

## Topic: Application of machine learning approaches for optimization of energy consumption of industrial plants

Driven by high expectation for industry 4.0 goals and outlooks of digitalization, process industry would highly appreciate an intensive integration of artificial intelligence and machine learning approaches in process control solutions. Nevertheless, a rapid transfer of research results to practice remains a challenge due to specific properties of each technological case and crucial requirements on amount and classification of data.

We offer an opportunity to actively participate in the digitalization of process industry through application of machine learning methods in an industrial environment.

Your task will be to develop an algorithm to optimize a control strategy for a coolant production in brewery cooling plant based on the analysis of process data and application of machine learning algorithms for forecasting of technological variables.

The production of coolant and especially starting mode of compressor units require a significant amount of total energy production of a whole brewery. The optimization goal is therefore to keep compressors in a smooth production mode avoiding starts and restarts for a longer possible period of time stabilizing the energy consumption at the level of 50..75% of the approximate peak capacity of 350 KW.

The forecasting of energy consumption will support control algorithm in an implementation of intelligent control strategy - do not stop compressors under certain technological circumstances if there is a significant probability of the raise of coolant consumption in the coming minutes.

The proposed work consists of the following parts:

- Analysis of cold production process
- Possible approach:
  - calculation of energy consumption in critical modes like unit start or restart
  - definition of potential savings on avoiding these modes
  - identification of the case intensity based on available data, i.e. how frequently the restarts take place
- Selection of relevant process variables
- Implementation and application of machine learning prediction models for a forecast of plant energy consumption and comparative analysis of the results
- Implementation of state forecast algorithm as a component of a control strategy for minimization of energy consumption
- Industrial tests and verification of results

The thesis must contain a detailed description of all developed and used algorithms as well as a profound result evaluation and discussion. The implemented code has to be documented and provided. An extended research on literature, existing patents and related work in the corresponding areas has to be performed.

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