Energy savings in the range of five-digit amounts in Euros per month

Volumetric flow control reduces energy consumption in pre-treatment for painting

Saving resources and minimizing the CO2 footprint is on the agenda of almost every company. A leading manufacturer of steel wheels took action in the pre-treatment for painting with the Ecoclean DFC dynamic volume flow control system. By controlling the feed pumps precisely to demand the company saves around 12,000 Euros per month - and this already in the adaptation phase.

Since 2018 the Accuride Wheels GmbH in Solingen belongs to the US American Accuride Corporation. The headquarters of Accuride Wheels Europe & Asia are in Solingen. The company produces wheels for the automotive, utility vehicle, agricultural and construction machinery industries at several national and international plants. The location in North-Rhine-Westphalia with approximately 350 employees has been specializing in the production of steel wheels for the utility vehicle industry since 2020, prior to this they also produced wheels for passenger cars. Practically all truck manufacturers are among their customers, to whom the wheels are delivered in the paint they desire. All production sites have their own inhouse painting lines for pre-treatment, cathodic dip priming and application of top coat.

Saving energy and reducing the CO_2 footprint

In order to produce CO2 neutrally by 2038 at the latest, the company is implementing measures step by step to save electricity and gas. Accordingly, the aim was to make the paint shop's pre-treatment system dating back to 1971 more energy efficient. It comprises eight spray zones for the degreasing, activating, phosphatizing, passivating, and rinsing process steps. The respective process fluids are delivered by pumps with motor ratings between 15 and 42 kW, and the operating pressures had been indicated by analog pressure gauges so far. 'Since none of the pumps were operated with closed-loop control, they ran full-time at 100% power in a three-shift schedule. Excess fluid was returned unused via bypass lines, leading to a significantly higher energy demand than necessary' says Peter Fuchs, expert for surface technologies at Acccuride Wheels.

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'An article in a specialized magazine drew my attention to the Ecoclean DFC dynamic volume flow control system. After having established contact by phone, an employee from Ecoclean inspected our equipment on site and noted the technical data and the energy consumption we have had so far.' The DFC control system is a hardware and software solution developed by Ecoclean. It facilitates automatic, precise and fast control of the pumps in line with actual demand based on the measured quantities pressure and volume flow.

Potential analysis as decision-making tool

Based on the process, production and equipment data and the previous energy consumption, Ecoclean performed a potential analysis. It considered the fact that the transport racks do no longer have two car wheels and one truck steel wheel as before, but only two wheels for trucks. The analysis forecast an energy reduction of approximately 40 per cent. 'Due to the high saving potential and the resulting short payback period of less than twelve months, we decided to install DFC control into the different process media circuits. It was also important for us that we would not be installing any no-name products in our equipment', says Peter Fuchs. In order to meet the process-specific requirements of delivering media to the different zones of the U-shaped pre-treatment line, a total of eight DFC controllers were integrated.

Controlled in line with demand based on operating pressure and volume flow

Control is based on the operating pressure defined for the respective media circuit, and the corresponding volume flow. In order to be able to measure both, electronic pressure and volume flow sensors were installed in the existing supply lines of the zones and each feed pump was fitted with a variable frequency drive (VFD).

As the VFDs could not be integrated into the existing switchgear cabinets for lack of space, they were installed on special mounting panels. The pressure and volume flow values determined by the sensors are continually transferred to the DFC control software that has been custom-adapted to Accuride Wheels' needs. The respective pump is controlled as a function of current demand, delivering the actually needed quantity at the actually required pressure.

Installation without production shutdown

The pre-treatment line at Accuride Wheels operates five days a week in three shifts. For an integration without interrupting production, numerous work items such as installation of the VFDs, preparations for installation of the sensors and cables were carried out offline. The actual integration of the DFC controllers could thus be made on three weekends without interrupting production.

'From consulting via project planning to implementation, Ecoclean optimally supported us. The company's expertise and their technical support are definitely beneficial for us,' comments Peter Fuchs. The surface technologies expert sees another advantage in the clear indication of pressures and volume flows at the individual nozzle assemblies. 'In a certain way the system monitors itself, and this visualisation of process data also increases process reliability.'

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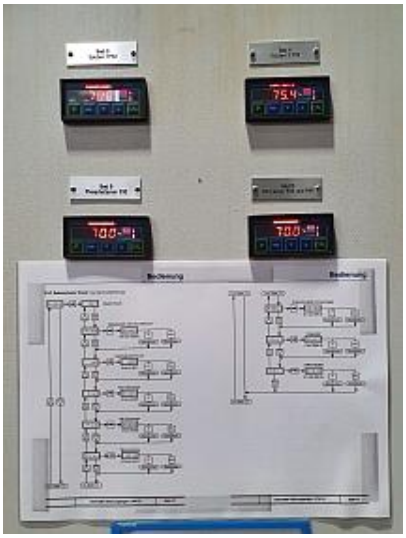
High savings already in the adaptation phase

We have been working with the DFC controllers since February 2022. Right from the beginning the pumps were set to 80 percent of the previous power. To ensure the quality of the paintwork on the one hand and to fully exploit the existing savings potential on the other, the settings continue to be adjusted further step by step. 'After each change of pressures and flow rates we check the quality of pre-treatment via SEM images. As soon as we have the parameters for a zone, we move to the next. As these adjustments are made in parallel to our daily business and other projects, it takes some time', explains Peter Fuchs. 'However, we are already seeing savings of approximately 12,000 Euros per month.' As a result, the project has already been presented at the second German production site in Ronneburg. 'As soon as we will have completely fine-tuned our equipment here, we also want to present it as pilot project at other sites, e.g. in France', adds Peter Fuchs.



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