

Advanced Control for Rotational Molding



Rotational molding is a specialized technique for producing relatively large plastic objects such as traffic bollards, road signs and even kayaks. The principle involved is to have hollow molds, each designed for the specific product concerned, which is placed in a rotational molding machine. Powdered plastic is placed in the mold and the machine raises its temperature to the appropriate level and then rotates in two axes. The mold itself rotates through 360° while the whole machine oscillates in one or two planes. The result of these actions is that the plastic powder melts and gradually covers the inside of the mold, taking on the appropriate shape.

At Rototek, a company specializing in the manufacture of product using rotational molding techniques, a program was put in place to maximize the use of material, minimize waste and, at the same time ensure product repeatability. The original control of the machines was by the use of PLCs but this was found

to lack the flexibility required for what is essentially a very complex control task.

A search was made by Rototek for a control system which could be adapted to the needs of rotational molding. After a several months of searching, initially for a programming system for PLCs, Martin Spencer, the managing director of Rototek, met with engineers from Systems Devices, a company which specializes in solving industrial control problems. He was immediately impressed with their positive approach and with the Opto 22 Mystic control system for which System Devices are agents in the UK. Mystic is a very powerful control system which incorporates analogue control functions with digital I/O and which has a sophisticated, computer based programming system, called Cyrano, for ease of set-up. Also there is an MMI package with the system which allows custom screens and operating interfaces to be developed.

Each product produced by the rotational molding method requires an individual mold. In order to optimize the product produced many variables need to be controlled including the oscillation angles of the machine in two planes, speed of oscillation, speed of rotation of the mold itself times of dwell in any position and the number of times a given cycle must be repeated. This can result in hundreds of mold specific operations which need to be stored. It is critical therefore for any control system to be able to store multiple process recipes. Further, it is also necessary to have the correct temperature control profile integrated with the appropriate logic functions.

Rototek began applying Mystic to the rotational molding process, initially by developing the logic functions, temperature control being handled by discrete instrumentation. Using the flexible development tools of Cyrano and with help from the System Devices engineers, the initial control system was up and running within three months with the ability to control up to 110 parameters. Design of the new controller was done live, in parallel with the existing control system, so that production could continue, with the ability to do a 'hot changeover'. The new controller produced significant improvements immediately. Martin Spencer commented, "Many of the products we make are complex shapes which require extremely rigorous procedures to be adhered to in order to achieve the repeatability and quality required. Without the new system the fine control necessary could not be achieved."

Further developments included the addition of the temperature control function which included an algorithm for the protection of the burner. This involved separately controlling the burner temperature as well as the mold temperature to avoid damage. Also full alarm systems were implemented together with full logging of variables so that individual product histories could be archived to hard disk.

The updated control package is now running extremely successfully with the ability to store process recipes with many hundreds of parameters and, Rototek now also sell the control system to other companies which use rotational molding in their production processes.

One such company is Gaybo Perception, manufacturers of high quality kayaks and canoes. In this production process a double ended machine is being used. One end processes the powder in the mold while the other end is cooling the previous product. The cooled product is automatically moved out on a conveyor while the new one is moved in for processing. The Mystic control system has been specifically adapted by Rototek for this type of machine. The aim of installing the new controls was to produce consistently high quality with minimal operator intervention. Graham Goldsmith, the managing director of Gaybo Perception said, "Our need was to ensure consistent wall thickness coupled with repeatability from product to product. The new control system has significantly improved this. Also the ability to carry out historical logging has meant that we can make direct comparisons from run to run. The use of the Opto 22 MMI package on the computer makes the whole operator interface extremely simple to operate."

At Rototek Martin Spencer is extremely pleased with the results obtained. He commented, "My business is about quality products and hence the need to have a reputation for innovation. The Mystic control system coupled with the considerable support from the System Devices engineers is advancing my processes on a continuing basis."

About Opto 22

Opto 22 manufactures and develops hardware and software products for applications in industrial automation, remote monitoring, and enterprise data acquisition. Using standard, commercially available Internet, networking, and computer technologies, Opto 22's SNAP systems allow customers to monitor, control, and acquire data from all of the mechanical, electrical, or electronic assets that are key to their business operations. Opto 22's products and services support automation end users, OEMs, and information technology and operations personnel. Founded in 1974 and with over 85 million Opto 22-connected devices deployed worldwide, the company has an established reputation for quality and reliability. Opto 22 products are sold through a worldwide network of distributors, partners, and system integrators. For more information, contact Opto 22 headquarters at 800-321-OPTO or visit our Web site at www.opto22.com.