

Process oriented measurements and improvements

- *An analysis of the OFCE-process at Tetra Pak BU DBF*

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This article is based on the results of a master thesis carried out at Tetra Pak Business Unit Dairy Beverage and Prepared food (BU DBF) during the spring of 2009. It aims to briefly present the case, the methodology and theoretical framework, the findings and finally some conclusions. The main themes of the thesis as well as the article are process improvements and performance measurements.

1. INTRODUCTION

During the last decades markets have become increasingly competitive due to globalization. As the number of products available has increased, so have the customer expectations in respect to quality, service and price. Companies have thus been forced to become process oriented in order to increase efficiency and effectiveness to provide more value to the customer. An important step in achieving this is to introduce a measurement system that can monitor performance and determine improvement areas.

Tetra Pak BU DBF is a company within Tetra Pak that produces processing equipment for dairy products, beverages and prepared food. During the last years BU DBF has become process oriented and at present they are working with introducing the *lean philosophy*. To overview the progress they in 2005 introduced a measurement system called 'New Milestones' which measures the internal delivery accuracy in the order fulfilment process (OFCE). The results from the last two years indicate issues in the process and the delivery accuracy target towards the external customers is only met through the use of overtime and excessive resources.

2. PURPOSE AND OBJECTIVES OF THE STUDY

The study is constituted by a critical analysis of the OFCE-process as well as of its measurement system, focusing on identifying improvement areas. The process in Lund is going to be used as benchmark for Tetra Pak's plants in Greenwood, USA and Shanghai, China and thus it is important that first identify and eliminate issues here, both in process execution and the measuring of it.

Based on the problems mentioned in the introduction three objectives were formulated:

- The first objective was to establish a good understanding of the process and its characteristics.
- The second objective was to analyze the process and identify improvement possibilities.
- The third objective was to describe the measurement system and its connections to the process. The system should be analyzed and improvements should be suggested.

3. METHODOLOGY

In order to fulfil the above described objectives a case study was conducted. A case study is an empirical research method that investigates a contemporary event within its real-life context. The case study relies on multiple sources of information and is the preferred strategy when the questions “how” and “why” are of interest [1]. Since the objects of interest are the *present* process and measurement system, and the questions are of the described nature the choice of research method is well motivated. The case study was supported by a thorough literature research which served as benchmark for the proposed recommendations.

4. THEORY

The theoretical framework used for the study is concentrated around three main areas, lean, processes and performance measurements.

Lean

The original lean concept essentially aims at eliminating *waste* that can be defined as activities that increase cost without generating value to the customers. The focus has historically been on the production workshop [2] but lately it has also been applied to the office environment. The most commonly identified wastes are overproduction, waiting, transport, inappropriate processing, excess inventory, unnecessary movements, defects [3] and unexploited creativity [4].

Processes

Processes are networks of in order linked activities that use information and resources to transform input to output in order to satisfy the customer’s needs [5]. The process framework can be used on different levels, to describe entire procedures or a single activity. Since processes are used to describe the work being carried out in the organization, their designs are of vital importance for the organizational performance [6].

The best way to describe a company’s processes is by visualising them, i.e. by creating process maps [7]. A process map can include different

levels where the main process map is the highest level and constitutes an overview of the organizations most important processes. Process maps should be complemented with process specifications and depending on the extensiveness of the process, it could be necessary to break it down into several levels [8].

Performance measurements

Performance measurements are processes to quantify the efficiency and effectiveness of an action [9]. They can be employed in very different parts of a business, and they can be both financial and non-financial. The purpose of the performance measuring is essentially to determine how the company is doing internally as well as in an external environment and influence people to take actions accordingly [10,11].

There are several attributes that characterizes a good measurement system. Good measures must for example be well-defined and accurate in order to provide trustable results. They should also be easy to understand and communicate, and their results should provide feedback that can be translated into action.

Designing a measurement system is not an easy task and many companies have “succeeded despite their measurement systems, rather than with of them” [12].

5. THE OFCE-PROCESS AND THE NEW MILESTONES

The OFCE-process

The OFCE process starts when an order is received from one of Tetra Pak’s market companies. The market company (MC) has, prior to this, worked out an agreement with the end customer which has been specified into an order.

The OFCE-process essentially includes five steps.

The first step of the process is all about developing an understanding of the order specification and on assigning personnel to the different roles. When this is done budget cost and transfer price are determined.

Following this is the creation of the technical specification and the creation of configuration documents for the design of the equipment. The latter among others include flow diagrams and the order BoM (Bill of Materials). When these are done there is a planning meeting where all aspects regarding the production of the order are clarified.

Following the planning meeting is the engineering of the different components. This work includes designing the process according to the requested performance, programming the automation software used to operate the machine(s) and the creation of the mechanical design drawings used in assembly. This phase also involves costs calculations and the purchasing of non-stock parts.

When all the machine specifications are done and the ordered components have arrived, the machine is ready to be assembled. This step of the process includes the bending of pipes, assembling, welding of components (manufacturing) and electrical wiring. Once the machine is assembled and ready, it can proceed to the next step, the workshop tests.

This last step exists to ensure that the machine follows the specifications, that it is correctly assembled and that the software is correctly programmed. When tests are completed and possible deviations from specifications are corrected, the machine is packed and sent to the customer's site. There it is installed and tested until it is meeting the agreed performance specified in the order/contract.

New Milestones

The 'New Milestones' is a measurement system used to track the performance of the OFCE-process. It focuses on measuring how well the planned ready dates for the main activities are

met. The system compares the actual ready date with the planned ready date and monthly presents how many of the orders that were on time for each activity.

The New Milestones is currently constituted by twenty measures which evaluate the performance of the OFCE-process from end to end. Since poor results in one part of the process could be related to problems in previous parts it is necessary to have a holistic view.

6. CURRENT SITUATION AND IMPROVEMENT POSSIBILITIES

The OFCE-process

The OFCE-process is well mapped and planned but still contains a number of improvement possibilities. The issues mostly exist in the interfaces and handovers between functions, where both sides has a responsibility and an interest to contribute to a better solution.

One major problem is that orders are not fully and correctly specified when received from the market companies. The additional time spent on clarifying the order delays the start of the process and time lost here is hard to catch up later. Since both sides of the handover exist within Tetra Pak, there is a common interest to improve. The market companies should make sure that they do not place an order until they have all the necessary input from the end customer, and BU DBF should make sure that order forms and instructions are clear and up to date.

Another interface where problems exist is the relation with the suppliers. Neither BU DBF nor the suppliers follow the agreements stated in the contract. BU DBF often requests a shorter delivery time than agreed upon, while suppliers sometimes confirms a longer delivery time than agreed upon. In some cases the suppliers even deliver later than they have confirmed. BU DBF first has to make sure that their process comes to a good start and that the contracts are aligned with process specifications. There also must be a dialogue with the suppliers about what

consequences late deliveries have, and how they could be avoided.

Other issues are related to deviation from process specifications in the daily work. The process specifications state that all the additional time spent clarifying an order should be added to the delivery date. This is not done at the moment.

The improvement possibilities does not only cover the work conducted in the process, but also the systems and documents that supports it. Delays can occur as a result of inaccurate templates, which have to be corrected. Inaccurate template also increases the risk of mistakes, which take time to correct.

Other causes of delays are high workloads and insufficient competence.

New Milestones

After a thorough analysis of the measurement system several issues could be identified. These could basically be classified as either design and measuring issues.

The first two Milestones focusing on the order receiving and clarification are not measuring what is intended. The given time specified for certain activities are given in workdays while the measuring measured differences between dates. When working with tight deadlines this has a significant impact on the results.

Another major issue with the 'Order Confirmation Milestone' is that the system cannot handle a long clarification phase, as it is specified in the process description. This issue can only be resolved through the introduction of a 'Date of clarification' to the measurement system.

An issue primarily related to the Milestones measuring the BoM and the automation software is ambiguities in how to handle revisions and changes (i.e. when there are two ready dates for the same Milestone). Researchers stress the importance that

measurements should be clearly defined, and this includes handling every type of possible scenario.

In relation with the ordering of components it has been identified that the Milestones called 'Materials, Confirmed date' and 'Materials, Requested date' are not measuring what was intended, indicating a better performance than what was the actual case. This has diverted focus from a problem area and redesign of the measures is needed to reflect the true performance.

All the Milestones related to the performance in the workshop are handled in the same way. They are taken from the ERP-system and put through several filters. Unfortunately this treatment does not guarantee that the data presented is what was intended. The recommendation is that the filters are adjusted, to make sure that only the correct and relevant data pass through.

The issue with 'Delivery Accuracy Milestone', the most important of the measures, is that it is based on opinion rather than objective facts. If an order is late there is always a possibility to do a review of the reason and change it manually. It is important that the measures do not leave any room for subjectivity.

7. CONCLUSIONS AND RECOMMENDATIONS

Deviations from the process descriptions

In general the process design seems to be followed and only a couple of deviations from the directives were identified. On the other hand there are strong reasons to believe that these deviations are causing problems in the handling of the orders. All deviations from process directives should be eliminated to be able to observe the true process performance.

Delays throughout the process

The clarification of orders takes too much time and delays later stages of the process. At the same time, the engineering is suffering from

delays due to revisions of the BoM. To reduce delays in these phases, feedback on the reasons of the delays should be collected.

In relation with purchasing of components the observed problems are related to late deliveries from the suppliers. To solve this problem dialogue, incitements and fines could be used.

In the testing of the produced equipment, most of the interruptions are related to problems originated in the previous phases. Here feedback is available but it is not always used for driving corrective actions.

Evaluation of the measurement system

The OFCE-process has some issues but the bad results indicated by the 'New Milestones' are also related to problems with the measurement system itself.

The most prominent issue is that the 'Order confirmation Milestone' does not take into consideration that orders needs additional time to be clarified. Further, the Milestone measuring the ordering of components do not measure what was intended and thus the results are not indicating the real process performance.

In general the Milestones need to be reviewed both in terms of design and measuring procedures.

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