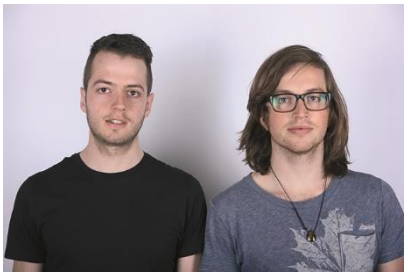
Zurich University
of Applied Sciences

School of
Engineering

InES Institute of
Embedded Systems

Energy optimsation of industrial motors in a milling plant



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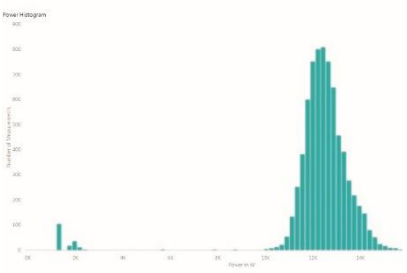
BühlerAG is a globally operating plant engineering company. Its core businesses are planning, erecting and commissioning food processing plants, mainly flour mills. Traditionally, BühlerAG has delivered rather generously dimensioned three-phase drives in order to provide the customer with a more powerful plant than they had initially specified. However, this overdimensioning results in higher energy consumption and hence additional costs. In a milling plant, the most important drives are compressors, blowers, fans and the drives of milling machines. These motors generally being in constant use and having a large rated power, they are responsible for a large share of energy costs. The aim of this project is therefore to measure power and energy values of selected motors with a system by Wago and to evaluate the collected data for saving potential. In this engineering project, an IoT gateway which reads the previously mentioned power and energy measurements with transmission protocol Modbus/TCP over Ethernet is programmed. The gateway then forwards the data to the Microsoft Azure Cloud. There, the data is evaluated in regards to energy saving potential. Based on motor parameters like rated power, type of drive and nominal efficiency, it is possible to estimate the energy saving potential of a particular drive with the aid of mathematical approximations. Another Microsoft service called Power BI is used for the final visualisation of the findings. To test the accuracy of the approximations and the validity of the entire system, it was installed into a milling plant. While only 65 of its 249 motors were measured, the selected motors make up a 84% of the power consumption. Using this data, it could be found that if the 16 motors with the highest saving potential were exchanged with a more efficient model, up to 3000 CHF could be saved. Costs could be saved to a similar amount if all idling motors were switched-off completely. These savings amount to 4.4% of the annual electrical energy costs for the surveyed milling plant. The system was assessed to pay back the original costs for measurement equipment within two years. Thus, milling plant operators can make use of the system at hand for their own benefit. Based on the respective outcomes of the individual analyses, they may initiate targeted measures in order to operate more efficiently and therewith save costs.

Detail of the visualization. The selected motor runs on average with 80% of its rated power as indicated with the bar graph. The black line in the graph shows the automatically detected idling power.



With this histogram of the individual power measurements of this motor the left accumulation is discovered as idling power of approximately 1.8 kW.