All-in-one profile section extrusion

Single extrusion line for profile sections with consistent automation from a single source

Coating International 10/10

Not only optically, but also technically, a new profile section extrusion line from Austria presents itself completely rounded in many ways: The appealing exterior designed by industrial designers encloses the complete extrusion know-how of three renowned specialists and an equally integrated automation technology from the world market leader. This is a proven combination that has been brought in close cooperation to series-production readiness.

The HTE Group with headquarters in the Austrian town of Korneuburg near Vienna is a fusion of Theysohn Extrusion, Topf Tooling and Technoplast, companies well-established in the extrusion industry for many years. The HTE abbreviation stands for High Tech Extrusion and the high claim of the group that considers itself to be the only true "all-in-one" supplier of the industry sector. Namely, as union, the group has comprehensive competency in the development and manufacturing of extruders (including worms and cylinders), downstream equipment and also extrusion tools. This provides the concentrated know-how for the further industrial optimization of the complete extrusion chain, starting with the material feed and ending at the stacking table. The Austrian company favors Siemens electrical engineering, control and drive technology throughout the electronic/electrical backbone of this chain. This was also the case for the current new development of an integrated, modularly constructed extrusion line. The company set the goal here to combine a significantly higher yield rate, plant and energy efficiency with the simplest possible use, handling and maintenance. The claim for integration is also shown in the now standardized design of extruders, vacuum calibration table and haul off / separator. One seeks in vain for the hoses and cables typically found in extrusion lines. These have been replaced with multipole connections for energy and measuring signals between extruder and die, fast-coupling blocks for vacuum and water between the calibration table and tool and a practical installation level between tool and calibration table. Thanks to the modular construction, the latter can be delivered in all required lengths. Despite all innovation and layout freedom, full downwards compatibility is maintained so that conventional tools can be used without any restrictions. The core goal of a significantly higher yield is realized partially by an optimized plastification and melt processing. For this purpose, the proven worm technology has been further developed and the L/D ratio increased. Frequency-controlled drives at the vacuum pumps and a low water consumption for the calibration table and the tool are significant factors for the further improved energy balance. A highly-efficient gearbox, insulated strip-type heaters, optimized worm geometry, an alternative fan technology and reduced water consumption on the extruder are other features.

Consistent automation from a single source

Even under the attractive cover that supports the work ergonomics, much value was placed on providing consistent, standardized structures: For many years, the High Tech Extrusion company group has been increasingly favoring integrated Siemens automation technology interconnected via PROFIBUS. Such technology is designed to be compatible and has also established a good name for itself for extruding throughout the world. A decisive reason from
the company management's viewpoint: Such automated lines are operable immediately after the commissioning and do not need to be converted at great effort and "made" compatible as some users for heterogeneous systems with controllers from different manufacturers sometimes do. This means all components match perfectly both with regard to the process and the automation on the new HTE extrusion line. The automation concept prepared together with Siemens takes the following form:

- **Robust embedded controller for the highest performance**
  The heart of the extruder control ("TEC4s" – Theysohn Extruder Control) is a SIMATIC Microbox 427C, a compact embedded industrial PC with WinAC RTX real-time extension in the currently highest expansion level and performance class. Because the device operates without hard disks and fans it is predestined for machine-oriented use in the harsh industrial environment, even under increased temperatures (up to +50° C, depending on the installation position and degree of expansion). The Intel Core 2 Duo processor was ideal for separating the operating system and visualization (Windows XP Professional / WinCC flexible) from the real-time process control (WinAC RTX). This allows the line to continue to run easier than previously, even after an operating system "crash", and so shutdown in a controlled manner. Because the programs and the production data are stored on a single CompactFlash (CF) card in the device, they can be quickly replaced by the user if required. This significantly simplifies the service and also permits software updates to be performed easily and without the help of the manufacturer's specialists.

- **Modular I/O peripherals for flexible configurations**
  All input/output signals are handled by the Siemens SIMOTION E510 peripheral system specially developed for applications in the plastics technology. The fast, scalable system integrates analog inputs/outputs, temperature inputs, counter inputs and reference outputs, and handles various I/O quantity structures cost-effectively. Using PROFIBUS DP, it acts as process interface for the extrusion line and bridge to the Microbox controller.

- **Drives and motors for all performance classes and tasks**
  Converters of the SINAMICS G120 series, each driven by motors of the 1LG4/1LA7 series and Siemens Motox geared motors, are primarily used for the wide range of drive tasks on the line. Some of these are operated on motor starters from the distributed SIMATIC ET200S peripheral system. Frequency-controlled vacuum and water pumps have been used for the first time on the calibration table. Some of these run synchronous to each other and only at the required speed and so play a significant role in achieving the high energy efficiency of the line. Specifically, the power of the vacuum pump motors could be reduced from 4.3 kW to 1.1 kW. At earlier plants, the vacuum pumps were always operated at maximum rated speed and the low air pressure required to support the profile section "controlled" using so-called poppet valves; this always causes losses. For the precisely dimensioned separation of the profile sections, the user can always choose between a saw and a guillotine. These are now operated dependent on the position of the haul off. HTE favors the integrated "basic positioner" function of the SINAMICS S120 drive family on the haul off that controls the traversal length and so the profile section length and issues a cut pulse at exactly the correct position.
• **Large-sized HMI for user-friendly process control**
  A swivelable SIMATIC Flat Panel Pro with 19" touchscreen display with full IP65 degree of protection conformance mounted on the extruder is provided for the operator control and monitoring. The line operator can also monitor the process operation of the complete line and intervene when necessary. The additional SIMATIC OP177B operator panel installed on the haul off also permits a fast intervention at the other end of the line and also saves long distances. The manufacturer also installs an identically-constructed operator panel (advantages: standardization and simple spare parts provisioning) in calibration tables sold separately.

• **PROFIBUS for integrated communication and diagnosis**
  All core components of the automation are linked with each other via PROFIBUS. This allows an integrated communication and so also an integrated diagnosis (routing) down to the drive level. Such interconnection also provides the prerequisites for simple remote maintenance and diagnosis via the Internet, for example with a VPN (Virtual Private Network) tunnel using a Scalance S612 security module. HTE service technicians at their office can use this secure path to log into an extrusion line at practically any location in the world and analyze the line down to the smallest detail. The service technician can provide the user with specific help for troubleshooting or make optimum preparation for any unavoidable service calls. Together, these minimize downtimes and help achieve maximum productivity.

**The "everything from a single source" advantage**

"The ordering procedure is simplified significantly when a company can procure practically the complete automation technology of its products from a single reliable partner", stated graduate engineer René Theimer, development manager at Theysohn Extrusionstechnik GmbH that belongs to the HTE group. He added: "Far more important, however, is that the complete use of Siemens components saves a great deal of preliminary harmonization work because the interaction of all components has been proven in advance and so functions without problem". Users throughout the world also know this and often specify the Siemens brand themselves. "At Siemens, they speak our language and they know the specific needs of our processes. This also led quickly to a technical and economically optimized solution even for this complex project", added René Theimers as positive result. The new extrusion line has proved its high productivity and energy efficiency in month-long tests at HTE and in practical application for selected pilot users. The complete package is ideally suited for the profile section extrusion on modern profile section tools with highest throughputs. According to the manufacturer, the first two extruders, including the successor, will be available for the K 2010 trade exhibition; further variants also for the pipe extrusion will augment the series later.