00	0:16:10
42,91811	0	0:16:20	42,75174	0,00E+00	0:16:20
42,84216	0	0:16:30	42,69748	0,00E+00	0:16:30
42,77705	0	0:16:40	42,62876	0,00E+00	0:16:40
42,70472	0	0:16:50	42,57089	0,00E+00	0:16:50
42,65408	0	0:17:00	42,5094	0,00E+00	0:17:00
42,58897	0	0:17:10	42,48047	0,00E+00	0:17:10
42,53834	0,002911	0:17:20	42,40813	0,00E+00	0:17:20
42,58897	5,550055	0:17:30	42,37558	0,00E+00	0:17:30
42,79152	5,600519	0:17:40	42,33579	0,00E+00	0:17:40
42,9362	5,554907	0:17:50	42,28154	2,91E-03	0:17:50
43,04109	5,587903	0:18:00	42,26707	6,09E+00	0:18:00
43,11704	5,655835	0:18:10	42,68301	5,59E+00	0:18:10
43,18576	5,597607	0:18:20	42,85301	5,53E+00	0:18:20
43,2147	5,500561	0:18:30	42,95428	5,54E+00	0:18:30
43,26895	5,570435	0:18:40	43,02662	5,52E+00	0:18:40
43,33406	5,565582	0:18:50	43,07002	5,56E+00	0:18:50
43,39193	5,554907	0:19:00	43,14959	5,54E+00	0:19:00
43,42086	5,575287	0:19:10	43,18938	5,55E+00	0:19:10
43,46065	5,556848	0:19:20	43,22916	5,52E+00	0:19:20
43,49681	5,523852	0:19:30	43,2581	5,49E+00	0:19:30
43,55107	5,51997	0:19:40	43,30512	5,53E+00	0:19:40
43,58362	5,525794	0:19:50	43,34852	5,52E+00	0:19:50
43,62341	5,543262	0:20:00	43,38831	5,54E+00	0:20:00
43,69936	5,569464	0:20:10	43,41363	5,52E+00	0:20:10
43,74638	5,530646	0:20:20	43,4498	5,51E+00	0:20:20
43,78255	5,58111	0:20:30	43,47873	5,51E+00	0:20:30
43,78978	5,505414	0:20:40	43,53299	5,50E+00	0:20:40
43,84404	5,555878	0:20:50	43,55107	5,51E+00	0:20:50
43,89829	5,562671	0:21:00	43,60894	5,51E+00	0:21:00
43,94893	5,555878	0:21:10	43,61979	5,49E+00	0:21:10
44,00318	5,533557	0:21:20	43,65958	5,49E+00	0:21:20
44,02488	5,53938	0:21:30	43,70298	5,51E+00	0:21:30
44,07914	5,535498	0:21:40	43,7283	5,49E+00	0:21:40
44,11531	5,51803	0:21:50	43,7717	5,52E+00	0:21:50
44,13701	5,519	0:22:00	43,80787	5,49E+00	0:22:00
44,18403	5,541321	0:22:10	43,82957	5,49E+00	0:22:10
44,22381	5,530646	0:22:20	43,84404	5,51E+00	0:22:20
44,25637	6,125537	0:22:30	43,89829	5,50E+00	0:22:30
44,19849	0,002911	0:22:40	43,92723	5,48E+00	0:22:40
44,06467	0,002911	0:22:50	43,96701	5,50E+00	0:22:50
43,97425	0	0:23:00	44,01041	5,49E+00	0:23:00
43,88021	0	0:23:10	43,9851	0,00E+00	0:23:10
43,7934	0	0:23:20	43,86574	0,00E+00	0:23:20
43,7283	0	0:23:30	43,76809	0,00E+00	0:23:30
43,66319	0	0:23:40	43,68489	0,00E+00	0:23:40
43,59447	0	0:23:50	43,60532	0,00E+00	0:23:50
43,5366	0	0:24:00	43,53299	0,00E+00	0:24:00
43,47512	0	0:24:10	43,45703	0,00E+00	0:24:10
43,43171	0	0:24:20	43,40639	0,00E+00	0:24:20

43,37384	0	0:24:30	43,34129	0,00E+00	0:24:30
43,33044	0	0:24:40	43,27618	0,00E+00	0:24:40
43,26895	0	0:24:50	43,22193	0,00E+00	0:24:50
43,21108	0	0:25:00	43,16045	0,00E+00	0:25:00
43,17853	0	0:25:10	43,11343	0,00E+00	0:25:10
43,12428	0	0:25:20	43,05194	0,00E+00	0:25:20
43,09534	6,773804	0:25:30	43,00853	0,00E+00	0:25:30
43,3232	5,571405	0:25:40	42,95428	0,00E+00	0:25:40
43,67405	5,565582	0:25:50	42,92173	0,00E+00	0:25:50
43,84766	5,558789	0:26:00	42,85301	0,00E+00	0:26:00
43,93084	5,548114	0:26:10	42,84578	0,00E+00	0:26:10
43,98872	5,553936	0:26:20	42,79152	0,00E+00	0:26:20
44,03574	5,578198	0:26:30	42,7445	0,00E+00	0:26:30
44,09361	5,557818	0:26:40	42,70833	0,00E+00	0:26:40
44,13339	5,531616	0:26:50	42,64685	0,00E+00	0:26:50
44,17318	5,555878	0:27:00	42,62876	8,15E+00	0:27:00
44,22381	5,527734	0:27:10	43,14959	5,52E+00	0:27:10
44,2419	5,537439	0:27:20	43,39193	5,51E+00	0:27:20
44,27083	5,532587	0:27:30	43,51852	5,49E+00	0:27:30
44,307	5,548114	0:27:40	43,57639	5,48E+00	0:27:40
44,3504	5,501532	0:27:50	43,63064	5,51E+00	0:27:50
44,37934	5,543262	0:28:00	43,67766	5,50E+00	0:28:00
44,40466	5,521912	0:28:10	43,69936	5,49E+00	0:28:10
44,45891	5,54035	0:28:20	43,73191	5,49E+00	0:28:20
44,46253	5,545203	0:28:30	43,76809	5,47E+00	0:28:30
44,51678	5,569464	0:28:40	43,80064	5,51E+00	0:28:40
44,5421	5,510266	0:28:50	43,82595	5,47E+00	0:28:50
44,57827	5,529675	0:29:00	43,86212	5,49E+00	0:29:00
44,61444	5,526764	0:29:10	43,89468	5,47E+00	0:29:10
44,64337	5,507355	0:29:20	43,89468	5,49E+00	0:29:20
44,67593	5,525794	0:29:30	43,94531	5,48E+00	0:29:30
44,72295	5,537439	0:29:40	43,97063	5,49E+00	0:29:40
44,75911	5,491827	0:29:50	43,99957	5,50E+00	0:29:50
44,76997	5,522882	0:30:00	44,02488	5,48E+00	0:30:00
44,83507	5,531616	0:30:10	44,06105	5,49E+00	0:30:10
44,8423	5,51997	0:30:20	44,07552	5,50E+00	0:30:20
44,8857	5,526764	0:30:30	44,11892	5,50E+00	0:30:30
44,91102	6,748571	0:30:40	44,14424	5,48E+00	0:30:40
44,81337	0,002911	0:30:50	44,17318	5,49E+00	0:30:50
44,70848	0	0:31:00	44,21658	5,49E+00	0:31:00
44,59635	0	0:31:10	44,2419	5,48E+00	0:31:10
44,50593	0	0:31:20	44,25998	5,49E+00	0:31:20
44,40828	0	0:31:30	44,27083	5,47E+00	0:31:30
44,35402	0	0:31:40	44,29615	5,47E+00	0:31:40
44,29977	0	0:31:50	44,33594	5,48E+00	0:31:50
44,2636	0	0:32:00	44,36126	5,46E+00	0:32:00
44,20573	0	0:32:10	44,3504	2,91E-03	0:32:10
44,13701	0	0:32:20	44,27083	3,88E-03	0:32:20
44,05382	0	0:32:30	44,17318	0,00E+00	0:32:30
43,9634	0	0:32:40	44,09361	0,00E+00	0:32:40

43,93084	0	0:32:50	44,0068	0,00E+00	0:32:50
43,87659	0	0:33:00	43,93084	0,00E+00	0:33:00
43,78617	0	0:33:10	43,84042	0,00E+00	0:33:10
43,74638	0	0:33:20	43,78978	0,00E+00	0:33:20
43,68489	0	0:33:30	43,71745	0,00E+00	0:33:30
43,64511	0	0:33:40	43,66319	0,00E+00	0:33:40
43,58362	0	0:33:50	43,60171	0,00E+00	0:33:50
43,53299	0	0:34:00	43,54022	0,00E+00	0:34:00
43,47873	0,002911	0:34:10	43,48235	0,00E+00	0:34:10
43,43895	0,002911	0:34:20	43,42448	0,00E+00	0:34:20
43,39193	8,002404	0:34:30	43,38831	0,00E+00	0:34:30
43,95255	5,507355	0:34:40	43,33044	0,00E+00	0:34:40
44,23466	5,538409	0:34:50	43,28342	0,00E+00	0:34:50
44,3504	5,513177	0:35:00	43,22916	0,00E+00	0:35:00
44,43359	5,533557	0:35:10	43,18576	0,00E+00	0:35:10
44,49508	5,510266	0:35:20	43,13151	0,00E+00	0:35:20
44,53487	5,535498	0:35:30	43,24002	5,78E+00	0:35:30
44,57827	5,54035	0:35:40	43,71021	5,49E+00	0:35:40
44,62529	5,529675	0:35:50	43,87659	5,49E+00	0:35:50
44,65422	5,521912	0:36:00	43,95616	5,48E+00	0:36:00
44,71571	5,529675	0:36:10	44,0068	5,48E+00	0:36:10
44,72295	5,514148	0:36:20	44,06105	5,46E+00	0:36:20
44,76273	5,510266	0:36:30	44,08999	5,47E+00	0:36:30
44,79528	5,51997	0:36:40	44,12977	5,46E+00	0:36:40
44,82422	5,492798	0:36:50	44,16233	5,45E+00	0:36:50
44,85677	5,509295	0:37:00	44,18041	5,46E+00	0:37:00
44,87486	5,512207	0:37:10	44,20935	5,48E+00	0:37:10
44,91102	5,514148	0:37:20	44,25637	5,45E+00	0:37:20
44,93996	5,541321	0:37:30	44,25637	5,47E+00	0:37:30
44,96528	5,509295	0:37:40	44,28892	5,46E+00	0:37:40
45,0123	5,49765	0:37:50	44,31062	5,47E+00	0:37:50
45,0557	5,486975	0:38:00	44,33232	5,47E+00	0:38:00
45,0557	5,504443	0:38:10	44,36126	5,47E+00	0:38:10
45,09187	5,489886	0:38:20	44,38657	5,47E+00	0:38:20
45,13889	5,477271	0:38:30	44,40828	5,46E+00	0:38:30
45,14974	5,506384	0:38:40	44,4553	5,46E+00	0:38:40
45,18591	5,477271	0:38:50	44,46253	5,47E+00	0:38:50
45,21484	5,521912	0:39:00	44,51316	5,48E+00	0:39:00
45,24016	5,477271	0:39:10	44,50955	5,46E+00	0:39:10
45,27633	5,499591	0:39:20	44,54934	5,48E+00	0:39:20
45,30888	5,506384	0:39:30	44,56742	5,47E+00	0:39:30
45,32335	0,002911	0:39:40	44,62167	5,47E+00	0:39:40
45,21484	0,002911	0:39:50	44,63614	5,47E+00	0:39:50
45,10633	0,002911	0:40:00	44,65784	5,47E+00	0:40:00
45,01953	0,002911	0:40:10	44,68678	5,47E+00	0:40:10
44,92911	0,002911	0:40:20	44,70486	5,47E+00	0:40:20
44,83145	0	0:40:30	44,74465	5,47E+00	0:40:30
44,76273	0	0:40:40	44,71209	2,91E-03	0:40:40
44,67954	0	0:40:50	44,59997	2,91E-03	0:40:50
44,62167	0	0:41:00	44,49508	2,91E-03	0:41:00

44,5421	0	0:41:10	44,41551	2,91E-03	0:41:10
44,49508	0	0:41:20	44,32508	0,00E+00	0:41:20
44,44083	0	0:41:30	44,24551	0,00E+00	0:41:30
44,37934	0,002911	0:41:40	44,19126	0,00E+00	0:41:40
44,52763	5,605371	0:41:50	44,14786	0,00E+00	0:41:50
44,87847	5,523852	0:42:00	44,06105	0,00E+00	0:42:00
45,01591	5,49765	0:42:10	44,01765	0,00E+00	0:42:10
45,10633	5,484064	0:42:20	43,94531	0,00E+00	0:42:20
45,14974	5,491827	0:42:30	43,90191	0,00E+00	0:42:30
45,19314	5,502502	0:42:40	43,81872	1,03E+01	0:42:40
45,22931	5,513177	0:42:50	44,16956	5,50E+00	0:42:50
45,27271	5,489886	0:43:00	44,36126	5,48E+00	0:43:00
45,30888	5,484064	0:43:10	44,43721	5,47E+00	0:43:10
45,34143	5,505414	0:43:20	44,51316	5,49E+00	0:43:20
45,36314	5,501532	0:43:30	44,56742	5,49E+00	0:43:30
45,39569	5,481152	0:43:40	44,6072	5,48E+00	0:43:40
45,40292	5,531616	0:43:50	44,63976	5,48E+00	0:43:50
45,45718	5,486004	0:44:00	44,67231	5,49E+00	0:44:00
45,47164	5,487946	0:44:10	44,70848	5,48E+00	0:44:10
45,52228	5,516089	0:44:20	44,71209	5,46E+00	0:44:20
45,54036	5,468536	0:44:30	44,76635	5,48E+00	0:44:30
45,57291	5,509295	0:44:40	44,7989	5,47E+00	0:44:40
45,59824	5,483093	0:44:50	44,8206	5,48E+00	0:44:50
45,6127	5,506384	0:45:00	44,86039	5,49E+00	0:45:00
45,65611	5,503473	0:45:10	44,86762	5,48E+00	0:45:10
45,68504	5,478241	0:45:20	44,89294	5,48E+00	0:45:20
45,71759	5,486975	0:45:30	44,93272	5,46E+00	0:45:30
45,73929	5,490857	0:45:40	44,96166	5,50E+00	0:45:40
45,77546	5,493768	0:45:50	44,99783	5,47E+00	0:45:50
45,80078	5,501532	0:46:00	45,01953	5,47E+00	0:46:00
45,85142	5,479211	0:46:10	45,03762	5,46E+00	0:46:10
45,8478	5,491827	0:46:20	45,08463	5,48E+00	0:46:20
45,90567	5,506384	0:46:30	45,11357	5,49E+00	0:46:30
45,90567	5,503473	0:46:40	45,13165	5,47E+00	0:46:40
45,95631	5,41225	0:46:50	45,15697	5,48E+00	0:46:50
45,88035	0,002911	0:47:00	45,19314	5,48E+00	0:47:00
45,76099	0,003882	0:47:10	45,22208	5,47E+00	0:47:10
45,65249	0	0:47:20	45,24739	5,47E+00	0:47:20
45,54036	0	0:47:30	45,28357	5,47E+00	0:47:30
45,48249	0	0:47:40	45,30527	5,49E+00	0:47:40
45,3993	0	0:47:50	45,33059	1,90E-01	0:47:50
45,30527	0	0:48:00	45,22931	2,91E-03	0:48:00
45,23655	0	0:48:10	45,10995	2,91E-03	0:48:10
45,16421	0	0:48:20	45,01953	2,91E-03	0:48:20
45,09549	0	0:48:30	44,92549	0,00E+00	0:48:30
45,02315	0	0:48:40	44,84954	0,00E+00	0:48:40
44,97974	0	0:48:50	44,76997	0,00E+00	0:48:50
44,90379	0	0:49:00	44,69401	0,00E+00	0:49:00
44,84954	0	0:49:10	44,63976	0,00E+00	0:49:10
44,79528	0	0:49:20	44,5421	0,00E+00	0:49:20

44,74465	0	0:49:30	44,51678	0,00E+00	0:49:30
44,69763	0	0:49:40	44,44444	0,00E+00	0:49:40
44,64337	0	0:49:50	44,3721	0,00E+00	0:49:50
44,58912	0,002911	0:50:00	44,31785	0,00E+00	0:50:00
44,92911	5,520941	0:50:10	44,28168	0,00E+00	0:50:10
45,2691	5,511237	0:50:20	44,23828	0,00E+00	0:50:20
45,42101	5,482123	0:50:30	44,17318	0,00E+00	0:50:30
45,48611	5,479211	0:50:40	44,12616	0,00E+00	0:50:40
45,55845	5,466595	0:50:50	44,10084	0,00E+00	0:50:50
45,58377	5,484064	0:51:00	44,03935	0,00E+00	0:51:00
45,62717	5,466595	0:51:10	43,97063	0,00E+00	0:51:10
45,67419	5,482123	0:51:20	43,93808	0,00E+00	0:51:20
45,69227	5,486004	0:51:30	43,88382	0,00E+00	0:51:30
45,73929	5,483093	0:51:40	43,86212	0,00E+00	0:51:40
45,75738	5,452038	0:51:50	43,81872	0,00E+00	0:51:50
45,79355	5,4763	0:52:00	43,80787	0,00E+00	0:52:00
45,81163	5,49765	0:52:10	43,75723	0,00E+00	0:52:10
45,8478	5,494739	0:52:20	43,72107	0,00E+00	0:52:20
45,85142	5,485034	0:52:30	43,66681	0,00E+00	0:52:30
45,8912	5,495709	0:52:40	43,63064	0,00E+00	0:52:40
45,94546	5,493768	0:52:50	43,59085	0,00E+00	0:52:50
45,95631	5,499591	0:53:00	43,58724	6,45E+00	0:53:00
45,98162	5,472418	0:53:10	44,20573	5,48E+00	0:53:10
46,0178	5,487946	0:53:20	44,49146	5,46E+00	0:53:20
46,04311	5,490857	0:53:30	44,59997	5,47E+00	0:53:30
46,06482	5,45495	0:53:40	44,67954	5,48E+00	0:53:40
46,0829	5,465625	0:53:50	44,74465	5,49E+00	0:53:50
46,11907	5,474359	0:54:00	44,76635	5,47E+00	0:54:00
46,15524	5,463684	0:54:10	44,83507	5,47E+00	0:54:10
46,17332	5,480182	0:54:20	44,86039	5,46E+00	0:54:20
46,19502	5,482123	0:54:30	44,87486	5,46E+00	0:54:30
46,23481	5,477271	0:54:40	44,90741	5,45E+00	0:54:40
46,24928	5,507355	0:54:50	44,92549	5,47E+00	0:54:50
46,29991	5,502502	0:55:00	44,96889	5,45E+00	0:55:00
46,30715	6,248785	0:55:10	44,98698	5,47E+00	0:55:10
46,21311	0,002911	0:55:20	45,01591	5,45E+00	0:55:20
46,07928	0,003882	0:55:30	45,0557	5,48E+00	0:55:30
45,97801	0,003882	0:55:40	45,0774	5,46E+00	0:55:40
45,88035	0,002911	0:55:50	45,08825	5,45E+00	0:55:50
45,80078	0,002911	0:56:00	45,1208	5,45E+00	0:56:00
45,72121	0,002911	0:56:10	45,15697	5,46E+00	0:56:10
45,65249	0	0:56:20	45,18229	5,45E+00	0:56:20
45,58377	0	0:56:30	45,20037	5,43E+00	0:56:30
45,48611	0	0:56:40	45,21484	5,45E+00	0:56:40
45,42101	0	0:56:50	45,24016	5,46E+00	0:56:50
45,36675	0	0:57:00	45,26548	5,45E+00	0:57:00
45,32335	0	0:57:10	45,30527	5,46E+00	0:57:10
45,24739	0	0:57:20	45,30888	5,44E+00	0:57:20
45,19676	6,746631	0:57:30	45,34143	5,45E+00	0:57:30
45,65611	5,500561	0:57:40	45,38484	5,45E+00	0:57:40

45,88397	5,486975	0:57:50	45,38122	5,45E+00	0:57:50
45,99609	5,492798	0:58:00	45,42824	5,45E+00	0:58:00
46,04673	5,4763	0:58:10	45,41377	2,91E-03	0:58:10
46,11907	5,507355	0:58:20	45,3125	2,91E-03	0:58:20
46,15162	5,492798	0:58:30	45,19676	2,91E-03	0:58:30
46,18055	5,481152	0:58:40	45,11357	0,00E+00	0:58:40
46,21311	5,469507	0:58:50	45,01591	0,00E+00	0:58:50
46,25289	5,482123	0:59:00	44,94358	0,00E+00	0:59:00
46,26736	5,503473	0:59:10	44,85315	0,00E+00	0:59:10
46,31438	5,495709	0:59:20	44,78082	0,00E+00	0:59:20
46,32523	5,475329	0:59:30	44,71571	0,00E+00	0:59:30
46,35778	5,486004	0:59:40	44,65422	0,00E+00	0:59:40
46,39757	5,4763	0:59:50	44,58189	0,00E+00	0:59:50
46,41565	5,480182	1:00:00	44,53487	0,00E+00	1:00:00
46,45906	5,467566	1:00:10	44,48061	0,00E+00	1:00:10
46,47714	5,488916	1:00:20	44,48061	0,00E+00	1:00:20
46,50246	5,488916	1:00:30	44,42274	0,00E+00	1:00:30
46,53863	5,469507	1:00:40	44,39019	0,00E+00	1:00:40
46,57118	5,448157	1:00:50	44,3287	0,00E+00	1:00:50
46,59288	5,481152	1:01:00	44,28892	0,00E+00	1:01:00
46,60735	5,495709	1:01:10	44,23466	0,00E+00	1:01:10
46,64713	5,468536	1:01:20	44,18041	0,00E+00	1:01:20
46,6616	5,494739	1:01:30	44,12616	0,00E+00	1:01:30
46,69415	5,487946	1:01:40	44,08275	0,00E+00	1:01:40
46,71585	5,485034	1:01:50	44,02127	0,00E+00	1:01:50
46,75564	5,460773	1:02:00	43,97063	0,00E+00	1:02:00
46,76649	5,49765	1:02:10	43,91999	0,00E+00	1:02:10
46,81351	5,473389	1:02:20	43,89106	0,00E+00	1:02:20
46,83883	5,480182	1:02:30	43,8368	0,00E+00	1:02:30
46,83883	0,002911	1:02:40	43,80425	0,00E+00	1:02:40
46,71947	0,002911	1:02:50	43,74638	0,00E+00	1:02:50
46,60373	0	1:03:00	43,71383	0,00E+00	1:03:00
46,47714	0	1:03:10	43,64511	0,00E+00	1:03:10
46,37949	0	1:03:20	43,63787	0,00E+00	1:03:20
46,28906	0	1:03:30	43,59085	0,00E+00	1:03:30
46,20949	0	1:03:40	43,55469	0,00E+00	1:03:40
46,11907	0	1:03:50	43,51128	0,00E+00	1:03:50
46,06482	0	1:04:00	43,47873	0,00E+00	1:04:00
46,02503	0	1:04:10	43,46065	0,00E+00	1:04:10
45,93822	0	1:04:20	43,40278	0,00E+00	1:04:20
45,83695	0	1:04:30	43,37384	0,00E+00	1:04:30
45,76099	0	1:04:40	43,35214	0,00E+00	1:04:40
45,67057	0	1:04:50	43,29789	0,00E+00	1:04:50
45,60185	0	1:05:00	43,26895	0,00E+00	1:05:00
45,52951	0	1:05:10	43,22555	0,00E+00	1:05:10
45,45356	0	1:05:20	43,20385	0,00E+00	1:05:20
45,41377	0	1:05:30	43,16768	0,00E+00	1:05:30
45,33059	0	1:05:40	43,14959	0,00E+00	1:05:40
45,27271	0	1:05:50	43,11343	0,00E+00	1:05:50
45,23293	0	1:06:00	43,07002	0,00E+00	1:06:00

45,18591	0	1:06:10	43,05917	0,00E+00	1:06:10
45,11357	0	1:06:20	43,023	0,00E+00	1:06:20
45,0557	0	1:06:30	42,9796	0,00E+00	1:06:30
45,02315	0	1:06:40	42,96152	0,00E+00	1:06:40
44,98336	0	1:06:50	42,93258	0,00E+00	1:06:50
44,92911	0,002911	1:07:00	42,90726	0,00E+00	1:07:00
45,34143	5,509295	1:07:10	42,86024	0,00E+00	1:07:10
45,86227	5,467566	1:07:20	42,84939	0,00E+00	1:07:20
46,06843	5,481152	1:07:30	42,81322	0,00E+00	1:07:30
46,17332	5,459802	1:07:40	42,77705	0,00E+00	1:07:40
46,24566	5,453979	1:07:50	42,76982	0,00E+00	1:07:50
46,30715	5,474359	1:08:00	42,73727	0,00E+00	1:08:00
46,36863	5,499591	1:08:10	42,71556	0,00E+00	1:08:10
46,40842	5,472418	1:08:20	42,6794	0,00E+00	1:08:20
46,44459	5,486975	1:08:30	42,66131	0,00E+00	1:08:30
46,48438	5,469507	1:08:40	42,63238	0,00E+00	1:08:40
46,48799	5,486975	1:08:50	42,59983	0,00E+00	1:08:50
46,53139	5,471447	1:09:00	42,58897	6,54E+00	1:09:00
46,54948	5,475329	1:09:10	43,58362	5,49E+00	1:09:10
46,58565	5,463684	1:09:20	44,02127	5,49E+00	1:09:20
46,61458	5,479211	1:09:30	44,22743	5,48E+00	1:09:30
46,63267	5,450098	1:09:40	44,33232	5,47E+00	1:09:40
46,65075	5,477271	1:09:50	44,41551	5,46E+00	1:09:50
46,69415	5,480182	1:10:00	44,4553	5,47E+00	1:10:00
46,70501	5,490857	1:10:10	44,51316	5,46E+00	1:10:10
46,73756	5,457861	1:10:20	44,56742	5,46E+00	1:10:20
46,76649	5,481152	1:10:30	44,5855	5,46E+00	1:10:30
46,80628	5,457861	1:10:40	44,62167	5,47E+00	1:10:40
46,8316	5,457861	1:10:50	44,65422	5,46E+00	1:10:50
46,84607	5,486975	1:11:00	44,69039	5,46E+00	1:11:00
46,86776	5,477271	1:11:10	44,70486	5,45E+00	1:11:10
46,87862	5,492798	1:11:20	44,73018	5,48E+00	1:11:20
46,92925	5,465625	1:11:30	44,75911	5,47E+00	1:11:30
46,95819	5,483093	1:11:40	44,78805	5,46E+00	1:11:40
46,98351	5,466595	1:11:50	44,83507	5,45E+00	1:11:50
47,01244	5,474359	1:12:00	44,85315	5,46E+00	1:12:00
47,02329	5,79267	1:12:10	44,87124	5,45E+00	1:12:10
46,9401	0,002911	1:12:20	44,88932	5,46E+00	1:12:20
46,82798	0,002911	1:12:30	44,92549	5,42E+00	1:12:30
46,71224	0,002911	1:12:40	44,93272	5,46E+00	1:12:40
46,62905	0,002911	1:12:50	44,96166	5,45E+00	1:12:50
46,53501	0,002911	1:13:00	44,99421	5,46E+00	1:13:00
46,45182	0	1:13:10	45,02315	5,45E+00	1:13:10
46,3614	0	1:13:20	45,0557	5,46E+00	1:13:20
46,28906	0	1:13:30	45,07017	5,44E+00	1:13:30
46,35055	0	1:13:40	45,10272	5,45E+00	1:13:40
46,29991	0	1:13:50	45,14251	5,44E+00	1:13:50
46,18779	0	1:14:00	45,14612	5,44E+00	1:14:00
46,06843	0	1:14:10	45,14251	2,91E-03	1:14:10
45,99609	0	1:14:20	45,05208	0,00E+00	1:14:20

45,90567	0	1:14:30	44,92188	0,00E+00	1:14:30
45,83695	0	1:14:40	44,83868	0,00E+00	1:14:40
45,77546	0	1:14:50	44,75188	0,00E+00	1:14:50
45,72121	0	1:15:00	44,66869	0,00E+00	1:15:00
45,65249	0	1:15:10	44,5855	0,00E+00	1:15:10
45,59462	0	1:15:20	44,51316	0,00E+00	1:15:20
45,53675	0	1:15:30	44,45168	0,00E+00	1:15:30
45,48249	0	1:15:40	44,37934	0,00E+00	1:15:40
45,41739	0	1:15:50	44,31785	0,00E+00	1:15:50
45,34505	0	1:16:00	44,27445	0,00E+00	1:16:00
45,32335	0	1:16:10	44,27806	0,00E+00	1:16:10
45,27633	0	1:16:20	44,22381	0,00E+00	1:16:20
45,22208	0	1:16:30	44,18041	0,00E+00	1:16:30
45,18229	0	1:16:40	44,13701	0,00E+00	1:16:40
45,14612	0	1:16:50	44,0719	0,00E+00	1:16:50
45,08825	0	1:17:00	43,9851	0,00E+00	1:17:00
45,05208	0	1:17:10	43,94531	0,00E+00	1:17:10
45,01953	0	1:17:20	43,89106	0,00E+00	1:17:20
44,96889	0	1:17:30	43,84042	0,00E+00	1:17:30
44,92549	0	1:17:40	43,77532	0,00E+00	1:17:40
44,88932	0	1:17:50	43,73553	0,00E+00	1:17:50
44,84954	0	1:18:00	43,68489	0,00E+00	1:18:00
44,81337	0	1:18:10	43,63787	0,00E+00	1:18:10
44,75911	0	1:18:20	43,59085	0,00E+00	1:18:20
44,72295	0	1:18:30	43,55469	0,00E+00	1:18:30
44,71209	0	1:18:40	43,52213	0,00E+00	1:18:40
44,66869	0	1:18:50	43,46788	0,00E+00	1:18:50
44,63614	0	1:19:00	43,44256	0,00E+00	1:19:00
44,59997	0	1:19:10	43,38469	0,00E+00	1:19:10
44,5638	0	1:19:20	43,35938	0,00E+00	1:19:20
44,52763	0	1:19:30	43,31236	0,00E+00	1:19:30
44,4987	0	1:19:40	43,27618	0,00E+00	1:19:40
44,4553	0	1:19:50	43,22916	0,00E+00	1:19:50
44,44444	0	1:20:00	43,20747	0,00E+00	1:20:00
44,39019	0	1:20:10	43,1713	0,00E+00	1:20:10
44,36849	0	1:20:20	43,11704	0,00E+00	1:20:20
44,33232	0	1:20:30	43,09896	0,00E+00	1:20:30
44,31062	0	1:20:40	43,06641	0,00E+00	1:20:40
44,28168	0	1:20:50	43,03385	0,00E+00	1:20:50
44,25637	0	1:21:00	43,01215	0,00E+00	1:21:00
44,22381	0	1:21:10	42,96152	0,00E+00	1:21:10
44,20211	0	1:21:20	42,9362	0,00E+00	1:21:20
44,16956	0	1:21:30	42,90364	0,00E+00	1:21:30
44,12977	0	1:21:40	42,86748	0,00E+00	1:21:40
44,10084	0	1:21:50	42,84939	0,00E+00	1:21:50
44,08275	0	1:22:00	42,8096	0,00E+00	1:22:00
44,04659	0	1:22:10	42,7879	0,00E+00	1:22:10
44,02127	0	1:22:20	42,76258	0,00E+00	1:22:20
43,99957	0	1:22:30	42,7228	0,00E+00	1:22:30
43,9634	0,002911	1:22:40	42,69025	0,00E+00	1:22:40

44,19126	5,664569	1:22:50	42,67216	0,00E+00	1:22:50
45,07378	5,443305	1:23:00	42,64323	0,00E+00	1:23:00
45,45356	5,472418	1:23:10	42,61429	0,00E+00	1:23:10
45,66695	5,503473	1:23:20	42,57451	0,00E+00	1:23:20
45,79355	5,465625	1:23:30	42,55281	0,00E+00	1:23:30
45,87312	5,45592	1:23:40	42,51664	0,00E+00	1:23:40
45,94546	5,459802	1:23:50	42,5094	0,00E+00	1:23:50
45,97801	5,474359	1:24:00	42,48047	0,00E+00	1:24:00
46,03588	5,484064	1:24:10	42,44791	0,00E+00	1:24:10
46,05035	5,479211	1:24:20	42,43345	0,00E+00	1:24:20
46,10822	5,45592	1:24:30	42,39005	0,00E+00	1:24:30
46,13715	5,470477	1:24:40	42,36111	0,00E+00	1:24:40
46,19141	5,465625	1:24:50	42,34664	0,00E+00	1:24:50
46,18779	5,469507	1:25:00	42,31047	0,00E+00	1:25:00
46,22396	5,477271	1:25:10	42,28877	0,00E+00	1:25:10
46,24566	5,443305	1:25:20	42,26707	0,00E+00	1:25:20
46,27098	5,453009	1:25:30	42,23452	0,00E+00	1:25:30
46,31438	5,451068	1:25:40	42,21643	0,00E+00	1:25:40
46,33608	5,447186	1:25:50	42,19112	0,00E+00	1:25:50
46,35416	5,478241	1:26:00	42,15495	0,00E+00	1:26:00
46,39395	5,45592	1:26:10	42,13686	0,00E+00	1:26:10
46,43012	5,470477	1:26:20	42,12239	0,00E+00	1:26:20
46,4482	5,461743	1:26:30	42,08984	0,00E+00	1:26:30
46,46267	5,435541	1:26:40	42,06814	0,00E+00	1:26:40
46,50608	5,452038	1:26:50	42,05367	0,00E+00	1:26:50
46,53863	5,457861	1:27:00	42,03197	0,00E+00	1:27:00
46,54948	5,456891	1:27:10	42,01751	0,00E+00	1:27:10
46,57841	5,465625	1:27:20	41,98133	0,00E+00	1:27:20
46,58926	5,43457	1:27:30	41,95602	0,00E+00	1:27:30
46,61097	5,457861	1:27:40	41,93793	0,00E+00	1:27:40
46,64713	5,39284	1:27:50	41,91262	0,00E+00	1:27:50
46,58565	0,002911	1:28:00	41,8873	0,00E+00	1:28:00
46,46267	0,002911	1:28:10	41,87283	0,00E+00	1:28:10
46,37587	0,002911	1:28:20	41,85474	0,00E+00	1:28:20
46,27821	0	1:28:30	41,83666	0,00E+00	1:28:30
46,17332	0	1:28:40	41,82219	0,00E+00	1:28:40
46,09013	0	1:28:50	41,80411	0,00E+00	1:28:50
45,99248	0	1:29:00	41,77879	0,00E+00	1:29:00
45,92014	0	1:29:10	41,75709	0,00E+00	1:29:10
45,71036	0	1:29:20	41,72454	0,00E+00	1:29:20
45,43186	0	1:29:30	41,6956	0,00E+00	1:29:30
45,21484	0	1:29:40	41,6739	0,00E+00	1:29:40
45,23293	0	1:29:50	41,65943	0,00E+00	1:29:50
45,19314	0	1:30:00	41,64135	0,00E+00	1:30:00
45,15697	0	1:30:10	41,61965	0,00E+00	1:30:10
45,10272	0	1:30:20	41,59795	0,00E+00	1:30:20
45,05208	0	1:30:30	41,58709	0,00E+00	1:30:30
45,00506	0	1:30:40	41,55816	0,00E+00	1:30:40
44,97974	0	1:30:50	41,54007	0,00E+00	1:30:50
44,92549	0	1:31:00	41,51114	0,00E+00	1:31:00

44,87486	0	1:31:10	41,49667	0,00E+00	1:31:10
44,87124	0	1:31:20	41,48582	0,00E+00	1:31:20
44,81699	0	1:31:30	41,44965	2,91E-03	1:31:30
44,75188	0	1:31:40	41,42072	2,91E-03	1:31:40
44,69763	0	1:31:50	41,40625	0,00E+00	1:31:50
44,65422	0	1:32:00	41,42434	0,00E+00	1:32:00
44,60359	0	1:32:10			
44,5421	0	1:32:20			
44,477	0	1:32:30			
44,43359	0	1:32:40			
44,3721	0	1:32:50			
44,32508	0	1:33:00			
44,28892	0	1:33:10			
44,25275	0	1:33:20			
44,18764	0	1:33:30			
44,16594	0	1:33:40			
44,10807	0	1:33:50			
44,0719	0	1:34:00			
44,02488	0	1:34:10			
44,00318	0	1:34:20			
43,94531	0	1:34:30			
43,90191	0	1:34:40			
43,89106	0	1:34:50			
43,84404	0	1:35:00			
43,78617	0	1:35:10			
43,7717	0	1:35:20			
43,73915	0	1:35:30			
43,70298	0	1:35:40			
43,66319	0	1:35:50			
43,61979	0	1:36:00			
43,58724	0	1:36:10			
43,56554	0	1:36:20			
43,52213	0	1:36:30			
43,4932	0	1:36:40			
43,45703	0	1:36:50			
43,42448	0	1:37:00			
43,39193	0	1:37:10			
43,37022	0	1:37:20			
43,33406	0	1:37:30			
43,3015	0	1:37:40			
43,26895	0	1:37:50			
43,25087	0	1:38:00			
43,20747	0	1:38:10			
43,18938	0	1:38:20			
43,15683	0	1:38:30			
43,12428	0	1:38:40			
43,10257	0	1:38:50			
43,07002	0	1:39:00			
43,05917	0	1:39:10			
43,00853	0	1:39:20			

43,00853	0	1:39:30
42,97237	0	1:39:40
42,94343	0	1:39:50
42,90003	0	1:40:00
42,88556	0	1:40:10
42,86024	0	1:40:20
42,84216	0	1:40:30
42,8096	0	1:40:40
42,78067	0	1:40:50
42,74088	0	1:41:00
42,7228	0	1:41:10
42,7011	0	1:41:20
42,68301	0	1:41:30
42,64685	0	1:41:40
42,63599	0	1:41:50
42,60706	0	1:42:00
42,58897	0	1:42:10
42,56004	0	1:42:20
42,52387	0	1:42:30
42,51664	0	1:42:40
42,48047	0	1:42:50
42,46238	0,002911	1:43:00
43,11343	5,486975	1:43:10
44,16233	5,506384	1:43:20
44,59635	5,462714	1:43:30
44,7989	5,465625	1:43:40
44,97613	5,477271	1:43:50
45,05208	5,479211	1:44:00
45,13889	5,528705	1:44:10
45,19314	5,441363	1:44:20
45,23293	5,469507	1:44:30
45,28718	5,545203	1:44:40
45,32335	5,464654	1:44:50
45,35952	5,506384	1:45:00
45,38484	5,474359	1:45:10
45,44994	5,447186	1:45:20
45,47164	5,459802	1:45:30
45,49334	5,477271	1:45:40
45,53675	5,474359	1:45:50
45,55483	5,442334	1:46:00
45,59824	5,453979	1:46:10
45,61993	5,466595	1:46:20
45,65249	5,482123	1:46:30
45,67057	5,505414	1:46:40
45,70313	5,471447	1:46:50
45,75376	5,470477	1:47:00
45,76461	5,470477	1:47:10
45,80801	5,438452	1:47:20
45,8261	5,453009	1:47:30
45,85503	5,464654	1:47:40

45,88758	5,453979	1:47:50
45,92014	5,482123	1:48:00
45,93822	5,722796	1:48:10
45,85142	0,002911	1:48:20
45,72121	0,002911	1:48:30
45,6344	0	1:48:40
45,5259	0	1:48:50
45,43186	0	1:49:00
45,3559	0	1:49:10
45,27271	0	1:49:20
45,17867	0	1:49:30
45,09549	0	1:49:40
45,04123	0	1:49:50
44,96528	0	1:50:00
44,91102	0	1:50:10
44,83868	0	1:50:20
44,76635	0	1:50:30
44,71209	0	1:50:40
44,7989	0	1:50:50
44,83145	0	1:51:00
44,74103	0	1:51:10
44,67593	0	1:51:20
44,60359	0	1:51:30
44,5421	0	1:51:40
44,48785	0	1:51:50
44,43359	0	1:52:00
44,3721	0	1:52:10
44,33232	0	1:52:20
44,27806	0	1:52:30
44,22743	0	1:52:40
44,16956	0	1:52:50
44,13339	0	1:53:00
44,08275	0	1:53:10
44,0285	0	1:53:20
43,98872	0	1:53:30
43,95616	0	1:53:40
43,89468	0	1:53:50
43,84766	0	1:54:00
43,80064	0	1:54:10
43,75723	0	1:54:20
43,73191	0	1:54:30
43,67766	0	1:54:40
43,63787	0	1:54:50
43,61256	0	1:55:00
43,56915	0	1:55:10
43,5149	0	1:55:20
43,48235	0	1:55:30
43,43171	0	1:55:40
43,38831	0	1:55:50
43,35214	0	1:56:00

43,29789	0	1:56:10
43,27618	0	1:56:20
43,23278	0	1:56:30
43,19661	0	1:56:40
43,16045	0	1:56:50
43,11343	0	1:57:00
43,09896	0	1:57:10
43,05194	0	1:57:20
43,00492	0	1:57:30
42,97598	0	1:57:40
42,93982	0	1:57:50
42,89641	0	1:58:00
42,87833	0	1:58:10
42,82407	0	1:58:20
42,79514	0	1:58:30
42,76982	0	1:58:40

B 1100rpm

Temperature	Ampere	Time
44,7989	0,002911	0:00:00
45,61993	0,003882	0:00:10
45,81887	0,002911	0:00:20
45,85503	10,381	0:00:30
45,15697	5,311322	0:00:40
44,87124	5,618958	0:00:50
44,75188	5,41322	0:01:00
44,69039	5,509295	0:01:10
44,66146	5,438452	0:01:20
44,68678	5,418072	0:01:30
44,70848	5,447186	0:01:40
44,71209	5,429718	0:01:50
44,72656	5,373431	0:02:00
44,76635	5,368579	0:02:10
44,7989	5,373431	0:02:20
44,81699	5,388958	0:02:30
44,83507	5,448157	0:02:40
44,87124	5,369549	0:02:50
44,89294	5,402545	0:03:00
44,92911	5,238537	0:03:10
44,89294	0	0:03:20
44,7989	0	0:03:30
44,72656	0	0:03:40
44,65061	0	0:03:50
44,59997	0	0:04:00
44,52763	9,845306	0:04:10
44,7338	5,443305	0:04:20
44,79528	5,388958	0:04:30
44,83868	5,388958	0:04:40
44,84954	5,374402	0:04:50
44,88932	5,463684	0:05:00
44,94358	5,387018	0:05:10
44,95081	5,404486	0:05:20
44,99783	5,45592	0:05:30
45,03762	5,396722	0:05:40
45,07017	5,419043	0:05:50
45,12804	5,498621	0:06:00
45,16421	5,487946	0:06:10
45,21123	5,571405	0:06:20
45,26548	5,507355	0:06:30
45,30527	5,493768	0:06:40
45,34505	5,60343	0:06:50
45,36314	6,788361	0:07:00
45,28357	0	0:07:10
45,20399	0	0:07:20
45,13889	0	0:07:30
45,0557	5,989673	0:07:40

B 80RH

Temperature	Ampere	Time
45,77546	0,002911	4:31:00
45,71759	0,002911	4:31:10
45,58015	0,003882	4:31:20
45,45356	0,002911	4:31:30
45,34505	0,002911	4:31:40
45,25101	0,002911	4:31:50
45,14612	0,002911	4:32:00
45,07017	0,002911	4:32:10
44,95804	0,003882	4:32:20
44,84954	0,003882	4:32:30
44,76635	0,002911	4:32:40
44,54572	0	4:32:50
44,40104	0	4:33:00
43,9851	0	4:33:10
43,59447	0	4:33:20
43,46426	0,002911	4:33:30
43,33406	0,002911	4:33:40
43,24363	0,002911	4:33:50
43,14236	0,002911	4:34:00
43,05194	0,003882	4:34:10
42,96152	0,003882	4:34:20
42,87833	0,003882	4:34:30
42,66855	0,002911	4:34:40
43,78617	0,002911	4:34:50
44,20573	0,002911	4:35:00
44,39019	0,002911	4:35:10
44,51316	0,002911	4:35:20
44,42274	5,388958	4:35:30
44,29253	5,32879	4:35:40
44,25998	5,306469	4:35:50
44,22743	5,313263	4:36:00
44,20935	5,346259	4:36:10
44,20935	5,323938	4:36:20
44,20935	5,308411	4:36:30
44,20211	5,284149	4:36:40
44,20211	5,309381	4:36:50
44,2202	5,360816	4:37:00
44,20935	5,302588	4:37:10
44,20935	5,375372	4:37:20
44,21658	5,380225	4:37:30
44,23466	5,362756	4:37:40
44,23828	5,302588	4:37:50
44,22381	0,003882	4:38:00
44,17318	0	4:38:10
44,08275	0	4:38:20
44,04297	0	4:38:30
43,98148	0	4:38:40

45,20399	5,613135	0:07:50	43,91276	0	4:38:50
45,30527	5,489886	0:08:00	43,95255	5,81596	4:39:00
45,38484	5,425836	0:08:10	44,03935	5,317145	4:39:10
45,42101	5,415161	0:08:20	44,07552	5,30744	4:39:20
45,43186	5,550055	0:08:30	44,07552	5,32782	4:39:30
45,47164	5,62478	0:08:40	44,0719	5,300647	4:39:40
45,56207	5,453979	0:08:50	44,0719	5,275415	4:39:50
45,61632	5,462714	0:09:00	44,08275	5,313263	4:40:00
45,68866	5,356934	0:09:10	44,07552	5,315204	4:40:10
45,69951	5,511237	0:09:20	44,08275	5,296765	4:40:20
45,76099	5,400604	0:09:30	44,09722	5,319086	4:40:30
45,81887	5,397693	0:09:40	44,09722	5,308411	4:40:40
45,86588	5,437481	0:09:50	44,09361	5,299676	4:40:50
45,93822	5,596637	0:10:00	44,09722	5,294824	4:41:00
45,95631	5,453009	0:10:10	44,10084	5,321026	4:41:10
45,90205	0	0:10:20	44,08999	5,319086	4:41:20
45,76099	0	0:10:30	44,10807	5,367609	4:41:30
45,66695	0	0:10:40	44,11531	5,294824	4:41:40
45,57653	0	0:10:50	44,08275	0	4:41:50
45,48611	0	0:11:00	44,00318	0	4:42:00
45,41377	5,98385	0:11:10	43,90191	0	4:42:10
45,64887	5,591784	0:11:20	43,81872	0	4:42:20
45,85503	5,456891	0:11:30	43,76809	0	4:42:30
45,94184	5,589844	0:11:40	43,84766	5,488916	4:42:40
46,02864	5,509295	0:11:50	43,9634	5,333642	4:42:50
46,10822	5,505414	0:12:00	43,99233	5,37149	4:43:00
46,14439	5,629632	0:12:10	43,9851	5,341406	4:43:10
46,24204	5,558789	0:12:20	44,01765	5,348199	4:43:20
46,28906	5,500561	0:12:30	44,01765	5,362756	4:43:30
46,37949	5,4763	0:12:40	44,02127	5,335583	4:43:40
46,45182	5,533557	0:12:50	44,05382	5,398663	4:43:50
46,48799	5,578198	0:13:00	44,06105	5,368579	4:44:00
46,56756	5,562671	0:13:10	44,07552	5,34917	4:44:10
46,62905	5,529675	0:13:20	44,07552	5,410309	4:44:20
46,69777	5,565582	0:13:30	44,10807	5,422925	4:44:30
46,75926	5,472418	0:13:40	44,11892	5,387988	4:44:40
46,82075	5,488916	0:13:50	44,12616	5,415161	4:44:50
46,8967	5,519	0:14:00	44,15509	5,462714	4:45:00
46,90032	0	0:14:10	44,16233	5,446216	4:45:10
46,72309	0	0:14:20	44,13339	0,002911	4:45:20
46,60735	0	0:14:30	44,04297	0	4:45:30
46,48076	0	0:14:40	43,95616	0	4:45:40
46,41204	0	0:14:50	43,88021	0	4:45:50
46,318	0	0:15:00	43,78617	0	4:46:00
46,21672	0	0:15:10	43,73191	0	4:46:10
46,14439	0	0:15:20	43,66681	0	4:46:20
46,05035	0	0:15:30	43,60894	0	4:46:30
45,98162	0	0:15:40	43,64149	5,707269	4:46:40
45,92737	0	0:15:50	43,91276	5,55976	4:46:50
45,86227	0	0:16:00	44,01041	5,618958	4:47:00

45,78993	0	0:16:10	44,04297	5,679126	4:47:10
45,71759	0	0:16:20	44,07552	5,459802	4:47:20
45,64887	0	0:16:30	44,07914	5,488916	4:47:30
45,55845	0	0:16:40	44,09361	5,58305	4:47:40
45,5259	0	0:16:50	44,12977	5,544232	4:47:50
45,46803	0	0:17:00	44,15509	5,478241	4:48:00
45,41377	0	0:17:10	44,14424	5,504443	4:48:10
45,36314	0,002911	0:17:20	44,17318	5,440393	4:48:20
45,68866	5,70921	0:17:30	44,18403	5,439423	4:48:30
46,10098	5,587903	0:17:40	44,23828	5,450098	4:48:40
46,32161	5,58111	0:17:50	44,27083	5,423895	4:48:50
46,43012	5,569464	0:18:00	44,2419	5,544232	4:49:00
46,53863	5,55976	0:18:10	44,27083	5,530646	4:49:10
46,62181	5,562671	0:18:20	44,31424	5,387988	4:49:20
46,6833	5,494739	0:18:30	44,29977	0	4:49:30
46,76649	5,585962	0:18:40	44,23466	0	4:49:40
46,8316	5,546173	0:18:50	44,14786	0	4:49:50
46,8967	5,49668	0:19:00	44,0719	0	4:50:00
46,96904	5,551996	0:19:10	43,9851	0	4:50:10
47,01968	5,477271	0:19:20	43,90191	0	4:50:20
47,0667	5,543262	0:19:30	43,84766	0	4:50:30
47,14627	5,511237	0:19:40	43,78617	0	4:50:40
47,20414	5,527734	0:19:50	43,71745	0	4:50:50
47,27286	5,552966	0:20:00	43,71021	0	4:51:00
47,33435	5,520941	0:20:10	43,67766	0	4:51:10
47,37413	5,493768	0:20:20	43,62703	0	4:51:20
47,45732	5,54035	0:20:30	43,59085	0	4:51:30
47,50072	5,504443	0:20:40	43,55469	0	4:51:40
47,55498	5,542291	0:20:50	43,50043	0	4:51:50
47,62732	5,533557	0:21:00	43,44618	0,002911	4:52:00
47,67795	5,468536	0:21:10	43,49681	5,509295	4:52:10
47,72497	5,505414	0:21:20	43,84042	5,552966	4:52:20
47,79731	5,528705	0:21:30	43,94893	5,55976	4:52:30
47,85156	5,534527	0:21:40	44,07552	5,432629	4:52:40
47,9239	5,477271	0:21:50	44,12977	5,487946	4:52:50
47,98177	5,514148	0:22:00	44,10084	5,566553	4:53:00
48,02156	5,473389	0:22:10	44,18403	5,49668	4:53:10
48,07219	5,453009	0:22:20	44,2202	5,483093	4:53:20
48,13006	5,39284	0:22:30	44,29253	5,609253	4:53:30
48,09751	0,002911	0:22:40	44,33232	5,593726	4:53:40
47,97092	0	0:22:50	44,36487	5,511237	4:53:50
47,83709	0	0:23:00	44,40104	5,487946	4:54:00
47,7105	0	0:23:10	44,43721	5,521912	4:54:10
47,60561	0	0:23:20	44,46976	5,53938	4:54:20
47,50072	0	0:23:30	44,52402	5,528705	4:54:30
47,41753	0	0:23:40	44,55295	5,605371	4:54:40
47,31988	0	0:23:50	44,59635	5,586932	4:54:50
47,24392	0	0:24:00	44,62529	5,534527	4:55:00
47,1752	0	0:24:10	44,67593	5,568493	4:55:10
47,09563	0	0:24:20	44,72656	5,622839	4:55:20

47,02691	0	0:24:30	44,75911	5,537439	4:55:30
46,95819	0	0:24:40	44,79528	5,548114	4:55:40
46,89309	0	0:24:50	44,85677	5,551025	4:55:50
46,83883	0	0:25:00	44,89294	5,521912	4:56:00
46,77373	0	0:25:10	44,91464	5,533557	4:56:10
46,69777	0	0:25:20	44,95804	5,535498	4:56:20
46,67607	0	0:25:30	45,0123	5,563641	4:56:30
46,60735	0	0:25:40	45,02315	5,527734	4:56:40
46,57841	0,002911	0:25:50	45,10272	5,555878	4:56:50
46,80628	5,552966	0:26:00	45,1208	5,541321	4:57:00
47,27647	5,515118	0:26:10	45,16059	5,462714	4:57:10
47,45732	5,525794	0:26:20	45,10633	0,002911	4:57:20
47,57306	5,504443	0:26:30	44,99421	0,002911	4:57:30
47,63816	5,514148	0:26:40	44,8857	0,002911	4:57:40
47,71774	5,551025	0:26:50	44,78805	0	4:57:50
47,78646	5,525794	0:27:00	44,69763	0	4:58:00
47,83709	5,542291	0:27:10	44,63614	0	4:58:10
47,88773	5,498621	0:27:20	44,56018	0	4:58:20
47,94922	5,516089	0:27:30	44,47338	0	4:58:30
47,98539	5,507355	0:27:40	44,42274	0	4:58:40
48,06134	5,486975	0:27:50	44,34317	0	4:58:50
48,12645	5,473389	0:28:00	44,31424	0	4:59:00
48,14091	5,4763	0:28:10	44,27806	0	4:59:10
48,21325	5,499591	0:28:20	44,19849	0	4:59:20
48,27112	5,487946	0:28:30	44,15147	0	4:59:30
48,32176	5,486975	0:28:40	44,09722	0	4:59:40
48,37601	5,459802	0:28:50	44,03935	0	4:59:50
48,41218	5,460773	0:29:00	43,98872	5,398663	5:00:00
48,45559	5,478241	0:29:10	44,25637	5,567523	5:00:10
48,50984	5,463684	0:29:20	44,5421	5,513177	5:00:20
48,57494	5,439423	0:29:30	44,71209	5,558789	5:00:30
48,61834	5,451068	0:29:40	44,78443	5,51997	5:00:40
48,69068	5,478241	0:29:50	44,8423	5,545203	5:00:50
48,7377	5,469507	0:30:00	44,89656	5,498621	5:01:00
48,78472	5,478241	0:30:10	44,94719	5,492798	5:01:10
48,81366	5,505414	0:30:20	44,97974	5,524823	5:01:20
48,88961	5,501532	0:30:30	45,00145	5,504443	5:01:30
48,92216	5,460773	0:30:40	45,05208	5,544232	5:01:40
48,96556	5,467566	0:30:50	45,08463	5,505414	5:01:50
48,99812	5,351111	0:31:00	45,12804	5,501532	5:02:00
48,99088	0,002911	0:31:10	45,16059	5,527734	5:02:10
48,86791	0	0:31:20	45,19676	5,526764	5:02:20
48,7377	0	0:31:30	45,23655	5,535498	5:02:30
48,62196	0	0:31:40	45,25825	5,516089	5:02:40
48,5243	0	0:31:50	45,28718	5,498621	5:02:50
48,42303	0	0:32:00	45,32697	5,498621	5:03:00
48,30729	0	0:32:10	45,37399	5,523852	5:03:10
48,23857	0	0:32:20	45,3993	5,534527	5:03:20
48,159	0	0:32:30	45,41377	5,506384	5:03:30
48,09028	0	0:32:40	45,45718	5,502502	5:03:40

48,00709	0	0:32:50	45,48611	5,508325	5:03:50
47,93475	0	0:33:00	45,53675	5,494739	5:04:00
47,85518	0	0:33:10	45,5476	5,511237	5:04:10
47,79007	0	0:33:20	45,591	5,490857	5:04:20
47,71774	0	0:33:30	45,6127	5,510266	5:04:30
47,63455	0	0:33:40	45,65611	5,486975	5:04:40
47,5803	0	0:33:50	45,68142	5,512207	5:04:50
47,51881	0	0:34:00	45,71759	5,488916	5:05:00
47,45732	0	0:34:10	45,73568	6,543805	5:05:10
47,4103	0	0:34:20	45,64525	0	5:05:20
47,37051	0	0:34:30	45,54036	0	5:05:30
47,29456	0	0:34:40	45,43909	0	5:05:40
47,24754	0	0:34:50	45,32697	0	5:05:50
47,20414	0	0:35:00	45,24739	0	5:06:00
47,14988	0	0:35:10	45,19314	0	5:06:10
47,09563	0	0:35:20	45,09187	0	5:06:20
47,0667	0	0:35:30	45,034	0	5:06:30
46,99074	0	0:35:40	44,96528	0	5:06:40
46,9401	0	0:35:50	44,90379	0	5:06:50
46,8967	0,002911	0:36:00	44,84954	0	5:07:00
46,9184	6,157562	0:36:10	44,81699	0	5:07:10
47,6888	5,480182	0:36:20	44,74826	0	5:07:20
47,98177	5,480182	0:36:30	44,67593	0	5:07:30
48,13006	5,486004	0:36:40	44,63976	6,340979	5:07:40
48,22049	5,503473	0:36:50	45,14251	5,488916	5:07:50
48,31091	5,462714	0:37:00	45,30165	5,520941	5:08:00
48,36155	5,500561	0:37:10	45,40292	5,49668	5:08:10
48,41218	5,4763	0:37:20	45,47164	5,482123	5:08:20
48,49175	5,49765	0:37:30	45,50781	5,504443	5:08:30
48,53877	5,467566	0:37:40	45,56207	5,500561	5:08:40
48,56409	5,512207	0:37:50	45,591	5,478241	5:08:50
48,62196	5,484064	0:38:00	45,6127	5,486004	5:09:00
48,66898	5,486004	0:38:10	45,64887	5,500561	5:09:10
48,71962	5,466595	0:38:20	45,68504	5,478241	5:09:20
48,78111	5,466595	0:38:30	45,69951	5,478241	5:09:30
48,79919	5,486004	0:38:40	45,71036	5,483093	5:09:40
48,86429	5,477271	0:38:50	45,75376	5,485034	5:09:50
48,89323	5,448157	0:39:00	45,7827	5,481152	5:10:00
48,9294	5,4763	0:39:10	45,81525	5,478241	5:10:10
48,99088	5,484064	0:39:20	45,83695	5,482123	5:10:20
49,01982	5,470477	0:39:30	45,85142	5,470477	5:10:30
49,07046	5,502502	0:39:40	45,90205	5,473389	5:10:40
49,10662	5,49668	0:39:50	45,92014	5,479211	5:10:50
49,15364	5,451068	0:40:00	45,93822	5,464654	5:11:00
49,19343	5,473389	0:40:10	45,97439	5,474359	5:11:10
49,25492	5,458832	0:40:20	46,01056	5,456891	5:11:20
49,28747	5,458832	0:40:30	46,03588	5,460773	5:11:30
49,35257	5,487946	0:40:40	46,06482	5,473389	5:11:40
49,38874	5,488916	0:40:50	46,07205	5,452038	5:11:50
49,43215	5,479211	0:41:00	46,10822	5,464654	5:12:00

49,46832	5,464654	0:41:10	46,14439	5,458832	5:12:10
49,51895	6,27887	0:41:20	46,15885	5,448157	5:12:20
49,41768	0,003882	0:41:30	46,18055	5,45495	5:12:30
49,273	0	0:41:40	46,23481	5,474359	5:12:40
49,16088	0	0:41:50	46,19864	0	5:12:50
49,05237	0	0:42:00	46,0829	0	5:13:00
48,94748	0	0:42:10	45,97439	0	5:13:10
48,84983	0	0:42:20	45,87312	0	5:13:20
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50,05064	0	1:25:40	46,58565	0	5:56:40
49,97468	0	1:25:50	46,53139	0	5:56:50
49,90596	0	1:26:00	46,4482	0	5:57:00
49,82639	0	1:26:10	46,37587	0	5:57:10
49,75043	0	1:26:20	46,30715	0	5:57:20
49,68895	0	1:26:30	46,23119	0	5:57:30
49,61661	0	1:26:40	46,19141	0	5:57:40
49,55512	0	1:26:50	46,11545	0	5:57:50
49,48278	0	1:27:00	46,06482	0	5:58:00
49,42853	0	1:27:10	46,05035	0	5:58:10
49,36343	0	1:27:20	46,01056	0	5:58:20
49,29832	0	1:27:30	45,95992	0	5:58:30
49,23684	0	1:27:40	45,8912	0	5:58:40
49,19343	0	1:27:50	45,85142	0	5:58:50
49,14641	0	1:28:00	45,7827	0	5:59:00
49,07407	0	1:28:10	45,73568	0	5:59:10
49,03067	0	1:28:20	45,67419	0	5:59:20
48,96556	0	1:28:30	45,61993	0	5:59:30
48,91854	0	1:28:40	45,57291	0	5:59:40
48,87153	0	1:28:50	45,52951	0	5:59:50
48,84983	0	1:29:00	45,47526	0	6:00:00
48,78472	0	1:29:10	45,41016	0	6:00:10
48,7377	0	1:29:20	45,38122	0	6:00:20
48,6943	0	1:29:30	45,30888	0	6:00:30
48,6509	0	1:29:40	45,27271	0	6:00:40
48,57856	0	1:29:50	45,23293	0	6:00:50
48,54962	0	1:30:00	45,18229	0	6:01:00
48,49537	0	1:30:10	45,13165	0	6:01:10
48,45559	0	1:30:20	45,07017	0	6:01:20
48,40495	0	1:30:30	45,05208	0	6:01:30
48,36878	0	1:30:40	45,0123	0	6:01:40
48,32176	0	1:30:50	44,95081	0	6:01:50
48,29644	0	1:31:00	44,90741	0	6:02:00

48,25304	0	1:31:10	44,86762	0	6:02:10
48,20602	0	1:31:20	44,83507	0	6:02:20
48,16262	0	1:31:30	44,78443	0	6:02:30
48,1156	0	1:31:40	44,76997	0	6:02:40
48,08666	0	1:31:50	44,70848	0	6:02:50
			44,67593	0	6:03:00
			44,62529	0	6:03:10
			44,58912	5,513177	6:03:20
			45,25101	5,450098	6:03:30
			45,92014	5,439423	6:03:40
			46,19864	5,456891	6:03:50
			46,35416	5,453979	6:04:00
			46,44459	5,437481	6:04:10
			46,50608	5,457861	6:04:20
			46,53863	5,423895	6:04:30
			46,58565	5,444275	6:04:40
			46,64352	5,452038	6:04:50
			46,65799	5,436511	6:05:00
			46,67969	5,432629	6:05:10
			46,70501	5,435541	6:05:20
			46,74117	5,437481	6:05:30
			46,78458	5,431659	6:05:40
			46,79543	5,431659	6:05:50
			46,83883	5,441363	6:06:00
			46,84245	5,438452	6:06:10
			46,88585	5,443305	6:06:20
			46,91478	5,442334	6:06:30
			46,95095	5,419043	6:06:40
			46,96542	5,420013	6:06:50
			46,98351	5,431659	6:07:00
			47,00521	5,436511	6:07:10
			47,01968	5,41225	6:07:20
			47,04861	5,420984	6:07:30
			47,09563	5,427777	6:07:40
			47,09925	5,421954	6:07:50
			47,12818	5,422925	6:08:00
			47,16797	5,452038	6:08:10
			47,18243	5,441363	6:08:20
			47,21137	6,553509	6:08:30
			47,10286	0,002911	6:08:40
			46,97627	0,002911	6:08:50
			46,86053	0,002911	6:09:00
			46,77011	0,002911	6:09:10
			46,67969	0,002911	6:09:20
			46,59288	0	6:09:30
			46,53139	0	6:09:40
			46,44459	0	6:09:50
			46,3614	0	6:10:00
			46,29991	0	6:10:10
			46,23119	0	6:10:20

46,15885	0	6:10:30
46,09737	0	6:10:40
46,05396	0	6:10:50
45,93822	0	6:11:00
45,88758	0	6:11:10
45,81163	0	6:11:20
45,75738	0	6:11:30
45,68866	0	6:11:40
45,6127	0	6:11:50
45,55845	0	6:12:00
45,50058	0	6:12:10
45,43909	0	6:12:20
45,38122	0	6:12:30
45,33059	0	6:12:40
45,2691	0	6:12:50
45,20037	0	6:13:00
45,15697	0	6:13:10
45,10633	0	6:13:20
45,05931	0	6:13:30
45,00506	0	6:13:40
44,96889	0	6:13:50
44,92549	0	6:14:00
44,86039	0	6:14:10
44,8423	0	6:14:20
44,78805	0	6:14:30
44,76635	0	6:14:40
44,72295	0	6:14:50
44,67593	0	6:15:00
44,63252	0	6:15:10
44,59997	0	6:15:20
44,54934	0	6:15:30
44,52402	0	6:15:40
44,48061	0	6:15:50
44,44083	0	6:16:00
44,42274	0	6:16:10
44,36849	0	6:16:20
44,3504	0	6:16:30
44,31424	0	6:16:40
44,28892	6,926166	6:16:50
45,20037	5,420984	6:17:00
45,73568	5,420984	6:17:10
45,98886	5,417102	6:17:20
46,11907	5,423895	6:17:30
46,21672	5,432629	6:17:40
46,28545	5,414191	6:17:50
46,3397	5,429718	6:18:00
46,3614	5,423895	6:18:10
46,40842	5,423895	6:18:20
46,4482	5,415161	6:18:30
46,48076	5,384106	6:18:40

46,50608	5,41322	6:18:50
46,52054	5,423895	6:19:00
46,57118	5,418072	6:19:10
46,59288	5,422925	6:19:20
46,60735	5,425836	6:19:30
46,62181	5,429718	6:19:40
46,65799	5,410309	6:19:50
46,67969	5,402545	6:20:00
46,69415	5,405457	6:20:10
46,71947	5,407397	6:20:20
46,74117	5,422925	6:20:30
46,75564	5,406427	6:20:40
46,80266	5,410309	6:20:50
46,8316	5,414191	6:21:00
46,86415	5,405457	6:21:10
46,86415	5,406427	6:21:20
46,89309	5,405457	6:21:30
46,91478	5,406427	6:21:40
46,9401	5,424866	6:21:50
46,92202	0,003882	6:22:00
46,82798	0,002911	6:22:10
46,67969	0	6:22:20
46,59288	0	6:22:30
46,49522	0	6:22:40
46,39395	0	6:22:50
46,31438	0	6:23:00
46,24204	0	6:23:10
46,14439	0	6:23:20
46,07205	0	6:23:30
45,99248	0	6:23:40
45,95269	0	6:23:50
45,88035	0	6:24:00
45,77908	0	6:24:10
45,69951	0	6:24:20
45,63079	0	6:24:30
45,55845	0	6:24:40
45,48249	0	6:24:50
45,41016	0	6:25:00
45,36675	0	6:25:10
45,29441	0	6:25:20
45,24016	0	6:25:30
45,17867	0	6:25:40
45,11357	0	6:25:50
45,04123	0	6:26:00
44,99421	0	6:26:10
44,95081	0	6:26:20
44,89294	0	6:26:30
44,83868	0	6:26:40
44,78082	0	6:26:50
44,76273	0	6:27:00

44,69401	0	6:27:10
44,65422	0	6:27:20
44,60359	0	6:27:30
44,57103	0	6:27:40
44,51678	0	6:27:50
44,48061	0	6:28:00
44,44444	0	6:28:10
44,40828	0	6:28:20
44,35402	0	6:28:30
44,31062	0	6:28:40
44,28892	0	6:28:50
44,25275	0	6:29:00
44,20935	0	6:29:10
44,18041	0	6:29:20
44,12616	0	6:29:30
44,11892	0	6:29:40
44,07552	0	6:29:50
44,03574	0	6:30:00
43,99957	0	6:30:10
43,97063	0	6:30:20
43,93084	0	6:30:30
43,89829	0	6:30:40
43,87297	0	6:30:50
43,84404	0	6:31:00
43,80064	0	6:31:10
43,7717	0	6:31:20
43,75362	0	6:31:30
43,69575	0	6:31:40
43,69213	0	6:31:50
43,66319	0	6:32:00
43,61979	0	6:32:10
43,60894	0	6:32:20
43,57277	0	6:32:30
43,55107	0	6:32:40
43,49681	0	6:32:50
43,48235	0	6:33:00
43,44618	0	6:33:10
43,26534	0	6:33:20
43,52937	0	6:33:30
43,07726	0	6:33:40
42,60706	0	6:33:50

A 80RH

Temperature	Ampere	Time
43,39554	3,88E-03	0:00:00
43,68489	2,91E-03	0:00:10
43,90191	1,06E+01	0:00:20
43,39554	5,33E+00	0:00:30
43,13874	5,52E+00	0:00:40
43,02662	5,38E+00	0:00:50
43,00853	5,35E+00	0:01:00
43,00492	5,38E+00	0:01:10
42,9796	5,29E+00	0:01:20
42,97237	5,34E+00	0:01:30
42,96152	5,34E+00	0:01:40
42,98684	5,30E+00	0:01:50
42,97237	5,37E+00	0:02:00
42,98684	5,34E+00	0:02:10
42,99768	5,33E+00	0:02:20
43,00492	5,32E+00	0:02:30
43,01215	5,36E+00	0:02:40
42,95428	0,00E+00	0:02:50
42,84939	0,00E+00	0:03:00
42,78067	0,00E+00	0:03:10
42,84578	5,43E+00	0:03:20
42,89641	5,32E+00	0:03:30
42,92173	5,29E+00	0:03:40
42,94343	5,36E+00	0:03:50
42,93982	5,30E+00	0:04:00
42,94343	5,30E+00	0:04:10
42,94343	5,30E+00	0:04:20
42,95066	5,28E+00	0:04:30
42,95428	5,30E+00	0:04:40
42,96875	5,32E+00	0:04:50
42,96875	5,30E+00	0:05:00
42,96875	5,32E+00	0:05:10
42,9796	5,29E+00	0:05:20
42,99045	5,35E+00	0:05:30
43,01577	5,30E+00	0:05:40
42,99768	5,27E+00	0:05:50
43,02662	5,34E+00	0:06:00
43,0447	5,32E+00	0:06:10
43,04832	6,64E+00	0:06:20
42,9579	9,70E-04	0:06:30
42,87109	0,00E+00	0:06:40
42,82407	0,00E+00	0:06:50
42,79152	0,00E+00	0:07:00
42,7228	9,29E+00	0:07:10
42,85301	5,32E+00	0:07:20
42,90726	5,32E+00	0:07:30
42,92535	5,39E+00	0:07:40

B 900rpm

Temperature	Ampere	Time
42,12601	0	0:16:20
42,05367	0	0:16:30
41,96687	0	0:16:40
41,91985	0	0:16:50
41,85113	0	0:17:00
41,79326	0	0:17:10
41,739	0	0:17:20
41,6956	0	0:17:30
41,63411	0	0:17:40
41,57624	0	0:17:50
41,54369	0	0:18:00
41,49667	0	0:18:10
41,4388	0	0:18:20
41,41348	0	0:18:30
41,35923	0	0:18:40
41,31221	0	0:18:50
41,29051	0	0:19:00
41,36646	5,764526	0:19:10
41,89091	5,387988	0:19:20
41,96325	0	0:19:30
41,85474	0	0:19:40
41,80411	0	0:19:50
41,74986	0,002911	0:20:00
41,77517	5,527734	0:20:10
42,03559	5,446216	0:20:20
42,21643	5,53938	0:20:30
42,31047	5,499591	0:20:40
42,38281	5,49765	0:20:50
42,46238	5,574317	0:21:00
42,52025	5,51803	0:21:10
42,57089	5,495709	0:21:20
42,61429	5,537439	0:21:30
42,69748	5,584021	0:21:40
42,76258	5,486975	0:21:50
42,79514	5,574317	0:22:00
42,85301	5,513177	0:22:10
42,89641	5,495709	0:22:20
42,95428	5,571405	0:22:30
43,01215	5,526764	0:22:40
43,06279	5,51803	0:22:50
43,10619	5,568493	0:23:00
43,1713	5,525794	0:23:10
43,22193	5,528705	0:23:20
43,26895	5,498621	0:23:30
43,33406	5,524823	0:23:40
43,37746	5,492798	0:23:50
43,4281	5,564612	0:24:00

42,9579	5,41E+00	0:07:50	43,47873	5,481152	0:24:10
42,96152	5,38E+00	0:08:00	43,50405	5,523852	0:24:20
42,97598	5,38E+00	0:08:10	43,58362	5,521912	0:24:30
42,98684	5,34E+00	0:08:20	43,62341	5,487946	0:24:40
43,01215	5,38E+00	0:08:30	43,67405	5,483093	0:24:50
43,00853	5,43E+00	0:08:40	43,7283	5,417102	0:25:00
43,05917	5,42E+00	0:08:50	43,67766	0,002911	0:25:10
43,04832	5,51E+00	0:09:00	43,56915	0,002911	0:25:20
43,05917	5,52E+00	0:09:10	43,43895	0,002911	0:25:30
43,07726	5,49E+00	0:09:20	43,33406	0,002911	0:25:40
43,07002	5,48E+00	0:09:30	43,24002	0,002911	0:25:50
43,04109	5,30E+00	0:09:40	43,1713	0,002911	0:26:00
42,96152	0,00E+00	0:09:50	43,08087	0,002911	0:26:10
42,90003	0,00E+00	0:10:00	43,00492	0,002911	0:26:20
42,82769	0,00E+00	0:10:10	42,95066	0,002911	0:26:30
42,75535	0,00E+00	0:10:20	42,87109	0	0:26:40
42,68301	0,00E+00	0:10:30	42,81684	0	0:26:50
42,61791	6,38E+00	0:10:40	42,75174	0	0:27:00
42,82769	5,35E+00	0:10:50	42,71556	0	0:27:10
42,86024	5,46E+00	0:11:00	42,65408	0	0:27:20
42,89641	5,43E+00	0:11:10	42,60706	0	0:27:30
42,95428	5,47E+00	0:11:20	42,57089	0	0:27:40
43,0447	5,44E+00	0:11:30	42,54557	0	0:27:50
43,08449	5,40E+00	0:11:40	42,50217	0	0:28:00
43,12428	5,39E+00	0:11:50	42,4443	0	0:28:10
43,13513	5,38E+00	0:12:00	42,40813	6,820385	0:28:20
43,13874	5,40E+00	0:12:10	42,92535	5,516089	0:28:30
43,19661	5,42E+00	0:12:20	43,1713	5,531616	0:28:40
43,24363	5,50E+00	0:12:30	43,30512	5,523852	0:28:50
43,22916	5,36E+00	0:12:40	43,39193	5,485034	0:29:00
43,25087	5,49E+00	0:12:50	43,45703	5,481152	0:29:10
43,26895	5,40E+00	0:13:00	43,53299	5,471447	0:29:20
43,29427	5,40E+00	0:13:10	43,56554	5,472418	0:29:30
43,33406	5,37E+00	0:13:20	43,63064	5,504443	0:29:40
43,34129	5,59E+00	0:13:30	43,68128	5,492798	0:29:50
43,3015	2,91E-03	0:13:40	43,73553	5,477271	0:30:00
43,193	0,00E+00	0:13:50	43,75723	5,483093	0:30:10
43,10619	0,00E+00	0:14:00	43,81872	5,486004	0:30:20
43,01577	0,00E+00	0:14:10	43,87297	5,484064	0:30:30
42,95428	0,00E+00	0:14:20	43,90191	5,517059	0:30:40
42,88918	0,00E+00	0:14:30	43,94531	5,485034	0:30:50
42,82769	0,00E+00	0:14:40	44,0068	5,478241	0:31:00
42,76982	0,00E+00	0:14:50	44,04659	5,477271	0:31:10
42,70472	0,00E+00	0:15:00	44,07914	5,463684	0:31:20
42,66855	0,00E+00	0:15:10	44,13339	5,486004	0:31:30
42,62876	0,00E+00	0:15:20	44,18764	5,493768	0:31:40
42,57813	0,00E+00	0:15:30	44,2202	5,483093	0:31:50
42,5094	0,00E+00	0:15:40	44,25637	5,481152	0:32:00
42,51664	0,00E+00	0:15:50	44,28168	5,466595	0:32:10
42,50579	0,00E+00	0:16:00	44,3287	5,438452	0:32:20

42,46238	0,00E+00	0:16:10	44,36849	5,474359	0:32:30
42,39728	0,00E+00	0:16:20	44,41551	5,471447	0:32:40
42,38281	0,00E+00	0:16:30	44,43721	5,479211	0:32:50
42,37196	0,00E+00	0:16:40	44,49146	5,487946	0:33:00
42,33941	0,00E+00	0:16:50	44,53125	5,479211	0:33:10
42,28877	0,00E+00	0:17:00	44,59635	5,481152	0:33:20
42,23814	0,00E+00	0:17:10	44,60359	0,240674	0:33:30
42,19835	2,91E-03	0:17:20	44,49146	0,002911	0:33:40
42,17303	6,11E+00	0:17:30	44,36849	0,002911	0:33:50
42,59621	5,47E+00	0:17:40	44,28168	0	0:34:00
42,80599	5,42E+00	0:17:50	44,18041	0	0:34:10
42,89641	5,50E+00	0:18:00	44,08999	0	0:34:20
42,9362	5,42E+00	0:18:10	44,01765	0	0:34:30
42,96875	5,44E+00	0:18:20	43,93084	0	0:34:40
43,00853	5,44E+00	0:18:30	43,86574	0	0:34:50
43,04109	5,41E+00	0:18:40	43,78255	0	0:35:00
43,08811	5,45E+00	0:18:50	43,73553	0	0:35:10
43,13513	5,51E+00	0:19:00	43,65958	0	0:35:20
43,20385	5,56E+00	0:19:10	43,60171	0	0:35:30
43,22193	5,45E+00	0:19:20	43,54745	0	0:35:40
43,26895	5,53E+00	0:19:30	43,55469	0	0:35:50
43,3015	5,61E+00	0:19:40	43,49681	0	0:36:00
43,34852	5,54E+00	0:19:50	43,46065	0	0:36:10
43,40639	5,53E+00	0:20:00	43,40639	0	0:36:20
43,44256	5,53E+00	0:20:10	43,33044	0	0:36:30
43,4932	5,56E+00	0:20:20	43,27618	0	0:36:40
43,5149	5,54E+00	0:20:30	43,22193	0	0:36:50
43,5583	5,52E+00	0:20:40	43,14959	0,002911	0:37:00
43,60171	5,50E+00	0:20:50	43,55107	5,509295	0:37:10
43,62341	5,55E+00	0:21:00	43,91638	5,462714	0:37:20
43,68489	5,57E+00	0:21:10	44,08999	5,458832	0:37:30
43,70298	5,49E+00	0:21:20	44,18764	5,473389	0:37:40
43,75	5,52E+00	0:21:30	44,22743	5,483093	0:37:50
43,80787	5,50E+00	0:21:40	44,307	5,453979	0:38:00
43,82595	5,52E+00	0:21:50	44,3287	5,457861	0:38:10
43,86574	5,50E+00	0:22:00	44,35402	5,458832	0:38:20
43,90914	5,50E+00	0:22:10	44,42274	5,437481	0:38:30
43,94893	5,49E+00	0:22:20	44,45168	5,468536	0:38:40
43,9851	5,51E+00	0:22:30	44,49146	5,471447	0:38:50
43,9634	2,91E-03	0:22:40	44,5638	5,460773	0:39:00
43,86574	2,91E-03	0:22:50	44,57827	5,451068	0:39:10
43,74638	0,00E+00	0:23:00	44,59997	5,447186	0:39:20
43,66681	0,00E+00	0:23:10	44,64337	5,456891	0:39:30
43,58724	0,00E+00	0:23:20	44,67954	5,464654	0:39:40
43,50405	0,00E+00	0:23:30	44,72295	5,451068	0:39:50
43,43171	0,00E+00	0:23:40	44,75911	5,458832	0:40:00
43,35938	0,00E+00	0:23:50	44,80613	5,447186	0:40:10
43,29789	0,00E+00	0:24:00	44,83868	5,436511	0:40:20
43,24002	0,00E+00	0:24:10	44,86762	5,446216	0:40:30
43,17491	0,00E+00	0:24:20	44,91102	5,45495	0:40:40

43,17491	0,00E+00	0:24:30	44,95081	5,43457	0:40:50
43,13513	0,00E+00	0:24:40	44,98698	5,452038	0:41:00
43,08087	0,00E+00	0:24:50	45,02315	5,444275	0:41:10
42,99407	0,00E+00	0:25:00	45,07017	5,448157	0:41:20
42,91811	0,00E+00	0:25:10	45,10272	5,424866	0:41:30
42,83131	0,00E+00	0:25:20	45,13165	5,446216	0:41:40
42,75535	0,00E+00	0:25:30	45,18591	5,43457	0:41:50
42,69025	0,00E+00	0:25:40	45,21846	5,45592	0:42:00
42,63238	0,00E+00	0:25:50	45,25101	5,363727	0:42:10
42,56366	0,00E+00	0:26:00	45,21123	0,002911	0:42:20
42,51664	2,91E-03	0:26:10	45,0774	0,002911	0:42:30
42,58897	5,97E+00	0:26:20	44,96528	0,003882	0:42:40
43,12428	5,51E+00	0:26:30	44,85677	0	0:42:50
43,33767	5,54E+00	0:26:40	44,75911	0	0:43:00
43,44618	5,50E+00	0:26:50	44,66146	0	0:43:10
43,52937	5,49E+00	0:27:00	44,56742	0	0:43:20
43,59085	5,50E+00	0:27:10	44,4987	0	0:43:30
43,62703	5,52E+00	0:27:20	44,42274	0	0:43:40
43,66319	5,47E+00	0:27:30	44,43359	0	0:43:50
43,69936	5,51E+00	0:27:40	44,39019	0	0:44:00
43,7283	5,50E+00	0:27:50	44,307	0	0:44:10
43,77532	5,48E+00	0:28:00	44,2419	0	0:44:20
43,78978	5,49E+00	0:28:10	44,16594	0	0:44:30
43,82957	5,52E+00	0:28:20	44,11531	0,002911	0:44:40
43,86574	5,48E+00	0:28:30	44,31424	5,507355	0:44:50
43,89829	5,48E+00	0:28:40	44,68678	5,449127	0:45:00
43,91999	5,51E+00	0:28:50	44,85315	5,468536	0:45:10
43,96701	5,50E+00	0:29:00	44,94358	5,4763	0:45:20
43,9851	5,48E+00	0:29:10	44,97613	5,453979	0:45:30
44,02127	5,49E+00	0:29:20	45,05208	5,464654	0:45:40
44,05382	5,49E+00	0:29:30	45,07378	5,420984	0:45:50
44,07552	5,49E+00	0:29:40	45,14251	5,459802	0:46:00
44,10084	5,48E+00	0:29:50	45,18229	5,446216	0:46:10
44,15147	5,47E+00	0:30:00	45,20037	5,420013	0:46:20
44,18041	5,47E+00	0:30:10	45,25463	5,447186	0:46:30
44,18764	5,46E+00	0:30:20	45,30527	5,439423	0:46:40
44,22381	5,47E+00	0:30:30	45,30888	5,437481	0:46:50
44,2419	5,46E+00	0:30:40	45,36314	5,45592	0:47:00
44,29253	5,47E+00	0:30:50	45,38484	5,451068	0:47:10
44,29253	5,48E+00	0:31:00	45,44994	5,43457	0:47:20
44,33232	5,46E+00	0:31:10	45,48249	5,467566	0:47:30
44,36849	5,49E+00	0:31:20	45,5042	5,451068	0:47:40
44,32508	3,88E-03	0:31:30	45,54036	5,428748	0:47:50
44,23466	3,88E-03	0:31:40	45,57653	5,440393	0:48:00
44,14424	2,91E-03	0:31:50	45,6127	5,444275	0:48:10
44,04659	2,91E-03	0:32:00	45,65611	5,427777	0:48:20
43,95616	0,00E+00	0:32:10	45,70674	5,435541	0:48:30
43,87659	0,00E+00	0:32:20	45,72844	5,442334	0:48:40
43,80425	0,00E+00	0:32:30	45,77185	5,435541	0:48:50
43,74638	0,00E+00	0:32:40	45,79716	5,439423	0:49:00

43,68489	0,00E+00	0:32:50	45,85142	5,428748	0:49:10
43,61256	0,00E+00	0:33:00	45,88035	5,440393	0:49:20
43,57277	0,00E+00	0:33:10	45,90205	5,432629	0:49:30
43,50405	0,00E+00	0:33:20	45,95269	5,43457	0:49:40
43,43895	0,00E+00	0:33:30	45,98162	5,335583	0:49:50
43,38831	0,00E+00	0:33:40	45,92737	0,002911	0:50:00
43,34852	0,00E+00	0:33:50	45,8261	0	0:50:10
43,29789	0,00E+00	0:34:00	45,68504	0	0:50:20
43,24725	0,00E+00	0:34:10	45,60185	0	0:50:30
43,18938	0,00E+00	0:34:20	45,49334	0	0:50:40
43,14236	0,00E+00	0:34:30	45,39569	0	0:50:50
43,09896	0,00E+00	0:34:40	45,3125	0	0:51:00
43,07002	0,00E+00	0:34:50	45,24016	0	0:51:10
43,03024	0,00E+00	0:35:00	45,16421	0	0:51:20
43,01577	0,00E+00	0:35:10	45,08825	0	0:51:30
42,97237	0,00E+00	0:35:20	45,03038	0	0:51:40
42,94343	0,00E+00	0:35:30	44,97974	0	0:51:50
42,90726	0,00E+00	0:35:40	44,89656	0	0:52:00
42,84578	0,00E+00	0:35:50	44,86039	0	0:52:10
42,82407	0,00E+00	0:36:00	44,8206	0	0:52:20
42,78067	0,00E+00	0:36:10	44,79528	0	0:52:30
42,7445	0,00E+00	0:36:20	44,7338	0	0:52:40
42,7011	7,90E+00	0:36:30	44,68678	0	0:52:50
43,24725	5,49E+00	0:36:40	44,60359	0,003882	0:53:00
43,52213	5,48E+00	0:36:50	44,55295	0,002911	0:53:10
43,66319	5,48E+00	0:37:00	44,48061	0,002911	0:53:20
43,73915	5,48E+00	0:37:10	44,47338	6,044989	0:53:30
43,7934	5,48E+00	0:37:20	45,08825	5,419043	0:53:40
43,8368	5,45E+00	0:37:30	45,3125	5,414191	0:53:50
43,86212	5,46E+00	0:37:40	45,44994	5,405457	0:54:00
43,90914	5,48E+00	0:37:50	45,51866	5,411279	0:54:10
43,92723	5,46E+00	0:38:00	45,57291	5,407397	0:54:20
43,9634	5,47E+00	0:38:10	45,60909	5,409338	0:54:30
44,00318	5,46E+00	0:38:20	45,65611	5,406427	0:54:40
44,03574	5,48E+00	0:38:30	45,71759	5,401575	0:54:50
44,05743	5,48E+00	0:38:40	45,74291	5,420984	0:55:00
44,09361	5,47E+00	0:38:50	45,77185	5,396722	0:55:10
44,11531	5,47E+00	0:39:00	45,80078	5,407397	0:55:20
44,13339	5,48E+00	0:39:10	45,85142	5,430688	0:55:30
44,15147	5,45E+00	0:39:20	45,88035	5,404486	0:55:40
44,18041	5,46E+00	0:39:30	45,91652	5,410309	0:55:50
44,2202	5,48E+00	0:39:40	45,9346	5,397693	0:56:00
44,25998	5,47E+00	0:39:50	45,97078	5,411279	0:56:10
44,2636	5,49E+00	0:40:00	45,99609	5,415161	0:56:20
44,29977	5,46E+00	0:40:10	46,02864	5,422925	0:56:30
44,31785	5,47E+00	0:40:20	46,07928	5,420013	0:56:40
44,34317	5,47E+00	0:40:30	46,13715	5,401575	0:56:50
44,37934	5,46E+00	0:40:40	46,14439	5,421954	0:57:00
44,39742	5,46E+00	0:40:50	46,15524	5,435541	0:57:10
44,42274	5,49E+00	0:41:00	46,19864	5,406427	0:57:20

44,45168	5,47E+00	0:41:10	46,21311	5,439423	0:57:30
44,49146	5,47E+00	0:41:20	46,26374	5,419043	0:57:40
44,51316	5,48E+00	0:41:30	46,28906	5,420013	0:57:50
44,52402	3,88E-03	0:41:40	46,33247	5,409338	0:58:00
44,40828	2,91E-03	0:41:50	46,35416	5,416131	0:58:10
44,33232	2,91E-03	0:42:00	46,38672	5,407397	0:58:20
44,23466	0,00E+00	0:42:10	46,44097	5,409338	0:58:30
44,15509	0,00E+00	0:42:20	46,42289	0,002911	0:58:40
44,07552	0,00E+00	0:42:30	46,32523	0,002911	0:58:50
43,99957	0,00E+00	0:42:40	46,19141	0,002911	0:59:00
43,92723	0,00E+00	0:42:50	46,09737	0,002911	0:59:10
43,87659	0,00E+00	0:43:00	45,97801	0,002911	0:59:20
43,80787	0,00E+00	0:43:10	45,88035	0	0:59:30
43,75	0,00E+00	0:43:20	45,77908	0	0:59:40
43,69575	0,00E+00	0:43:30	45,70674	0	0:59:50
43,63787	0,00E+00	0:43:40	45,62717	0	1:00:00
43,57639	0,00E+00	0:43:50	45,56207	0	1:00:10
43,51852	0,00E+00	0:44:00	45,47526	0	1:00:20
43,47873	0,00E+00	0:44:10	45,40292	0	1:00:30
43,41001	0,00E+00	0:44:20	45,34143	0	1:00:40
43,38469	0,00E+00	0:44:30	45,28718	0	1:00:50
43,3015	6,78E+00	0:44:40	45,22931	0	1:01:00
43,60532	5,51E+00	0:44:50	45,16421	0	1:01:10
43,91999	5,49E+00	0:45:00	45,13165	0	1:01:20
44,05382	5,49E+00	0:45:10	45,0557	0	1:01:30
44,14786	5,49E+00	0:45:20	45,14974	6,024609	1:01:40
44,19126	5,48E+00	0:45:30	45,69951	5,438452	1:01:50
44,22743	5,46E+00	0:45:40	45,89844	5,421954	1:02:00
44,27445	5,48E+00	0:45:50	46,02503	5,443305	1:02:10
44,29977	5,49E+00	0:46:00	46,07205	5,416131	1:02:20
44,33232	5,49E+00	0:46:10	46,13353	5,425836	1:02:30
44,36849	5,48E+00	0:46:20	46,1697	5,399634	1:02:40
44,38657	5,48E+00	0:46:30	46,21311	5,424866	1:02:50
44,42274	5,46E+00	0:46:40	46,25289	5,438452	1:03:00
44,4553	5,48E+00	0:46:50	46,29991	5,420984	1:03:10
44,47338	5,47E+00	0:47:00	46,30715	5,416131	1:03:20
44,49508	5,48E+00	0:47:10	46,35416	5,43457	1:03:30
44,52402	5,47E+00	0:47:20	46,38672	5,41225	1:03:40
44,56018	5,49E+00	0:47:30	46,40842	5,431659	1:03:50
44,58912	5,48E+00	0:47:40	46,4482	5,424866	1:04:00
44,6072	5,49E+00	0:47:50	46,48799	5,43457	1:04:10
44,63614	5,46E+00	0:48:00	46,53501	5,430688	1:04:20
44,67954	5,47E+00	0:48:10	46,5531	5,426806	1:04:30
44,69763	5,47E+00	0:48:20	46,57479	5,421954	1:04:40
44,73018	5,46E+00	0:48:30	46,60373	5,424866	1:04:50
44,76635	5,47E+00	0:48:40	46,6399	5,421954	1:05:00
44,79528	5,48E+00	0:48:50	46,65075	5,423895	1:05:10
44,80613	5,49E+00	0:49:00	46,71585	5,409338	1:05:20
44,84954	5,51E+00	0:49:10	46,73394	5,420984	1:05:30
44,88932	5,47E+00	0:49:20	46,75203	5,422925	1:05:40

44,88932	5,48E+00	0:49:30	46,78458	5,419043	1:05:50
44,93996	5,48E+00	0:49:40	46,8316	5,411279	1:06:00
44,96528	6,77E+00	0:49:50	46,86776	5,418072	1:06:10
44,87124	2,91E-03	0:50:00	46,90032	5,427777	1:06:20
44,75188	0,00E+00	0:50:10	46,93287	5,426806	1:06:30
44,65784	0,00E+00	0:50:20	46,97266	5,425836	1:06:40
44,54572	0,00E+00	0:50:30	46,9401	0,002911	1:06:50
44,477	0,00E+00	0:50:40	46,82436	0,002911	1:07:00
44,39019	0,00E+00	0:50:50	46,70501	0,002911	1:07:10
44,3287	0,00E+00	0:51:00	46,59288	0	1:07:20
44,27445	0,00E+00	0:51:10	46,50246	0	1:07:30
44,22381	0,00E+00	0:51:20	46,40842	0	1:07:40
44,15509	0,00E+00	0:51:30	46,31438	0	1:07:50
44,08999	0,00E+00	0:51:40	46,25289	0	1:08:00
44,05743	0,00E+00	0:51:50	46,16247	0	1:08:10
43,99957	0,00E+00	0:52:00	46,07205	0	1:08:20
44,01041	0,00E+00	0:52:10	46,01056	0	1:08:30
43,93446	0,00E+00	0:52:20	45,9346	0	1:08:40
43,84766	0,00E+00	0:52:30	45,8695	0	1:08:50
43,78255	0,00E+00	0:52:40	45,7827	0	1:09:00
43,71383	0,00E+00	0:52:50	45,75738	0	1:09:10
43,64149	0,00E+00	0:53:00	45,71759	0	1:09:20
43,56915	0,00E+00	0:53:10	45,64887	0	1:09:30
43,5149	0,00E+00	0:53:20	45,63079	0	1:09:40
43,4932	0,00E+00	0:53:30	45,55845	0	1:09:50
43,40278	0,00E+00	0:53:40	45,5042	0	1:10:00
43,36661	2,91E-03	0:53:50	45,45356	0	1:10:10
43,61256	5,48E+00	0:54:00	45,3993	0	1:10:20
44,11169	5,47E+00	0:54:10	45,49334	5,625751	1:10:30
44,28892	5,46E+00	0:54:20	46,0612	5,411279	1:10:40
44,38657	5,46E+00	0:54:30	46,28183	5,419043	1:10:50
44,44083	5,44E+00	0:54:40	46,39395	5,415161	1:11:00
44,48785	5,47E+00	0:54:50	46,46629	5,446216	1:11:10
44,55295	5,45E+00	0:55:00	46,51331	5,3909	1:11:20
44,5855	5,45E+00	0:55:10	46,5531	5,393811	1:11:30
44,6072	5,45E+00	0:55:20	46,59288	5,410309	1:11:40
44,63614	5,44E+00	0:55:30	46,62543	5,385077	1:11:50
44,65784	5,43E+00	0:55:40	46,66522	5,395752	1:12:00
44,70486	5,45E+00	0:55:50	46,70139	5,422925	1:12:10
44,74103	5,44E+00	0:56:00	46,71585	5,403515	1:12:20
44,76273	5,46E+00	0:56:10	46,73756	5,397693	1:12:30
44,79528	5,44E+00	0:56:20	46,78819	5,405457	1:12:40
44,79528	5,44E+00	0:56:30	46,78819	5,402545	1:12:50
44,83145	5,46E+00	0:56:40	46,84245	5,389929	1:13:00
44,85677	5,44E+00	0:56:50	46,89309	5,3909	1:13:10
44,87486	5,46E+00	0:57:00	46,92202	5,409338	1:13:20
44,91102	5,44E+00	0:57:10	46,9401	5,399634	1:13:30
44,92188	5,44E+00	0:57:20	46,96904	5,406427	1:13:40
44,95081	5,42E+00	0:57:30	46,99074	5,410309	1:13:50
45,00145	5,44E+00	0:57:40	47,03053	5,410309	1:14:00

45,01953	5,43E+00	0:57:50	47,03776	5,411279	1:14:10
45,03762	5,44E+00	0:58:00	47,09563	5,403515	1:14:20
45,06655	5,44E+00	0:58:10	47,12818	5,399634	1:14:30
45,09187	5,42E+00	0:58:20	47,13541	5,418072	1:14:40
45,1208	5,44E+00	0:58:30	47,18243	5,376343	1:14:50
45,14612	5,45E+00	0:58:40	47,21137	5,398663	1:15:00
45,17506	5,42E+00	0:58:50	47,23669	5,402545	1:15:10
45,20399	5,62E+00	0:59:00	47,26563	5,387988	1:15:20
45,12442	2,91E-03	0:59:10	47,29818	5,34917	1:15:30
45,00506	2,91E-03	0:59:20	47,27286	0,002911	1:15:40
44,90379	2,91E-03	0:59:30	47,12095	0,002911	1:15:50
44,82422	0,00E+00	0:59:40	47,00159	0,002911	1:16:00
44,73018	0,00E+00	0:59:50	46,88585	0,002911	1:16:10
44,64337	0,00E+00	1:00:00	46,77373	0,002911	1:16:20
44,56742	0,00E+00	1:00:10	46,67969	0,002911	1:16:30
44,4987	0,00E+00	1:00:20	46,59288	0,002911	1:16:40
44,45168	0,00E+00	1:00:30	46,50608	0,002911	1:16:50
44,36487	0,00E+00	1:00:40	46,41565	0,002911	1:17:00
44,31062	0,00E+00	1:00:50	46,32161	0,002911	1:17:10
44,24551	0,00E+00	1:01:00	46,26013	0,002911	1:17:20
44,20211	0,00E+00	1:01:10	46,18055	0,002911	1:17:30
44,14786	0,00E+00	1:01:20	46,0829	0,002911	1:17:40
44,09361	0,00E+00	1:01:30	46,01418	0,002911	1:17:50
44,0285	0,00E+00	1:01:40	45,94546	0,002911	1:18:00
43,98872	0,00E+00	1:01:50	45,87312	0,002911	1:18:10
43,93808	0,00E+00	1:02:00	45,79716	0,002911	1:18:20
43,89829	0,00E+00	1:02:10	45,73568	0,002911	1:18:30
43,84042	0,00E+00	1:02:20	45,67419	0,002911	1:18:40
43,81149	0,00E+00	1:02:30	45,62717	0,002911	1:18:50
43,76447	0,00E+00	1:02:40	45,57291	0,002911	1:19:00
43,71021	0,00E+00	1:02:50	45,48973	0,002911	1:19:10
43,67766	0,00E+00	1:03:00	45,43909	0,002911	1:19:20
43,61979	0,00E+00	1:03:10	45,38484	0,002911	1:19:30
43,58724	0,00E+00	1:03:20	45,30888	0,002911	1:19:40
43,56915	0,00E+00	1:03:30	45,28357	0,002911	1:19:50
43,5366	0,00E+00	1:03:40	45,21846	0,002911	1:20:00
43,5149	0,00E+00	1:03:50	45,16059	0,002911	1:20:10
43,44256	0,00E+00	1:04:00	45,10995	0,002911	1:20:20
43,40278	0,00E+00	1:04:10	45,0557	0,002911	1:20:30
43,35576	0,00E+00	1:04:20	45,01591	0,002911	1:20:40
43,3015	0,00E+00	1:04:30	44,96528	0	1:20:50
43,25087	0,00E+00	1:04:40	44,95804	0	1:21:00
43,18938	0,00E+00	1:04:50	44,95081	0	1:21:10
43,14959	0,00E+00	1:05:00	44,92911	0	1:21:20
43,10619	0,00E+00	1:05:10	44,88932	0	1:21:30
43,02662	0,00E+00	1:05:20	44,85677	0	1:21:40
43,00492	0,00E+00	1:05:30	44,83145	0	1:21:50
42,9362	0,00E+00	1:05:40	44,79528	0	1:22:00
42,9145	0,00E+00	1:05:50	44,75188	0	1:22:10
42,86748	0,00E+00	1:06:00	44,72656	0	1:22:20

42,82769	0,00E+00	1:06:10	44,69401	0	1:22:30
42,76982	0,00E+00	1:06:20	44,65061	0	1:22:40
42,74088	0,00E+00	1:06:30	44,62167	0	1:22:50
42,70833	0,00E+00	1:06:40	44,58189	0	1:23:00
42,63238	0,00E+00	1:06:50	44,56018	0	1:23:10
42,59983	0,00E+00	1:07:00	44,52402	0	1:23:20
42,56366	0,00E+00	1:07:10	44,49146	0	1:23:30
42,52387	0,00E+00	1:07:20	44,46976	0	1:23:40
42,48409	0,00E+00	1:07:30	44,41912	0	1:23:50
42,42622	0,00E+00	1:07:40	44,40104	0	1:24:00
42,3792	0,00E+00	1:07:50	44,36126	0	1:24:10
42,37558	0,00E+00	1:08:00	44,34679	0	1:24:20
42,30686	0,00E+00	1:08:10	44,31424	0	1:24:30
42,27069	0,00E+00	1:08:20	44,27445	0	1:24:40
42,23452	0,00E+00	1:08:30	44,2636	0	1:24:50
42,19112	0,00E+00	1:08:40	44,23466	0	1:25:00
42,17665	0,00E+00	1:08:50	44,20935	0	1:25:10
42,12963	0,00E+00	1:09:00	44,16956	0	1:25:20
42,09346	0,00E+00	1:09:10	44,14424	0	1:25:30
42,05367	0,00E+00	1:09:20	44,09722	0	1:25:40
42,02112	0,00E+00	1:09:30	44,07552	0	1:25:50
41,98133	0,00E+00	1:09:40	44,04297	0	1:26:00
41,95963	0,00E+00	1:09:50	44,02488	0	1:26:10
41,80049	0,00E+00	1:10:00	44,02127	0	1:26:20
41,70645	0,00E+00	1:10:10	43,97425	0	1:26:30
41,64858	0,00E+00	1:10:20	43,93084	0	1:26:40
41,6739	0,00E+00	1:10:30	43,89829	0	1:26:50
41,64858	0,00E+00	1:10:40	43,88021	0	1:27:00
41,61603	0,00E+00	1:10:50	43,84766	0	1:27:10
41,58709	0,00E+00	1:11:00	43,82957	0	1:27:20
41,56901	0,00E+00	1:11:10	43,80064	0	1:27:30
41,53284	0,00E+00	1:11:20	43,76809	0	1:27:40
41,51476	0,00E+00	1:11:30	43,76447	0	1:27:50
41,48582	0,00E+00	1:11:40	43,69936	0	1:28:00
41,44242	0,00E+00	1:11:50	43,68489	0	1:28:10
41,51114	5,97E+00	1:12:00	43,65958	0	1:28:20
42,75535	5,45E+00	1:12:10	43,64149	0	1:28:30
43,31597	5,46E+00	1:12:20	43,60532	0	1:28:40
43,55469	5,44E+00	1:12:30	43,57639	0	1:28:50
43,69936	5,45E+00	1:12:40	43,55107	0	1:29:00
43,78978	5,45E+00	1:12:50	43,53299	0	1:29:10
43,85851	5,44E+00	1:13:00	43,49681	0,002911	1:29:20
43,91999	5,44E+00	1:13:10	43,47512	7,033886	1:29:30
43,95616	5,43E+00	1:13:20	44,57103	5,418072	1:29:40
44,02127	5,43E+00	1:13:30	45,28357	5,410309	1:29:50
44,06105	5,43E+00	1:13:40	45,58377	5,407397	1:30:00
44,07914	5,44E+00	1:13:50	45,74291	5,428748	1:30:10
44,11531	5,40E+00	1:14:00	45,86227	5,405457	1:30:20
44,13701	5,42E+00	1:14:10	45,95269	5,423895	1:30:30
44,18403	5,42E+00	1:14:20	46,01056	5,411279	1:30:40

44,20935	5,42E+00	1:14:30
44,22743	5,43E+00	1:14:40
44,25998	5,43E+00	1:14:50
44,28168	5,42E+00	1:15:00
44,29977	5,43E+00	1:15:10
44,32508	5,43E+00	1:15:20
44,3504	5,42E+00	1:15:30
44,36487	5,42E+00	1:15:40
44,40828	5,40E+00	1:15:50
44,43359	5,43E+00	1:16:00
44,4553	5,41E+00	1:16:10
44,46976	5,42E+00	1:16:20
44,49508	5,42E+00	1:16:30
44,53125	5,41E+00	1:16:40
44,56018	5,43E+00	1:16:50
44,58189	5,42E+00	1:17:00
44,54934	3,88E-03	1:17:10
44,44083	0,00E+00	1:17:20
44,3504	0,00E+00	1:17:30
44,23828	0,00E+00	1:17:40
44,16233	0,00E+00	1:17:50
44,0719	0,00E+00	1:18:00
44,00318	0,00E+00	1:18:10
43,91999	0,00E+00	1:18:20
43,8368	0,00E+00	1:18:30
43,75723	0,00E+00	1:18:40
43,68489	0,00E+00	1:18:50
43,63064	0,00E+00	1:19:00
43,57639	0,00E+00	1:19:10
43,52213	0,00E+00	1:19:20
43,47512	0,00E+00	1:19:30
43,42448	0,00E+00	1:19:40
43,37022	0,00E+00	1:19:50
43,29789	0,00E+00	1:20:00
43,22555	0,00E+00	1:20:10
43,13151	0,00E+00	1:20:20
43,01215	0,00E+00	1:20:30
42,86748	0,00E+00	1:20:40
42,64323	0,00E+00	1:20:50
42,2526	0,00E+00	1:21:00
41,76432	0,00E+00	1:21:10
41,29051	0,00E+00	1:21:20
40,85648	0,00E+00	1:21:30
40,58883	0,00E+00	1:21:40
40,33203	0,00E+00	1:21:50

46,06482	5,421954	1:30:50
46,11907	5,39187	1:31:00
46,15162	5,399634	1:31:10
46,19141	5,405457	1:31:20
46,22396	5,414191	1:31:30
46,26013	5,398663	1:31:40
46,29991	5,398663	1:31:50
46,33608	5,41322	1:32:00
46,37225	5,399634	1:32:10
46,40842	5,401575	1:32:20
46,43012	5,435541	1:32:30
46,48076	5,403515	1:32:40
46,48799	5,397693	1:32:50
46,53501	5,386047	1:33:00
46,56033	5,399634	1:33:10
46,58926	5,379254	1:33:20
46,62543	5,406427	1:33:30
46,6399	5,389929	1:33:40
46,67969	5,396722	1:33:50
46,70139	5,393811	1:34:00
46,73394	5,397693	1:34:10
46,76649	5,393811	1:34:20
46,80989	5,394782	1:34:30
46,80989	3,325763	1:34:40
46,68692	0,002911	1:34:50
46,57841	0,002911	1:35:00
46,4482	0,002911	1:35:10
46,35416	0	1:35:20
46,24566	0	1:35:30
46,14077	0	1:35:40
46,0612	0	1:35:50
45,95269	0	1:36:00
45,85142	0	1:36:10
45,76461	0	1:36:20
45,66695	0	1:36:30
45,60185	0	1:36:40
45,48973	0	1:36:50
45,43186	0	1:37:00
45,34505	0	1:37:10
45,25825	0	1:37:20
45,16059	0	1:37:30
45,10633	0	1:37:40
45,05208	0	1:37:50
44,93996	0	1:38:00
44,87486	0	1:38:10
44,62529	0	1:38:20
44,40466	0	1:38:30
44,28168	0	1:38:40
44,13339	0	1:38:50
44,01041	0	1:39:00

43,88021	0	1:39:10
43,75362	0	1:39:20
43,67766	0	1:39:30
43,60894	0	1:39:40
43,51852	0	1:39:50
43,41001	0	1:40:00
43,34852	0	1:40:10
43,33767	0	1:40:20
43,29427	0	1:40:30
43,24363	0	1:40:40
43,22555	0	1:40:50
43,19661	0	1:41:00
43,16045	0	1:41:10
43,0447	0	1:41:20
42,97237	0	1:41:30
42,94343	0	1:41:40
42,86748	0	1:41:50
42,86024	0	1:42:00
42,86386	0	1:42:10
42,86386	0	1:42:20
42,84578	0	1:42:30
42,89641	0	1:42:40
42,86024	0	1:42:50
42,81684	0	1:43:00
42,81322	0	1:43:10
42,80599	0	1:43:20
42,79152	0	1:43:30
42,77344	0	1:43:40
42,75897	0	1:43:50
42,73365	0	1:44:00
42,70472	0	1:44:10
42,65046	0	1:44:20
42,60706	0	1:44:30
42,53472	0	1:44:40
42,466	0	1:44:50
42,41898	0	1:45:00
42,36473	0	1:45:10
42,30686	0	1:45:20
42,27069	0	1:45:30
42,28154	0	1:45:40
42,39366	0	1:45:50
42,35749	0	1:46:00

B pH10

Temperature	Ampere	Time
42,50217	5,40E+00	0:22:30
42,44791	5,51E+00	0:22:40
42,466	5,39E+00	0:22:50
42,4443	5,42E+00	0:23:00
42,40813	5,37E+00	0:23:10
42,3792	5,36E+00	0:23:20
42,39366	5,50E+00	0:23:30
42,50579	5,39E+00	0:23:40
42,58174	5,46E+00	0:23:50
42,69025	5,45E+00	0:24:00
42,79152	5,45E+00	0:24:10
42,84939	5,43E+00	0:24:20
42,82407	5,50E+00	0:24:30
42,87109	5,46E+00	0:24:40
42,91811	5,40E+00	0:24:50
42,95066	5,49E+00	0:25:00
42,99407	5,49E+00	0:25:10
43,03385	5,53E+00	0:25:20
43,08087	5,54E+00	0:25:30
43,13513	5,52E+00	0:25:40
43,18576	5,41E+00	0:25:50
43,24002	5,46E+00	0:26:00
43,29427	5,52E+00	0:26:10
43,28704	5,42E+00	0:26:20
43,31236	5,51E+00	0:26:30
43,37022	6,18E+00	0:26:40
43,29789	0,00E+00	0:26:50
43,15683	0,00E+00	0:27:00
43,06641	0,00E+00	0:27:10
42,97237	0,00E+00	0:27:20
42,90364	0,00E+00	0:27:30
42,83131	0,00E+00	0:27:40
42,76982	0,00E+00	0:27:50
42,70472	0,00E+00	0:28:00
42,65408	0,00E+00	0:28:10
42,58897	0,00E+00	0:28:20
42,53834	0,00E+00	0:28:30
42,4877	0,00E+00	0:28:40
42,4443	0,00E+00	0:28:50
42,40813	0,00E+00	0:29:00
42,33941	6,83E+00	0:29:10
42,73365	5,58E+00	0:29:20
42,96875	5,55E+00	0:29:30
43,08811	5,57E+00	0:29:40
43,16045	5,50E+00	0:29:50
43,22555	5,57E+00	0:30:00
43,28342	5,48E+00	0:30:10

C 43C

Temperature	Ampere	Time
44,92911	0,002911	0:00:00
44,86039	0,002911	0:00:10
44,7772	0,002911	0:00:20
44,67954	0,002911	0:00:30
44,59635	0,002911	0:00:40
44,52402	0,002911	0:00:50
44,43721	0,002911	0:01:00
44,35402	0,002911	0:01:10
44,29253	0,002911	0:01:20
44,23828	0,002911	0:01:30
44,11531	0	0:01:40
43,88382	0	0:01:50
43,2798	0	0:02:00
42,93258	0	0:02:10
42,81322	0	0:02:20
42,59983	0,002911	0:02:30
42,54557	0,002911	0:02:40
43,76809	0,002911	0:02:50
44,4553	0,002911	0:03:00
44,52763	0,002911	0:03:10
44,67231	0,002911	0:03:20
44,48785	5,551996	0:03:30
44,18041	5,319086	0:03:40
44,06105	5,310351	0:03:50
44,02488	5,353052	0:04:00
43,99957	5,341406	0:04:10
43,99233	5,320056	0:04:20
43,99233	5,380225	0:04:30
43,9851	5,311322	0:04:40
43,99233	5,382165	0:04:50
44,00318	5,366638	0:05:00
44,00318	5,346259	0:05:10
44,01765	5,319086	0:05:20
44,0285	5,332672	0:05:30
44,01765	5,318115	0:05:40
44,03574	5,335583	0:05:50
44,05382	5,290942	0:06:00
44,03574	5,289001	0:06:10
44,05382	6,369122	0:06:20
43,98872	0,002911	0:06:30
43,91276	0	0:06:40
43,88382	0	0:06:50
43,82595	0	0:07:00
43,7717	0	0:07:10
43,77532	5,914948	0:07:20
43,90914	5,372461	0:07:30
43,93084	5,352081	0:07:40

43,31597	5,50E+00	0:30:20	43,93808	5,320056	0:07:50
43,37022	5,50E+00	0:30:30	43,93808	5,293854	0:08:00
43,41363	5,59E+00	0:30:40	43,94893	5,337524	0:08:10
43,46065	5,56E+00	0:30:50	43,94531	5,326849	0:08:20
43,52213	5,56E+00	0:31:00	43,97063	5,306469	0:08:30
43,55469	5,53E+00	0:31:10	43,94893	5,314233	0:08:40
43,59447	5,49E+00	0:31:20	43,96701	5,308411	0:08:50
43,62341	5,54E+00	0:31:30	43,9634	5,298706	0:09:00
43,65958	5,52E+00	0:31:40	43,99233	5,386047	0:09:10
43,70298	5,55E+00	0:31:50	43,99233	5,316174	0:09:20
43,75723	5,56E+00	0:32:00	43,99233	5,329761	0:09:30
43,78255	5,54E+00	0:32:10	44,01041	5,37052	0:09:40
43,84042	5,52E+00	0:32:20	44,02488	6,83106	0:09:50
43,87659	5,52E+00	0:32:30	43,9634	0,003882	0:10:00
43,89829	5,56E+00	0:32:40	43,89106	0	0:10:10
43,94893	5,53E+00	0:32:50	43,80425	0	0:10:20
43,97425	5,49E+00	0:33:00	43,73191	0	0:10:30
44,04297	5,53E+00	0:33:10	43,66681	6,450641	0:10:40
44,06467	5,53E+00	0:33:20	43,87659	5,380225	0:10:50
44,10084	5,53E+00	0:33:30	43,93084	5,376343	0:11:00
44,13339	5,53E+00	0:33:40	43,9634	5,417102	0:11:10
44,17318	5,54E+00	0:33:50	43,96701	5,460773	0:11:20
44,19849	5,53E+00	0:34:00	43,98872	5,39187	0:11:30
44,25637	5,51E+00	0:34:10	44,01041	5,404486	0:11:40
44,24551	2,91E-03	0:34:20	44,04297	5,499591	0:11:50
44,12977	0,00E+00	0:34:30	44,05743	5,462714	0:12:00
44,03935	0,00E+00	0:34:40	44,07552	5,526764	0:12:10
43,93084	0,00E+00	0:34:50	44,09361	5,493768	0:12:20
43,85489	0,00E+00	0:35:00	44,07914	5,32782	0:12:30
43,75362	0,00E+00	0:35:10	44,11169	5,487946	0:12:40
43,68128	0,00E+00	0:35:20	44,11169	5,566553	0:12:50
43,62341	0,00E+00	0:35:30	44,07552	5,386047	0:13:00
43,5366	0,00E+00	0:35:40	44,06467	6,054693	0:13:10
43,49681	0,00E+00	0:35:50	43,9851	0,002911	0:13:20
43,4281	0,00E+00	0:36:00	43,89829	0	0:13:30
43,36661	0,00E+00	0:36:10	43,8368	0	0:13:40
43,3015	0,00E+00	0:36:20	43,76447	0	0:13:50
43,26895	0,00E+00	0:36:30	43,69936	0	0:14:00
43,2147	0,00E+00	0:36:40	43,64511	0	0:14:10
43,193	0,00E+00	0:36:50	43,60171	0	0:14:20
43,13513	0,00E+00	0:37:00	43,5583	0	0:14:30
43,08449	0,00E+00	0:37:10	43,60894	5,586932	0:14:40
43,0447	0,00E+00	0:37:20	43,80787	5,459802	0:14:50
42,98684	0,00E+00	0:37:30	43,89829	5,39284	0:15:00
42,93982	0,00E+00	0:37:40	43,94893	5,426806	0:15:10
42,90003	2,91E-03	0:37:50	44,0068	5,522882	0:15:20
42,9579	5,73E+00	0:38:00	44,10807	5,493768	0:15:30
43,49681	5,53E+00	0:38:10	44,11892	5,460773	0:15:40
43,71021	5,54E+00	0:38:20	44,15147	5,439423	0:15:50
43,80064	5,51E+00	0:38:30	44,13701	5,384106	0:16:00

43,86574	5,53E+00	0:38:40	44,11892	5,373431	0:16:10
43,93084	5,52E+00	0:38:50	44,17318	5,430688	0:16:20
43,9851	5,52E+00	0:39:00	44,25275	5,446216	0:16:30
44,01765	5,52E+00	0:39:10	44,307	5,39187	0:16:40
44,05382	5,53E+00	0:39:20	44,34679	5,517059	0:16:50
44,10084	5,50E+00	0:39:30	44,35402	5,431659	0:17:00
44,12616	5,52E+00	0:39:40	44,31424	5,513177	0:17:10
44,19126	5,50E+00	0:39:50	44,27806	5,398663	0:17:20
44,20935	5,52E+00	0:40:00	44,21658	0,002911	0:17:30
44,22743	5,51E+00	0:40:10	44,11531	0,002911	0:17:40
44,24551	5,51E+00	0:40:20	44,03574	0	0:17:50
44,29977	5,53E+00	0:40:30	43,94893	0	0:18:00
44,32508	5,53E+00	0:40:40	43,86574	0	0:18:10
44,35402	5,51E+00	0:40:50	43,82234	0	0:18:20
44,3721	5,50E+00	0:41:00	43,75723	0	0:18:30
44,40828	5,50E+00	0:41:10	43,66681	0	0:18:40
44,45168	5,51E+00	0:41:20	43,62703	0	0:18:50
44,49146	5,50E+00	0:41:30	43,54022	0	0:19:00
44,52763	5,53E+00	0:41:40	43,48597	0	0:19:10
44,5421	5,51E+00	0:41:50	43,41001	0	0:19:20
44,57827	5,52E+00	0:42:00	43,34129	0	0:19:30
44,60359	5,50E+00	0:42:10	43,29427	0	0:19:40
44,63976	5,52E+00	0:42:20	43,24002	0	0:19:50
44,66146	5,52E+00	0:42:30	43,193	0	0:20:00
44,72656	5,49E+00	0:42:40	43,14236	0	0:20:10
44,74103	5,51E+00	0:42:50	43,10257	0	0:20:20
44,76273	5,41E+00	0:43:00	43,22193	5,68883	0:20:30
44,71571	2,91E-03	0:43:10	43,56554	5,402545	0:20:40
44,62167	2,91E-03	0:43:20	43,78255	5,408368	0:20:50
44,49146	2,91E-03	0:43:30	43,7934	5,414191	0:21:00
44,39742	2,91E-03	0:43:40	43,85851	5,51997	0:21:10
44,31424	0,00E+00	0:43:50	43,98148	5,485034	0:21:20
44,25275	0,00E+00	0:44:00	44,04659	5,495709	0:21:30
44,17318	0,00E+00	0:44:10	44,11169	5,430688	0:21:40
44,09722	0,00E+00	0:44:20	44,15509	5,482123	0:21:50
44,0285	0,00E+00	0:44:30	44,14786	5,411279	0:22:00
43,97425	0,00E+00	0:44:40	44,15509	5,401575	0:22:10
43,90191	0,00E+00	0:44:50	44,15509	5,435541	0:22:20
43,89106	0,00E+00	0:45:00	44,25275	5,395752	0:22:30
43,84766	0,00E+00	0:45:10	44,29977	5,405457	0:22:40
43,7934	0,00E+00	0:45:20	44,36126	5,403515	0:22:50
43,75723	0,00E+00	0:45:30	44,40466	5,414191	0:23:00
43,71383	7,18E+00	0:45:40	44,42274	5,495709	0:23:10
44,10084	5,52E+00	0:45:50	44,44444	5,443305	0:23:20
44,31785	5,52E+00	0:46:00	44,43359	5,435541	0:23:30
44,42274	5,52E+00	0:46:10	44,477	5,463684	0:23:40
44,4987	5,51E+00	0:46:20	44,51316	5,372461	0:23:50
44,54572	5,49E+00	0:46:30	44,55295	5,408368	0:24:00
44,59997	5,54E+00	0:46:40	44,56018	5,453979	0:24:10
44,62529	5,48E+00	0:46:50	44,57827	5,423895	0:24:20

44,66869	5,51E+00	0:47:00	44,63614	5,420984	0:24:30
44,69401	5,51E+00	0:47:10	44,61444	5,592755	0:24:40
44,74465	5,51E+00	0:47:20	44,67593	5,451068	0:24:50
44,76997	5,50E+00	0:47:30	44,69401	5,462714	0:25:00
44,78805	5,51E+00	0:47:40	44,73018	5,422925	0:25:10
44,83145	5,49E+00	0:47:50	44,75911	5,479211	0:25:20
44,85677	5,51E+00	0:48:00	44,79528	5,315204	0:25:30
44,87847	5,51E+00	0:48:10	44,69401	0,002911	0:25:40
44,92188	5,50E+00	0:48:20	44,59635	0	0:25:50
44,94358	5,49E+00	0:48:30	44,49146	0	0:26:00
44,96889	5,49E+00	0:48:40	44,38657	0	0:26:10
45,0123	5,48E+00	0:48:50	44,29977	0	0:26:20
45,03762	5,49E+00	0:49:00	44,22743	0	0:26:30
45,07378	5,47E+00	0:49:10	44,10807	0	0:26:40
45,09187	5,49E+00	0:49:20	43,91276	0	0:26:50
45,12804	5,49E+00	0:49:30	43,95255	0	0:27:00
45,16782	5,49E+00	0:49:40	43,89468	0	0:27:10
45,20399	5,49E+00	0:49:50	43,84404	0	0:27:20
45,21846	5,49E+00	0:50:00	43,78617	0	0:27:30
45,25101	5,48E+00	0:50:10	43,7717	0	0:27:40
45,28718	5,49E+00	0:50:20	43,70298	0	0:27:50
45,30888	5,47E+00	0:50:30	43,65958	0	0:28:00
45,33059	5,49E+00	0:50:40	43,5583	0	0:28:10
45,33782	2,91E-03	0:50:50	43,50043	0	0:28:20
45,23655	2,91E-03	0:51:00	43,43171	0	0:28:30
45,10633	0,00E+00	0:51:10	43,38831	0	0:28:40
45,00506	0,00E+00	0:51:20	43,33044	0	0:28:50
44,90741	0,00E+00	0:51:30	43,26534	0	0:29:00
44,83868	0,00E+00	0:51:40	43,22193	0	0:29:10
44,76997	0,00E+00	0:51:50	43,17853	0	0:29:20
44,68678	0,00E+00	0:52:00	43,11343	0	0:29:30
44,6072	0,00E+00	0:52:10	43,08087	0	0:29:40
44,57103	0,00E+00	0:52:20	43,04109	0	0:29:50
44,53125	0,00E+00	0:52:30	43,00853	0	0:30:00
44,49146	0,00E+00	0:52:40	42,96875	0	0:30:10
44,44083	0,00E+00	0:52:50	42,92535	0	0:30:20
44,39019	0,00E+00	0:53:00	42,89641	0	0:30:30
44,33232	0,00E+00	0:53:10	42,88194	0	0:30:40
44,31062	0,00E+00	0:53:20	42,83492	0	0:30:50
44,25275	0,00E+00	0:53:30	42,79514	0	0:31:00
44,22381	0,00E+00	0:53:40	42,75897	0	0:31:10
44,16956	0,00E+00	0:53:50	42,71556	0	0:31:20
44,10084	0,00E+00	0:54:00	42,7011	0	0:31:30
44,03935	0,00E+00	0:54:10	42,66855	0	0:31:40
43,97063	2,91E-03	0:54:20	42,62876	0	0:31:50
44,27445	5,50E+00	0:54:30	42,61068	7,729706	0:32:00
44,60359	5,48E+00	0:54:40	42,96875	5,589844	0:32:10
44,74465	5,50E+00	0:54:50	43,4932	5,538409	0:32:20
44,80613	5,47E+00	0:55:00	43,80064	5,440393	0:32:30
44,87486	5,50E+00	0:55:10	43,94531	5,493768	0:32:40

44,92911	5,49E+00	0:55:20	44,05743	5,462714	0:32:50
44,96166	5,49E+00	0:55:30	44,18403	5,410309	0:33:00
44,99421	5,47E+00	0:55:40	44,25275	5,388958	0:33:10
45,01953	5,47E+00	0:55:50	44,31062	5,468536	0:33:20
45,05931	5,47E+00	0:56:00	44,33594	5,39284	0:33:30
45,08825	5,48E+00	0:56:10	44,40104	5,478241	0:33:40
45,1208	5,49E+00	0:56:20	44,4553	5,484064	0:33:50
45,16421	5,48E+00	0:56:30	44,50593	5,399634	0:34:00
45,17506	5,46E+00	0:56:40	44,53487	5,478241	0:34:10
45,19676	5,47E+00	0:56:50	44,54934	5,498621	0:34:20
45,23293	5,49E+00	0:57:00	44,59635	5,432629	0:34:30
45,2691	5,47E+00	0:57:10	44,63614	5,436511	0:34:40
45,2908	5,47E+00	0:57:20	44,67231	5,416131	0:34:50
45,3125	5,47E+00	0:57:30	44,71209	5,388958	0:35:00
45,34505	5,49E+00	0:57:40	44,7338	5,45592	0:35:10
45,37399	5,47E+00	0:57:50	44,76273	5,396722	0:35:20
45,38122	5,48E+00	0:58:00	44,7772	5,475329	0:35:30
45,43186	5,47E+00	0:58:10	44,80613	5,45495	0:35:40
45,45718	5,48E+00	0:58:20	44,85315	5,405457	0:35:50
45,48249	5,48E+00	0:58:30	44,88932	5,408368	0:36:00
45,51866	5,48E+00	0:58:40	44,89656	5,405457	0:36:10
45,54398	5,49E+00	0:58:50	44,93996	5,475329	0:36:20
45,57291	5,49E+00	0:59:00	44,96528	5,500561	0:36:30
45,591	5,46E+00	0:59:10	45,02315	5,489886	0:36:40
45,62717	5,48E+00	0:59:20	45,0557	5,4336	0:36:50
45,63802	5,91E+00	0:59:30	45,04123	5,453979	0:37:00
45,5476	2,91E-03	0:59:40	45,04847	0,002911	0:37:10
45,43186	2,91E-03	0:59:50	44,94358	0,002911	0:37:20
45,3125	2,91E-03	1:00:00	44,83868	0,002911	0:37:30
45,23655	2,91E-03	1:00:10	44,74103	0,003882	0:37:40
45,14251	2,91E-03	1:00:20	44,66146	0	0:37:50
45,05931	0,00E+00	1:00:30	44,57103	0	0:38:00
44,98336	0,00E+00	1:00:40	44,46976	0	0:38:10
44,91102	0,00E+00	1:00:50	44,43721	0	0:38:20
44,8423	0,00E+00	1:01:00	44,36126	0	0:38:30
44,7772	0,00E+00	1:01:10	44,29615	0	0:38:40
44,72295	0,00E+00	1:01:20	44,23828	0	0:38:50
44,65422	0,00E+00	1:01:30	44,16594	0	0:39:00
44,60359	0,00E+00	1:01:40	44,10084	0	0:39:10
44,54572	0,00E+00	1:01:50	44,06467	0	0:39:20
44,49508	0,00E+00	1:02:00	43,99957	0	0:39:30
44,43721	0,00E+00	1:02:10	43,94531	0	0:39:40
44,38296	0,00E+00	1:02:20	43,90914	0	0:39:50
44,33232	7,22E+00	1:02:30	43,85489	0	0:40:00
44,83868	5,46E+00	1:02:40	43,80787	0	0:40:10
45,10272	5,49E+00	1:02:50	43,73553	0	0:40:20
45,19676	5,48E+00	1:03:00	43,69213	0	0:40:30
45,28718	5,47E+00	1:03:10	43,62703	0	0:40:40
45,33059	5,50E+00	1:03:20	43,57639	0	0:40:50
45,39569	5,47E+00	1:03:30	43,52213	0	0:41:00

45,3993	5,48E+00	1:03:40	43,48235	0	0:41:10
45,43547	5,49E+00	1.03.50	43,44256	0	0.41.20
45,48611	5,46E+00	1:04:00	43,40278	0	0:41:30
45,49334	5,48E+00	1:04:10	43,33767	0	0:41:40
45,54398	5,49E+00	1:04:20	43,31959	0	0:41:50
45,57291	5,47E+00	1:04:30	43,26534	0	0:42:00
45,60909	5,47E+00	1:04:40	43,2147	0	0:42:10
45,61632	5,48E+00	1:04:50	43,18938	0	0:42:20
45,65611	5,49E+00	1:05:00	43,15683	0	0:42:30
45,68504	5,47E+00	1:05:10	43,13874	0	0:42:40
45,72483	5,48E+00	1:05:20	43,08087	0	0:42:50
45,75376	5,50E+00	1:05:30	43,04832	0	0:43:00
45,78993	5,48E+00	1:05:40	43,01215	0	0:43:10
45,80801	5,47E+00	1:05:50	42,9796	0	0:43:20
45,83695	5,48E+00	1:06:00	42,95428	0	0:43:30
45,86588	5,48E+00	1:06:10	42,9362	0	0:43:40
45,8912	5,47E+00	1:06:20	42,89641	0	0:43:50
45,90929	5,49E+00	1:06:30	42,86386	0	0:44:00
45,94546	5,48E+00	1:06:40	42,81684	0	0:44:10
45,98162	5,49E+00	1:06:50	42,80599	0	0:44:20
46,01418	5,48E+00	1:07:00	42,77344	0	0:44:30
46,04311	5,49E+00	1:07:10	42,76982	0	0:44:40
46,05396	5,46E+00	1:07:20	42,7228	0	0:44:50
46,11907	5,49E+00	1:07:30	42,69748	0	0:45:00
46,09737	2,91E-03	1:07:40	42,66131	0	0:45:10
45,97801	2,91E-03	1:07:50	42,62876	0	0:45:20
45,88035	2,91E-03	1:08:00	42,61068	0	0:45:30
45,77185	2,91E-03	1:08:10	42,57451	0	0:45:40
45,65611	2,91E-03	1:08:20	42,56366	0	0:45:50
45,58377	0,00E+00	1:08:30	42,55642	0	0:46:00
45,50058	0,00E+00	1:08:40	42,50217	0	0:46:10
45,41377	0,00E+00	1:08:50	42,49132	0	0:46:20
45,33782	0,00E+00	1:09:00	42,46238	0	0:46:30
45,28357	0,00E+00	1:09:10	42,45515	0	0:46:40
45,19676	0,00E+00	1:09:20	42,41536	0	0:46:50
45,12804	0,00E+00	1:09:30	42,39728	0	0:47:00
45,05931	0,00E+00	1:09:40	42,37196	0	0:47:10
45,03038	0,00E+00	1:09:50	42,36111	0	0:47:20
44,97974	0,00E+00	1:10:00	42,32132	0	0:47:30
44,92911	0,00E+00	1:10:10	42,29962	0	0:47:40
44,87486	0,00E+00	1:10:20	42,2743	0	0:47:50
44,87124	6,18E+00	1:10:30			
45,30888	6,74E+00	1:10:40			
45,25825	3,88E-03	1:10:50			
45,15697	0,00E+00	1:11:00			
45,0774	0,00E+00	1:11:10			
45,01953	0,00E+00	1:11:20			
44,94719	0,00E+00	1:11:30			
44,87486	0,00E+00	1:11:40			
44,8206	0,00E+00	1:11:50			

44,98336	5,51E+00	1:12:00
45,33782	5,47E+00	1:12:10
45,48611	5,47E+00	1:12:20
45,58377	5,50E+00	1:12:30
45,61993	5,48E+00	1:12:40
45,67057	5,48E+00	1:12:50
45,72121	5,48E+00	1:13:00
45,75376	5,46E+00	1:13:10
45,80078	5,47E+00	1:13:20
45,81887	5,46E+00	1:13:30
45,85142	5,45E+00	1:13:40
45,87312	5,47E+00	1:13:50
45,89844	5,49E+00	1:14:00
45,92737	5,48E+00	1:14:10
45,95631	5,46E+00	1:14:20
45,98162	5,49E+00	1:14:30
46,01418	5,47E+00	1:14:40
46,02864	5,46E+00	1:14:50
46,06843	5,47E+00	1:15:00
46,09013	5,46E+00	1:15:10
46,13353	5,44E+00	1:15:20
46,14439	5,49E+00	1:15:30
46,17332	5,45E+00	1:15:40
46,21311	5,47E+00	1:15:50
46,23481	5,48E+00	1:16:00
46,25289	5,46E+00	1:16:10
46,2963	5,46E+00	1:16:20
46,32161	5,48E+00	1:16:30
46,36863	5,47E+00	1:16:40
46,38672	5,48E+00	1:16:50
46,37587	2,91E-03	1:17:00
46,27821	2,91E-03	1:17:10
46,14439	2,91E-03	1:17:20
46,03226	0,00E+00	1:17:30
45,94546	0,00E+00	1:17:40
45,8478	0,00E+00	1:17:50
45,76461	0,00E+00	1:18:00
45,66695	0,00E+00	1:18:10
45,59824	0,00E+00	1:18:20
45,51143	0,00E+00	1:18:30
45,46803	0,00E+00	1:18:40
45,40292	0,00E+00	1:18:50
45,3559	0,00E+00	1:19:00
45,29441	0,00E+00	1:19:10
45,24016	0,00E+00	1:19:20
45,17506	3,88E-03	1:19:30
45,42824	5,49E+00	1:19:40
45,76099	5,50E+00	1:19:50
45,92376	5,47E+00	1:20:00
46,01418	5,48E+00	1:20:10

46,0829	5,45E+00	1:20:20
46,1263	5,47E+00	1:20:30
46,17332	5,46E+00	1:20:40
46,20587	5,45E+00	1:20:50
46,23481	5,47E+00	1:21:00
46,24928	5,47E+00	1:21:10
46,28906	5,49E+00	1:21:20
46,32161	5,48E+00	1:21:30
46,35778	5,49E+00	1:21:40
46,36863	5,46E+00	1:21:50
46,41204	5,50E+00	1:22:00
46,43374	5,46E+00	1:22:10
46,46629	5,48E+00	1:22:20
46,49522	5,50E+00	1:22:30
46,51331	5,47E+00	1:22:40
46,54948	5,46E+00	1:22:50
46,56756	5,48E+00	1:23:00
46,5965	5,48E+00	1:23:10
46,61097	5,49E+00	1:23:20
46,63267	5,46E+00	1:23:30
46,66522	5,46E+00	1:23:40
46,71947	5,49E+00	1:23:50
46,73032	5,47E+00	1:24:00
46,74841	5,46E+00	1:24:10
46,79543	5,47E+00	1:24:20
46,80628	5,47E+00	1:24:30
46,8316	5,87E+00	1:24:40
46,74841	2,91E-03	1:24:50
46,62181	2,91E-03	1:25:00
46,51693	0,00E+00	1:25:10
46,41204	0,00E+00	1:25:20
46,30353	0,00E+00	1:25:30
46,22396	0,00E+00	1:25:40
46,13715	0,00E+00	1:25:50
46,0612	0,00E+00	1:26:00
45,98886	0,00E+00	1:26:10
45,90929	0,00E+00	1:26:20
45,85503	0,00E+00	1:26:30
45,79355	0,00E+00	1:26:40
45,79355	0,00E+00	1:26:50
45,71759	0,00E+00	1:27:00
45,65611	0,00E+00	1:27:10
45,6127	0,00E+00	1:27:20
45,54398	0,00E+00	1:27:30
45,48249	0,00E+00	1:27:40
45,43186	0,00E+00	1:27:50
45,37399	0,00E+00	1:28:00
45,30888	0,00E+00	1:28:10
45,25101	0,00E+00	1:28:20
45,21846	0,00E+00	1:28:30

45,16059	0,00E+00	1:28:40
45,10633	0,00E+00	1:28:50
45,0557	0,00E+00	1:29:00
45,02315	0,00E+00	1:29:10
44,96889	0,00E+00	1:29:20
44,92911	0,00E+00	1:29:30
44,87486	0,00E+00	1:29:40
44,8423	0,00E+00	1:29:50
44,81337	0,00E+00	1:30:00
44,75188	0,00E+00	1:30:10
44,72656	0,00E+00	1:30:20
44,69401	0,00E+00	1:30:30
44,62529	0,00E+00	1:30:40
44,59635	0,00E+00	1:30:50
44,58189	0,00E+00	1:31:00
44,5421	0,00E+00	1:31:10
44,4987	0,00E+00	1:31:20
44,47338	0,00E+00	1:31:30
44,41551	0,00E+00	1:31:40
44,39019	0,00E+00	1:31:50
44,3504	0,00E+00	1:32:00
44,31424	0,00E+00	1:32:10
44,28892	0,00E+00	1:32:20
44,27083	0,00E+00	1:32:30
44,22381	0,00E+00	1:32:40
44,19849	0,00E+00	1:32:50
44,17318	0,00E+00	1:33:00
44,13701	0,00E+00	1:33:10
44,11531	6,31E+00	1:33:20
44,91464	5,49E+00	1:33:30
45,38484	5,49E+00	1:33:40
45,62717	5,49E+00	1:33:50
45,74291	5,46E+00	1:34:00
45,81887	5,45E+00	1:34:10
45,90567	5,48E+00	1:34:20
45,94546	5,45E+00	1:34:30
45,98162	5,46E+00	1:34:40
46,0178	5,43E+00	1:34:50
46,07205	5,48E+00	1:35:00
46,09013	5,47E+00	1:35:10
46,12268	5,46E+00	1:35:20
46,15885	5,47E+00	1:35:30
46,18779	5,48E+00	1:35:40
46,21311	5,45E+00	1:35:50
46,24928	5,46E+00	1:36:00
46,26374	5,47E+00	1:36:10
46,32161	5,47E+00	1:36:20
46,33247	5,45E+00	1:36:30
46,3614	5,49E+00	1:36:40
46,37949	5,45E+00	1:36:50

46,41565	5,45E+00	1:37:00
46,4482	5,44E+00	1:37:10
46,46991	5,46E+00	1:37:20
46,48799	5,47E+00	1:37:30
46,52416	5,56E+00	1:37:40
46,5531	5,46E+00	1:37:50
46,57479	5,47E+00	1:38:00
46,5965	5,45E+00	1:38:10
46,61458	5,47E+00	1:38:20
46,5965	2,91E-03	1:38:30
46,47714	2,91E-03	1:38:40
46,35778	0,00E+00	1:38:50
46,22396	0,00E+00	1:39:00
46,13353	0,00E+00	1:39:10
46,03226	0,00E+00	1:39:20
45,94546	0,00E+00	1:39:30
45,86227	0,00E+00	1:39:40
45,77546	0,00E+00	1:39:50
45,69227	0,00E+00	1:40:00
45,61993	0,00E+00	1:40:10
45,54398	0,00E+00	1:40:20
45,48249	0,00E+00	1:40:30
45,42824	0,00E+00	1:40:40
45,34867	0,00E+00	1:40:50
45,30165	0,00E+00	1:41:00
45,24016	0,00E+00	1:41:10
45,16782	0,00E+00	1:41:20
45,12804	0,00E+00	1:41:30
45,07017	0,00E+00	1:41:40
45,02315	0,00E+00	1:41:50
45,13165	0,00E+00	1:42:00
45,10272	0,00E+00	1:42:10
45,07017	0,00E+00	1:42:20
44,99783	0,00E+00	1:42:30
44,88932	0,00E+00	1:42:40
44,81337	0,00E+00	1:42:50
44,73018	0,00E+00	1:43:00
44,65784	0,00E+00	1:43:10
44,5855	0,00E+00	1:43:20
44,53487	0,00E+00	1:43:30
44,4553	0,00E+00	1:43:40
44,41912	0,00E+00	1:43:50
44,36849	0,00E+00	1:44:00
44,31062	0,00E+00	1:44:10
44,27806	0,00E+00	1:44:20
44,2202	0,00E+00	1:44:30
44,16594	0,00E+00	1:44:40
44,10807	0,00E+00	1:44:50
44,07914	0,00E+00	1:45:00
44,0285	0,00E+00	1:45:10

43,9851	0,00E+00	1:45:20
43,94893	5,51E+00	1:45:30
44,43721	5,47E+00	1:45:40
45,16059	5,47E+00	1:45:50
45,45718	5,44E+00	1:46:00
45,59824	5,43E+00	1:46:10
45,70313	5,45E+00	1:46:20
45,77546	5,47E+00	1:46:30
45,83333	5,50E+00	1:46:40
45,88035	5,45E+00	1:46:50
45,92014	5,45E+00	1:47:00
45,95631	5,47E+00	1:47:10
45,97801	5,45E+00	1:47:20
46,03226	5,42E+00	1:47:30
46,03226	5,46E+00	1:47:40
46,06843	5,46E+00	1:47:50
46,1046	5,51E+00	1:48:00
46,14077	5,45E+00	1:48:10
46,16247	5,46E+00	1:48:20
46,19141	5,53E+00	1:48:30
46,20949	5,47E+00	1:48:40
46,24566	5,46E+00	1:48:50
46,28183	5,44E+00	1:49:00
46,28906	5,46E+00	1:49:10
46,32523	5,45E+00	1:49:20
46,33608	5,45E+00	1:49:30
46,37587	5,43E+00	1:49:40
46,4048	5,44E+00	1:49:50
46,41204	5,44E+00	1:50:00
46,45906	5,44E+00	1:50:10
46,48438	5,45E+00	1:50:20
46,50246	5,45E+00	1:50:30
46,52054	6,55E+00	1:50:40
46,43012	2,91E-03	1:50:50
46,28906	0,00E+00	1:51:00
46,20587	0,00E+00	1:51:10
46,08652	0,00E+00	1:51:20
45,97439	0,00E+00	1:51:30
45,90205	0,00E+00	1:51:40
45,83333	0,00E+00	1:51:50
45,74291	0,00E+00	1:52:00
45,67057	0,00E+00	1:52:10
45,60185	0,00E+00	1:52:20
45,54398	0,00E+00	1:52:30
45,5042	0,00E+00	1:52:40
45,44632	0,00E+00	1:52:50
45,3993	0,00E+00	1:53:00
45,32697	0,00E+00	1:53:10
45,26548	0,00E+00	1:53:20
45,19676	0,00E+00	1:53:30

45,15697	0,00E+00	1.53.40
45,09549	0,00E+00	1:53:50
45,03762	0,00E+00	1:54:00
44,97974	0,00E+00	1:54:10
44,95081	0,00E+00	1:54:20
44,87486	0,00E+00	1:54:30
44,83507	0,00E+00	1:54:40
44,79528	0,00E+00	1:54:50
44,74826	0,00E+00	1:55:00
44,67231	0,00E+00	1:55:10
44,63614	0,00E+00	1:55:20
44,59635	0,00E+00	1:55:30
44,54934	0,00E+00	1:55:40
44,49146	0,00E+00	1:55:50
44,47338	0,00E+00	1:56:00
44,39742	0,00E+00	1:56:10
44,34679	0,00E+00	1:56:20
44,3287	0,00E+00	1:56:30
44,27806	0,00E+00	1:56:40
44,25998	0,00E+00	1:56:50
44,2202	0,00E+00	1:57:00
44,17318	0,00E+00	1:57:10
44,13701	0,00E+00	1:57:20
44,08999	0,00E+00	1:57:30
44,03935	0,00E+00	1:57:40
44,00318	0,00E+00	1:57:50
43,97425	0,00E+00	1:58:00
43,92723	0,00E+00	1:58:10
43,89829	0,00E+00	1:58:20
43,84766	0,00E+00	1:58:30
43,81149	0,00E+00	1:58:40
43,78255	0,00E+00	1:58:50
43,73915	0,00E+00	1:59:00
43,71021	0,00E+00	1:59:10
43,67405	0,00E+00	1:59:20
43,64873	0,00E+00	1:59:30
43,59447	0,00E+00	1:59:40
43,56554	0,00E+00	1:59:50
43,53299	0,00E+00	2:00:00
43,48235	0,00E+00	2:00:10
43,46788	0,00E+00	2:00:20
43,4281	0,00E+00	2:00:30
43,39193	0,00E+00	2:00:40
43,35938	0,00E+00	2:00:50
43,33406	0,00E+00	2:01:00
43,28704	0,00E+00	2:01:10
43,26172	0,00E+00	2:01:20
43,2147	0,00E+00	2:01:30
43,18938	0,00E+00	2:01:40
43,16768	0,00E+00	2:01:50
43,13513	0,00E+00	2:02:00
43,08811	0,00E+00	2:02:10
42,99045	0,00E+00	2:02:20
42,77705	0,00E+00	2:02:30
42,37558	0,00E+00	2:02:40
41,68475	0,00E+00	2:02:50

B 35C

Temperature	Ampere	Time
37,2215	0,002911	0:00:00
37,16724	0,002911	0:00:10
37,11661	0,002911	0:00:20
37,05874	0,002911	0:00:30
37,01895	0,002911	0:00:40
36,97193	0,002911	0:00:50
36,92853	0,002911	0:01:00
36,87789	0,002911	0:01:10
36,73684	0	0:01:20
36,4945	0	0:01:30
36,35344	0	0:01:40
36,26302	0,002911	0:01:50
35,87963	0,003882	0:02:00
36,08218	0,002911	0:02:10
36,39685	0,003882	0:02:20
36,46918	0,002911	0:02:30
36,57046	0,002911	0.02.40
36,54876	5,45495	0:02:50
36,46556	5,282208	0:03:00
36,46556	5,233685	0:03:10
36,43301	5,246301	0:03:20
36,4511	5,269592	0:03:30
36,48003	5,28609	0:03:40
36,48727	5,26377	0:03:50
36,4945	5,272503	0:04:00
36,51258	5,258917	0:04:10
36,50535	5,258917	0:04:20
36,54876	5,309381	0:04:30
36,56684	5,280267	0:04:40
36,57769	5,26571	0:04:50
36,60301	5,262799	0:05:00
36,62109	5,256976	0:05:10
36,62833	5,267651	0:05:20
36,64641	5,28706	0:05:30
36,6645	0,217383	0:05:40
36,61386	0,001941	0:05:50
36,58854	0	0:06:00
36,55599	0	0:06:10
36,51982	7,077557	0:06:20
36,60662	5,28609	0:06:30
36,6428	5,256976	0.06.40
36,65726	5,28512	0:06:50
36,66811	5,261828	0:07:00
36,68258	5,295794	0:07:10
36,71513	5,258917	0:07:20
36,71875	5,257946	0:07:30
36,74045	5,266681	0:07:40

B pH12

Temperature	Ampere	Time
39,72439	0,002911	0:00:00
39,62312	0,002911	0:00:10
39,49653	0,002911	0:00:20
39,39525	0,002911	0:00:30
39,30483	0,002911	0:00:40
39,21079	0,002911	0:00:50
39,13484	0,003882	0:01:00
39,06612	0,002911	0:01:10
38,91059	0,002911	0:01:20
40,61053	0,002911	0:01:30
42,82769	0,003882	0:01:40
43,67766	0,002911	0:01:50
43,89468	0,003882	0:02:00
43,58362	5,690772	0:02:10
42,50579	5,403515	0:02:20
42,14048	5,317145	0:02:30
41,98133	5,270563	0.02.40
41,909	5,272503	0:02:50
41,86921	5,294824	0:03:00
41,85113	5,310351	0:03:10
41,85474	5,426806	0:03:20
41,85113	5,298706	0:03:30
41,85474	5,326849	0:03:40
41,85474	5,319086	0:03:50
41,87283	5,252124	0:04:00
41,88368	5,344317	0:04:10
41,909	5,273474	0:04:20
41,89453	5,329761	0:04:30
41,909	5,309381	0:04:40
41,909	5,283179	0:04:50
41,92347	6,780597	0:05:00
41,88368	0,002911	0:05:10
41,79326	0,002911	0:05:20
41,71007	0	0:05:30
41,65582	0	0:05:40
41,58709	0	0:05:50
41,54369	0	0:06:00
41,54007	0	0:06:10
41,49667	0	0:06:20
41,44242	0	0:06:30
41,43518	6,284692	0.06.40
41,70284	5,28512	0:06:50
41,72815	5,322968	0:07:00
41,74624	5,266681	0:07:10
41,7607	5,28512	0:07:20
41,78241	5,26377	0:07:30
41,80411	5,276385	0:07:40

36,75853	5,289001	0:07:50	41,82219	5,331702	0:07:50
36,78386	5,268622	0:08:00	41,81134	5,275415	0:08:00
36,7947	5,277356	0:08:10	41,82219	5,284149	0:08:10
36,80917	5,267651	0:08:20	41,82943	5,298706	0:08:20
36,81279	5,266681	0:08:30	41,85836	5,276385	0:08:30
36,84534	5,266681	0:08:40	41,87283	5,296765	0:08:40
36,87428	5,848956	0:08:50	41,88368	5,267651	0:08:50
36,82002	0	0:09:00	41,90176	5,291913	0:09:00
36,78386	0	0:09:10	41,91985	5,417102	0:09:10
36,71513	0	0:09:20	41,85113	0	0:09:20
36,71875	5,907184	0:09:30	41,77879	0	0:09:30
36,7947	5,293854	0:09:40	41,72092	0	0:09:40
36,84896	5,306469	0:09:50	41,74624	5,462714	0:09:50
36,86704	5,276385	0:10:00	41,82943	5,330731	0:10:00
36,86343	5,274445	0:10:10	41,8656	5,330731	0:10:10
36,89598	5,28512	0:10:20	41,87645	5,311322	0:10:20
36,93215	5,288031	0:10:30	41,89453	5,299676	0:10:30
36,94661	5,311322	0:10:40	41,92347	5,339465	0:10:40
36,96832	5,26474	0:10:50	41,94517	5,37149	0:10:50
36,9864	5,295794	0:11:00	41,94155	5,312293	0:11:00
37,00449	5,279297	0:11:10	41,98495	5,342377	0:11:10
37,0298	5,298706	0:11:20	41,98133	5,373431	0:11:20
37,04427	5,325879	0:11:30	41,98495	5,362756	0:11:30
37,08406	5,321997	0:11:40	42,01027	5,379254	0:11:40
37,09129	5,313263	0:11:50	42,03921	5,382165	0:11:50
37,10938	6,730133	0:12:00	42,06814	5,411279	0:12:00
37,05512	0	0:12:10	42,11155	5,393811	0:12:10
37,00449	0	0:12:20	42,10069	0,198944	0:12:20
36,94661	2,975427	0:12:30	42,02112	0	0:12:30
37,03704	5,341406	0:12:40	41,94878	0	0:12:40
37,09129	5,326849	0:12:50	41,84751	0	0:12:50
37,14554	5,341406	0:13:00	41,78241	0	0:13:00
37,15639	5,320056	0:13:10	41,79688	5,531616	0:13:10
37,15639	5,366638	0:13:20	41,9741	5,404486	0:13:20
37,20341	5,375372	0:13:30	42,05006	5,503473	0:13:30
37,21788	5,360816	0:13:40	42,07537	5,477271	0:13:40
37,25767	5,34917	0:13:50	42,11155	5,369549	0:13:50
37,29745	5,37052	0:14:00	42,14048	5,49765	0:14:00
37,3083	5,384106	0:14:10	42,12963	5,532587	0:14:10
37,33724	5,421954	0:14:20	42,12601	5,403515	0:14:20
37,37341	5,461743	0:14:30	42,18388	5,442334	0:14:30
37,40234	5,503473	0:14:40	42,18388	5,457861	0:14:40
37,42405	5,550055	0:14:50	42,2309	5,393811	0:14:50
37,43851	5,330731	0:15:00	42,24537	5,403515	0:15:00
37,42043	5,403515	0:15:10	42,24537	5,387018	0:15:10
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45,57291	5,491827	1:40:30	45,84418	5,460773	1:40:30
45,60185	5,484064	1:40:40	45,88035	5,442334	1:40:40
45,6127	5,494739	1:40:50	45,89844	5,491827	1:40:50
45,65611	5,469507	1:41:00	45,92737	5,469507	1:41:00
45,69951	5,500561	1:41:10	45,96354	5,483093	1:41:10
45,72483	5,482123	1:41:20	46,00694	5,501532	1:41:20
45,75738	5,516089	1:41:30	46,02503	5,511237	1:41:30
45,76099	5,486975	1:41:40	46,0612	5,542291	1:41:40
45,81887	5,477271	1:41:50	46,08652	5,516089	1:41:50
45,8478	5,4763	1:42:00	46,11545	5,485034	1:42:00
45,88758	5,543262	1:42:10	46,15524	5,453009	1:42:10
45,90929	5,482123	1:42:20	46,15885	5,448157	1:42:20
45,9346	5,452038	1:42:30	46,19864	5,470477	1:42:30
45,95269	5,494739	1:42:40	46,23119	5,459802	1:42:40
45,93822	0,002911	1:42:50	46,25289	5,447186	1:42:50
45,8478	0,002911	1:43:00	46,28545	5,459802	1:43:00
45,71759	0,002911	1:43:10	46,30715	5,453009	1:43:10
45,64525	0,002911	1:43:20	46,35778	5,474359	1:43:20
45,54036	0	1:43:30	46,3614	6,581653	1:43:30
45,47164	0	1:43:40	46,25289	0,002911	1:43:40
45,38484	0	1:43:50	46,12268	0,002911	1:43:50
45,30888	0	1:44:00	46,01056	0	1:44:00
45,21846	0	1:44:10	45,90929	0	1:44:10
45,17506	0	1:44:20	45,80078	0	1:44:20
45,11357	0	1:44:30	45,73568	0	1:44:30
45,0557	0	1:44:40	45,65611	0	1:44:40
45,00145	0	1:44:50	45,57291	0	1:44:50
44,92911	0	1:45:00	45,49334	0	1:45:00
44,87486	0	1:45:10	45,40292	0	1:45:10
44,8206	0	1:45:20	45,33782	0	1:45:20
44,76635	0	1:45:30	45,2691	0	1:45:30
44,73018	0	1:45:40	45,21484	0	1:45:40
44,69039	0	1:45:50	45,14974	0	1:45:50
44,61805	0	1:46:00	45,09187	0	1:46:00
44,56018	0	1:46:10	45,02315	0	1:46:10
44,52402	0	1:46:20	44,96889	0	1:46:20
44,48061	0	1:46:30	44,91464	0	1:46:30
44,477	0	1:46:40	44,87124	0	1:46:40
44,4553	0	1:46:50	44,80252	0	1:46:50
44,37934	0	1:47:00	44,7338	0	1:47:00
44,307	0	1:47:10	44,66869	0	1:47:10
44,28168	0	1:47:20	44,61805	0	1:47:20
44,27083	0	1:47:30	44,56742	0	1:47:30
44,2419	0	1:47:40	44,52763	0	1:47:40

44,19849	0	1:47:50	44,477	0	1:47:50
44,16233	0	1:48:00	44,40828	0	1:48:00
44,10084	0	1:48:10	44,37934	0	1:48:10
44,0719	0	1:48:20	44,32508	0	1:48:20
44,02127	0	1:48:30	44,28168	0	1:48:30
43,98872	0	1:48:40	44,25275	0	1:48:40
43,94893	0	1:48:50	44,20935	0	1:48:50
43,90191	0	1:49:00	44,16233	0	1:49:00
43,87297	0	1:49:10	44,12977	0	1:49:10
43,82957	0	1:49:20	44,09361	0	1:49:20
43,78255	0	1:49:30	44,05743	0	1:49:30
43,73191	0	1:49:40	43,98872	0	1:49:40
43,70298	0	1:49:50	43,95255	0	1:49:50
43,65596	0	1:50:00			
43,63787	0	1:50:10			
43,56915	0	1:50:20			
43,53299	0	1:50:30			
43,50043	0	1:50:40			
43,43895	0	1:50:50			
43,41363	0	1:51:00			
43,36661	0	1:51:10			
43,33767	0	1:51:20			
43,28704	0	1:51:30			
43,22916	0	1:51:40			
43,20747	0	1:51:50			
43,15683	0	1:52:00			
43,13874	0	1:52:10			
43,09896	0	1:52:20			
43,0447	0	1:52:30			
43,00853	0	1:52:40			
42,9796	0	1:52:50			
42,93258	0	1:53:00			
42,88918	0	1:53:10			
42,85301	0	1:53:20			
42,81684	0	1:53:30			
42,77344	0	1:53:40			
42,75174	0	1:53:50			
42,69025	0	1:54:00			
42,66493	0	1:54:10			
42,62514	0	1:54:20			
42,57813	0	1:54:30			
42,39005	0	1:54:40			
42,42622	0	1:54:50			
42,22728	0	1:55:00			
41,93793	0	1:55:10			
41,64135	0	1:55:20			
41,38093	0	1:55:30			
41,20008	0	1:55:40			
40,9252	0	1:55:50			

Fiber yield

PM	Accept	Test	Available fiber yield
B	98,75	43 °C	97,79
B	98,47	55 °C	98,18
A	99,35	43 °C	98,8
A	99,46	43 °C	98,91
A	99,28	55 °C	99,23
A	99,49	55 °C	99,44
B	98,73	16 h	98,61
B	98,91	16 h	98,79
A	99,49	16 h	99,25
A	99,41	16 h	99,17
B	98,28	1100 rpm	98,28
B	98,11	1100 rpm	98,11
B	98,17	RH 80%	98,17
B	97,89	RH 80%	97,89
A	99,4	RH 80%	99,4
A	99,61	RH 80%	99,61
B	98,11	900 rpm	96,89
B	98,1	900 rpm	96,88
B	98,54	pH 10	98,17
B	98,33	pH 10	97,96
C	98,99	43 °C	98,99
C	98,96	43 °C	98,96
C	98,91	43 °C	98,2
C	98,97	43 °C	98,26
B	98,8	35 °C	98,6
B	98,99	35 °C	98,79
B	99	pH 12	98,8
B	98,84	pH 12	98,64

Drying

Time(h)	Moisture (%)	Xt (g H20/g Solid)
0,083719566	0,951617802	14,6262272
0,216635165	2,942336192	14,31216434
0,349550764	5,134244206	13,96636109
0,482466363	7,230851872	13,63559276
0,615381961	9,295692755	13,30983608
0,74829756	11,32876686	12,98909103
0,881213159	13,33007417	12,67335763
1,014128758	15,27843685	12,36597696
1,147044357	17,22679953	12,05859629
1,279959956	19,15398436	11,75455672
1,412875555	21,03881347	11,45719933
1,545791154	22,91305366	11,16151249
1,678706753	24,7343492	10,87417839
1,811622352	26,56623368	10,58517374
1,944537951	28,38752923	10,29783964
2,07745355	30,17705799	10,01551718
2,210369149	31,93481998	9,738206356
2,343284748	33,71375981	9,457554442
2,476200347	35,40798823	9,190266904
2,609115946	37,1233945	8,919638273
2,742031545	38,81762292	8,652350735
2,874947144	40,48008456	8,390074839
3,007862743	42,12136833	8,131140037
3,140778342	43,75206319	7,873875782
3,273693941	45,38275804	7,616611528
3,40660954	46,97109718	7,366029461
3,539525139	48,54884739	7,117117942
3,672440738	50,1265976	6,868206423
3,805356337	51,71493675	6,617624356
3,938271936	53,21856447	6,380406667
4,071187535	54,75395897	6,138177336
4,204103134	56,23640883	5,904300741
4,337018733	57,74003655	5,667083051
4,469934332	59,22248642	5,433206456
4,602849931	60,68375843	5,202670955
4,73576553	62,12385258	4,975476548
4,868681129	63,56394674	4,748282141
5,001596728	64,99345196	4,522758281
5,134512327	66,42295719	4,297234422
5,267427926	67,83128456	4,075051656
5,400343525	69,21843408	3,856209985
5,533259124	70,63735038	3,632356672
5,666174723	72,01391097	3,415185548
5,799090322	73,40106048	3,196343877
5,932005921	74,78821	2,977502205
6,064921519	76,18594844	2,756989987
6,197837118	77,5519201	2,54148941
6,330752717	78,90730284	2,32765938
6,463668316	80,28386343	2,110488256

D=26,7mm	0,0267
A=	0,000774
LS =	0,313
x6	0,0002
x5	-0,0043
x4	0,0344
x3	-0,1341
x2	0,3533
x	-2,728
Ad	0,00056
density	0,8502
V0	5,38E-06
h	2,55

6,596583915	81,62865723	1,898328773
6,729499514	82,97345104	1,68616929
6,862415113	84,35001163	1,468998166
6,995330712	85,6418608	1,265191418
7,128246311	86,91253211	1,064725765
7,26116191	88,16202557	0,867601206
7,394077509	89,29504082	0,688852666
7,526993108	90,27981109	0,533491784
7,659908707	91,1269253	0,399848016
7,792824306	91,86815023	0,282909718
7,925739905	92,45054125	0,191029627
8,058655504	92,94822084	0,112513913
8,191571103	93,36118902	0,047362576
8,306361848	93,61532328	0,007269445