KMK
Tube Time

KMK Maschinen AG in Switzerland, member of the PackSys Global group, has developed a new plastic heading machine (HPM) for the production of seamless tubes. The machine addresses the cosmetic industry's need for rapid changeover times, with complete size changes possible in ten minutes, without the use of hand tools.

25 billion pieces per year and increasing – that is the current number of tubes needed worldwide for packaging various products such as creams, cosmetics, toothpaste, shampoo, mayonnaise, mustard or lubricant. That's an unbelievable sum, which can be rationalized by quickly looking around the house to see what types of products are packaged in tube form. Tubes are mostly available in three different materials: aluminum, laminate or plastic. The demand on the world market is saturated for tubes made of the first two materials. The need for plastic tubes as high-quality packaging is on the increase, in large part due to the increasing worldwide demand for cosmetics.

Patented procedure.

Plastic tubes have the advantage of being able to store products longer. Beautifully designed tubes that are seamless and extremely well sealed can be manufactured and meet the demands on aesthetics for exquisite products. In the 70's, KMK Maschinen AG in Rüti, Switzerland, patented a special procedure for manufacturing plastic tubes. Embedded in the PackSys Global Corporation, the core competencies of KMK are the areas of research, development and construction of machines for tube manufacturing (see sidebar).

To meet the increasing demands for plastic tubes for the cosmetic and food industries, KMK developed a new tube heading machine, the HPM. The patented procedure allows compression forming of the tube head and sealing the tube end to be completed in a single process step. In this way, seamless tubes are manufactured at a rate of up to 120 pieces per minute. An important goal when developing the HPM was shortening the changeover time. Tubes for high quality products are typically produced in smaller quantities than mass produced goods. That means quick changeover of the machine for different tube dimensions increases the efficiency and therefore the value for the tube manufacturer. The sensational changeover time achieved by the new HPM lies under 10 minutes. The cost savings are clear, comparable machines require between 1.5 and 2 hours to complete this task. For the first time, tubes with 22 mm to 64 mm diameter can be manufactured quickly and flexibly on a single machine.

Challenging automation.

In addition to the high level of creativity required in the area of mechanical machine construction, a project of this kind can only be handled with an advanced control and drive system. For easy service and modular expansions, a continuous system for automation is required without system division on the hardware and software levels. To keep wiring to a minimum, a fieldbus system and remote I/O stations are required. The machine dynamics place high demands on the drives. Design and operational ergonomics, as well as worldwide use, require a flexible structure for the visualization. At KMK, the decision was made at the beginning of 2002 to implement a complete automation solution for the HPM from B&R.

The entire machine is controlled by an Industrial PC from the Provit 5000 series. This is also used for the operation and visualization of the system. As for design and ergonomics, KMK didn't have to make any compromises. Machine and operating interfaces were designed according to aesthetic and ergonomic aspects by an industrial designer. The graphic layout of the visualization and adaptation to different languages was handled using Visual Components, an integrated part of B&R Automation Studio. "The scope of the software and the clean concepts were decisive," says Dipl.-Ing. Julius Läubli, Project Manager for Electronics at KMK Maschinen AG. The B&R philosophy "One tool, many targets" will make it easy to adapt future control and operation to the new Power Panel PP200.

Efficient networking.

ETHERNET Powerlink will be used to network a large part of the machine. "The dynamic requirements of the system could not to be met with CAN," states Läubli. With this network, up to 15 ACOPOS drives and four distributed I/O stations will be synchronized in the final stage. "With an 800 µs cycle time for data exchange, we are on the safe side," continues Läubli. "For the heater units, we unfortunately still need an RS485 connection. A Powerlink-capable device is not yet available." The low cabling requirements using standard products from the IT world guarantee modular expandability and reduces maintenance and service work. Wiring is also minimized on the machine. The new, robust X67 I/O modules with IP67 protection are used in close proximity to sensors and pneumatic valves.

The ergonomically designed control cabinet is conveniently integrated in the 250-tube accumulator reducing required floor space.

Connecting the machine in a factory net is also being discussed. ETHERNET Powerlink is based on Internet standards which already allow complete communication on all levels of the factory. Once the HPM is used throughout the world, efficient maintenance and service concepts will be needed. Easy electronic maintenance via the Internet or modem is guaranteed up to the drive and I/O levels using Ethernet protocols. B&R Automation Studio also shows its strengths here. Automation components can be monitored and programmed via any interface and from any point in the world, as if the engineer were standing right next to the machine.

An interesting detail of the machine is the rotary table with tools used for compression forming of tube heads/shoulders and sealing the tube bodies. On this table, an I/O station is mounted on the prototype which records process values. Power supply to the station and data transfer take place using slip rings. "Unfortunately, we couldn't find a slip ring carrier on the market suitable for Ethernet signals," says Läubli. "So we still have to use CAN to connect this rotary station to the IPC." A CAN bus is also used in a few other places where third-party products are not yet available with ETHERNET Powerlink communication. "In the future, we want to tighten up the bus concept, i.e. connect as much as possible with the Powerlink bus," explains Läubli. "We are therefore very interested in finding out which suppliers are developing new products with Powerlink connections."

Modern software architecture.

"We required modern software architecture which could meet our needs," explains Läubli. "A clear hierarchical software system with a high degree of reusability for the program modules was our goal. We also wanted to use the fewest possible number of development tools for programming, error search and maintenance." B&R provides a single software tool – Automation Studio – for all areas of automation, which is exactly what they were looking for. With this tool, the software modules for movement tasks, operation, visualization with multimedia support, management of the production data and many other features are programmed in Automation Basic and integrated into the entire system. The entire project management, adding expansion modules and maintenance are also handled in a uniform manner with Automation Studio. This minimizes programming and training for developers and maintenance personnel.

"We were impressed by the innovation power of B&R," stated Läubli in closing. "There were a few difficulties at the beginning with the new technology and an increased need for knowledge acquisition, but we are very satisfied with our selection. A great deal of know-how is available and the support by the local office in Frauenfeld, Switzerland, helped us reach the goals we set for the HPM." Because of the good experiences KMK Maschinen AG had, PackSys Global Gruppe will now implement solutions from B&R worldwide.

Switzerland kmk maschinen ag

KMK Maschinen AG was founded in the early 1970's. They develop and produce machines for manufacturing plastic and laminate tubes. One of their core competencies is the compression forming of polymers (PE and others) in tube heads and simultaneous connection with the tube body to create a finished tube. This patented procedure allows tubes to be produced in an extremely cost-efficient and efficient manner.

KMK is part of PackSys Global Ltd. (PSG), an international group of manufacturers providing equipment for the manufacture of laminate and plastic tubes, aerosol cans and other aluminum packages, as well as machinery for the production of caps and closures. This group also includes PSG-Wesco Co. Ltd. in Thailand, manufacturer of machines for aluminum tubes, cans and printing machines. Oberburg Engineering in Switzerland manufacturers machines for metal and plastic closures and can shaping. The group has support and service centers in Europe, Thailand, India, China and Japan.