

# Understanding influential process parameters of NPK fertilizer production; A study on prilling process in the NPK3 prilling tower (POR)

**Master's thesis number: 18-22**

## **Introduction and background:**

In the last decades, notable problems have occurred when producing specific NPK products in the NPK-3 factory, located at Herøya, Porsgrunn. The main result of these problems are the production of prills that vary in both size and shape, both qualities that are important for the end-result that the farmers obtain. Ideally, the prills would be spherical, to reduce abrasion and loss of material through handling and transporting, while also reducing problems related to end-user dispersion. However, prills that are considered non-spherical are becoming an increasing problem. In order to combat this problem, a large undertaking has been made to try and assess the root causes of these non-spherical particles (NSP). This thesis is an attempt at providing a basis for understanding the physical nature of the NPK products, and how they behave in the prilling tower. This is done through the lens of a heat and mass balance model.

## **Problem description and objective:**

The key purpose of this thesis is to develop a model which can properly identify the influence of different process parameters on compound fertilizer prills temperature development and crystallization during their descent in a prilling tower. The objectives were 4-fold:

- Develop and program a heat and mass balance, based on previous work and proposed upgrades.
- Perform a sensitivity analysis to assess parameter influences on thermal behavior.
- Investigate crystallization of four specified focus grades, produced at Herøya.
- Assess product quality by connecting temperature simulations to degree of crystallization of the different focus grades.



### **Candidate:**

Anders Aaland Ytterbø

### **Telephone:**

+47 93008153

### **Email:**

Anders.ytterbo@outlook.com