Popular Science Summary

Stainless steel is used all over the world and one of the areas of use is brazed plate heat exchangers. During the brazing process of the heat exchangers, the stainless steel withstands high temperatures, which affect their properties. Properties as mechanical strength and corrosion resistance is affected. During this thesis, two different coils of the same stainless steel is evaluated. However, the two coils have slightly different compositions. The two coils will undergo three different heat treatments, where different amounts of nitrogen pressure will be present during the brazing. The length of the heat treatment is varied. In one of the short brazing cycles, where the lowest amount of nitrogen is present, is called the short cycle. In the longest brazing cycle, a higher nitrogen pressure is present. This cycle is called the long cycle. Lastly, the shortest cycle with the highest nitrogen pressure is called the modified cycle. The different compositions of the steel can be described similarly to different ingredients when baking. The different brazing cycles compared to different programs in the oven, such as vapour heating and under heating. In different cycles different amount of vapour of nitrogen is present. The different ingredients give different taste of the bread, and different properties of the steel.

All these samples were evaluated by their mechanical, compositional, surface and corrosion properties. In the stainless steel it is known that different alloying elements has different effects on the properties of the steel. For instance, the most important alloying element is chromium. Chromium is the element that gives the steel their stainless steel character. Chromium can be described as a protective raincoat, sheltering the steel from moisture and oxygen. Keeping the steel dry and protecting it from rusting. Elements as nickel also elevate the corrosion resistance of the steel and molybdenum both increase the steels mechanical strength and corrosion resistance.

The different analytical methods showed that the highest nitrogen pressure gave the highest corrosion resistance and the strongest steel. However, the steel was also more brittle than the other samples. The nitrogen had also penetrated the steel. The elevated nitrogen can be compared to the stainless steel carrying an armour. The armour protects the steel from corrosion and also makes the steel stronger. However, the armour makes it harder to move and the steel is not as flexible anymore, making it more brittle. The samples that were heat treated in the longest cycle had the highest grain growth. These samples had the lowest mechanical strength. The low strength of these samples is due to the large grains have lower resistance to prevent slip planes, where the slip planes lead to breakage of the steel. The tests indicate the higher the chromium content in the stainless steel, the higher corrosion resistance, and the heat treated samples with the smallest grains had the best mechanical properties.