Kautex Textron GmbH & Co. KG is the world’s leading producer of plastic tank systems for auto manufacturers. At its headquarters in Bonn-Holzlar, the company makes products such as multilayer coextruded tanks. Kautex develops and manufactures all expertise-rich and quality-relevant production facilities in-house and relies upon Siemens control and drive technology. Hence, at the nearby Siemens Application Center (APC) in Cologne, the applications and equipment of the tank manufacturer are well known. In light of the availability of more energy-efficient solutions than DC drives for large coex blow molding systems, the Siemens experts suggested a machine and system energy analysis. With energy costs becoming a major consideration for manufacturing companies, Kautex was eager to find out if and where significant energy savings could be achieved, e.g., through retrofitting, to improve the cost situation.

Interfaces for recording energy data

With APC Cologne, Kautex developed a project with the aim of performing an energy analysis of a coex blow molding system. The project partners determined the required measurement setup (type, location, and number of measuring points) and developed a measuring kit that can be used in the future for other energy analyses. This mobile system is easy to install and causes minimal disturbance to running operations.

At the heart of the measuring kit is a Simatic HMI IPC677C panel PC installed with a Simatic WinAC soft PLC and the Simatic Step 7 software package for engineering, powermanager for recording energy data, ServiceLab for access to Simatic process images, and an SQL database. The panel PC has all of the interfaces prevalent in industry for centrally bundling and preparing recorded energy data via Industrial Ethernet and switch or LAN adapter or Profibus DP.

A total of 23 of Siemens’ Sentron 7KM PAC4200 measuring devices were installed at various positions in the blow molding system; these delivered energy data from the primary AC loads to the panel PC via the Ethernet network. The DC component loads were recorded via analog input modules for Simatic ET 200M and saved with the other data in the SQL database. The total system load and the individual loads of the hydraulic and vacuum pumps, blowers, fans, heating and cooling units, and handling systems, among others, were recorded and analyzed.

Energy management

The global ISO 50001 standard has been effective in Germany since April 2012. This energy-saving standard defines binding criteria for companies to create sustainable energy management. Siemens offers a unique portfolio for operational energy management in industry. We divide operational energy management into three phases:

- **Identification**: company-wide transparency of energy flows
- **Evaluation**: pinpointing savings potential
- **Implementation**: measures for increasing energy efficiency

Kautex and Siemens have analyzed the energy flows in a coextrusion blow molding system to identify possible savings potential.
Identifying main consumers

The main consumers in the blow molding system were found to be the main DC drives (screw drives) for the six extruders with rated outputs of 18 kW to 170 kW. To minimize the efforts required for measurement, only the consumption data of the largest main drive were recorded in detail, with the other consumption being calculated as fractions thereof. For this purpose, the loads of the extruders that were not measured were recorded as percentages. At the same time all operating states (start-up, automatic, fault, pause, etc.) occurring over a seven-day production period were recorded from the Simatic control system via the ServiceLab program and included in the analysis.

The recorded energy data were analyzed and visualized using Microsoft Excel. The measured quantities were displayed in the form of characteristic curves (for example); predefined and freely configurable reports were created and key figures determined. This enabled energy requirements to be assigned to actual consumption, for example, in the form of an energy flow diagram (Sankey diagram), which shows the distribution of energy flows in a plant. The largest energy consumers were identified and various measures formulated to optimize the energy input.

One of these energy-saving measures is the use of the latest Simotics M-1PH8 synchronous servo motors with the Sinamics S120 drive system. The entire drive train proved to be much more efficient (88%) in the observed partial load range than the previous components had been. Extrapolation for the largest extruder yielded savings of up to 40%; the same also applied to the remaining screw drives.

Additionally, further energy savings could be realized at low costs, for example, with
• state-of-the-art, on-demand hydraulic servo pumps
• innovative, automated shutdown concepts (application solutions) during breaks (planned) or failures (unplanned)
• machine-oriented compensation systems avoiding transformation and line losses through reactive currents, and possibly enabling smaller wire sizes

The total load in the blow molding system was thereby reduced by 20 to 30%. “The energy analysis already paid off just because we now know where the greatest savings potentials are, and how to achieve them,” summarizes Günter Linden, director of global operations at Kautex. “This knowledge can be used in the next new development or any upcoming modernizations.”

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