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THE MAGAZINE FOR
DIE CASTING INDUSTRY
MANAGEMENT

DIE CASTING MANAGEMENT

Industry Profile:
MOKON DIVISION

Three-zone Mokon Circulating Oil Temperature Control System maintains precise temperature on 700-ton die casting machine producing aluminum parts at AC Rochester Division's Rochester, N.Y. operation.

Persistence and innovation of engineers to "find a better way" lead to formation and growth of company that builds temperature control systems which improve die casters quality and production.

Industry Profile

MOKON DIVISION

The two young engineers sat in the cafeteria of Hewlett-Packard's Palo Alto, CA plant one summer morning discussing a perplexing manufacturing problem over a cup of coffee. Spread out on the table in front of them were a defective die casting and a lengthy report from a research team at Stanford University.

The report had been commissioned by Hewlett-Packard to determine the cause of premature failure in large, thin-walled parts being cast in 360 aluminum. Cracks had developed in the part and a thin projecting area of the die surface had actually broken off.

Prior to receiving the Stanford study, the two manufacturing engineers, assisted by H-P's die casting manager, researched the complete die casting process. Their conclusion was that the die temperature was the only variable in H-P's process over which there appeared to be insufficient control.

So the engineers studied the "good news, bad news" report with mixed emotions. Stanford's research confirmed that more heat had to be added to the die before the first production shot was made and die temperature had to be maintained constant during production in order to reduce thermal shock.

"That's just great!" exclaimed one of the engineers, "They tell us what the problem is, but not how to solve it."

Mokon's Intro to Die Casting

On the way back to their offices, one of the engineers suggested a detour through H-P's plastic molding department. He recalled his experience a few months earlier in resolving an unrelated manufacturing problem and was aware that die temperature control was important to plastic molding processes.

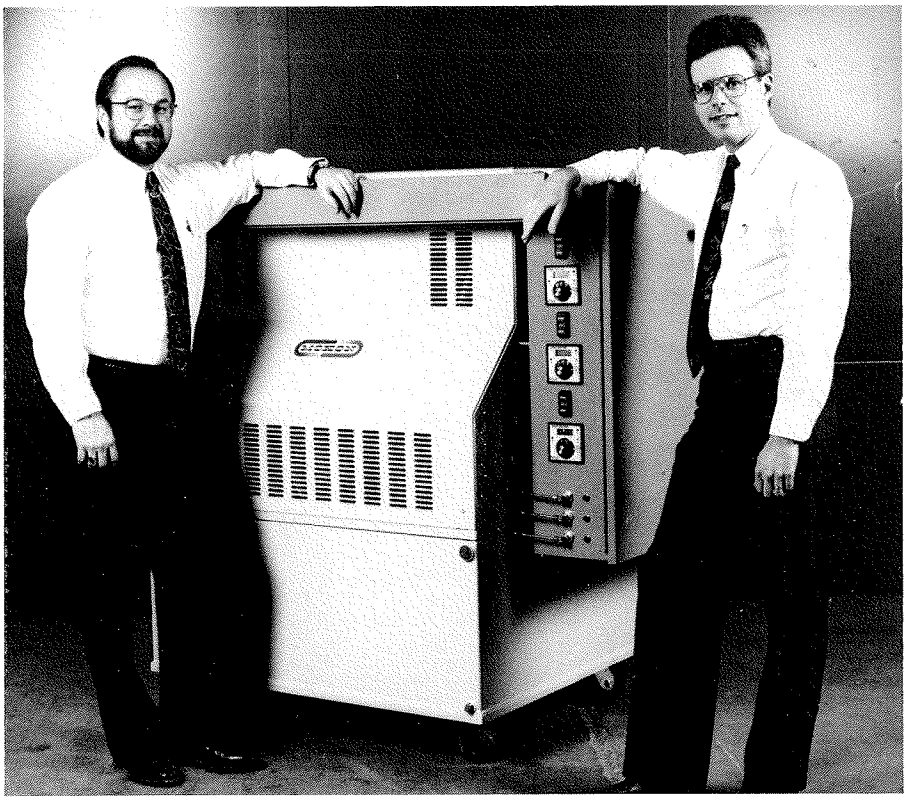
After a bit of coaxing of the department manager, they obtained a small, circulating oil temperature control system, carted it over to the metal die casting department, and began some experimentation.

Following a short series of hit-and-miss trials, they felt that a properly sized system would give them the necessary control capabilities over die temperature. Eight competitive systems were investigated before Hewlett-Packard decided on two high-temperature, three-zone, circulating oil system from Mokon Division, Buffalo, N.Y.

Once the new units were delivered, connected to the die which had oil line passages machined in it, and tested, the results were almost unbelievable. It took about 45 minutes for the die to reach an average temperature of 425°F. In comparison, it previously had taken a traditional radiant heater the same amount of time to preheat the same die to only 180°F...and this 180°F was mostly a die surface temperature, while the hot-oil-generated 425°F was heated from the inside out for a uniform temperature throughout the die.

The conclusion of the H-P test was that the Mokon circulating high temperature oil system did everything its engineers had hoped it would do:

1. Start-up time and die changeover achieved in much shorter periods.
2. Die life increased as much as 150%.
3. Need for die maintenance and repair noticeably reduced.



Tom Valentine (left), vice president, and Bob Erickson, president, with a Mokon Circulating Oil Temperature Control System moving from test to shipping.

4. Part quality improved.
5. Productivity improved due to less scrap.

And so a new market was spawned for Mokon, which during the prior two decades had concentrated on establishing itself as a manufacturer of efficient, high quality temperature control systems for the rapidly growing plastic processing industry.

Its entry into the die casting market, the result of two innovative manufacturing engineers at Hewlett-Packard, is a case of *deja vu* for Mokon. Its own start in the design of efficient mold temperature control systems happened in 1956 as the result of engineers who were determined in their pursuit of "something better than what was available."

Mokon's Beginning

The Mokon history dates back to the time when Protective Closures Co., Inc., a proprietary and custom plastic molder, was pioneering the development of a hot runner injection molding technique for forming polyethylene protective closures.

To maintain uniform high quality in mass production of these plastic caps and plugs, the company needed better temperature control equipment than was then available. More compact, safer—above all more precise and efficient. After trying all circulating liquid temperature controllers, engineers at Protective Closures set out to design and build their own system.

Protective Closures found that the new units worked beautifully. Word got around and soon the company found itself making units for sale to other manufacturers. So, in 1955, the Mokon Division was formed to design, manufacture, and market a full-line of circulating liquid temperature control systems.

Since that time, thousands of Mokon systems have been used in the various applications requiring circulating liquid temperature control, such as die casting, chemical processing, pharmaceutical and food processing related applications.

Presently, Mokon is enjoying its 17th consecutive year of growth, which in part has been due to increased demand from the die casting industry for circulating temperature control system.

The Mokon Line

Mokon's reputation is one of providing a uniquely designed, high-quality system which is dependable and durable under various processing conditions. Even though the current line has expanded considerably and has infused modern technological advances, all Mokon units still possess many of the sound engineering features which made these systems so successful.

Mokon offers a complete line of circulating water systems, which stand apart from the competition by utilizing nonferrous (noncorrosive) materials of construction as standard. These controllers also incorporate a uniquely designed, compact manifold which assures highly efficient heat transfer as well as overall compactness. All water units can be rated to 300°F operating temperature.

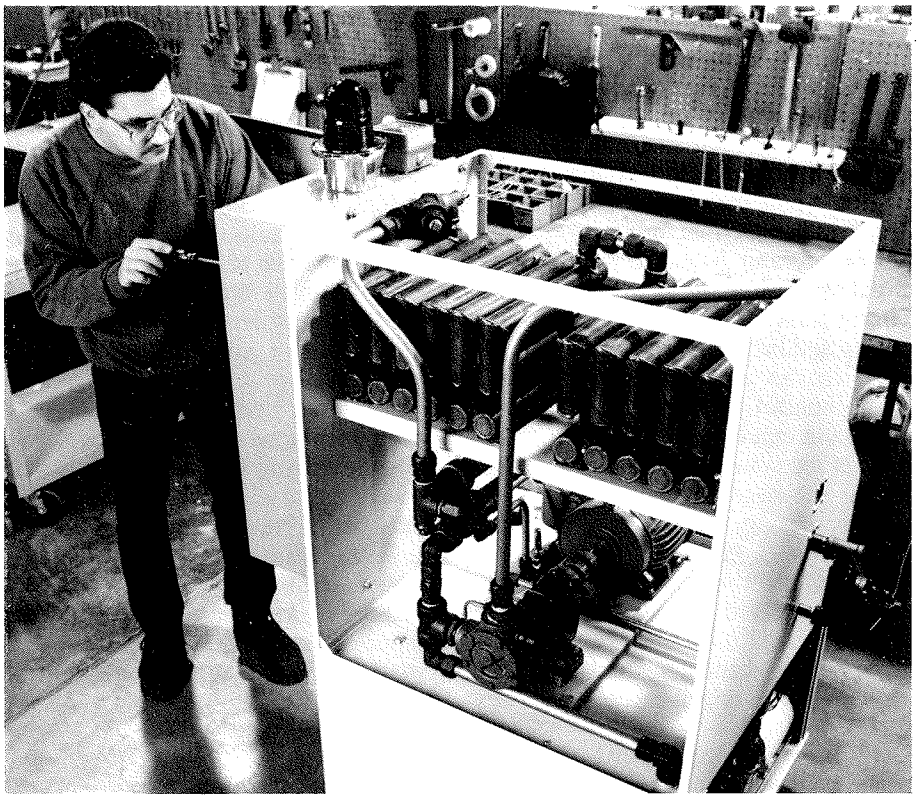
Most commonly used in the die casting industry are Mokon's circulating heat transfer fluid systems. Once again, due to a unique design, these stand alone when compared to others. They offer the most efficient means of heating and safest means of cooling by virtue of the small heating manifold and cool oil reservoir.

The horizontally-mounted heating chambers possess individual heating elements, providing an optimally efficient design to induce high rates of heating, at the same time reducing the breakdown of heat transfer fluid. This modular design also lends itself to easy maintenance and/or replacement of heaters, should one burn out.

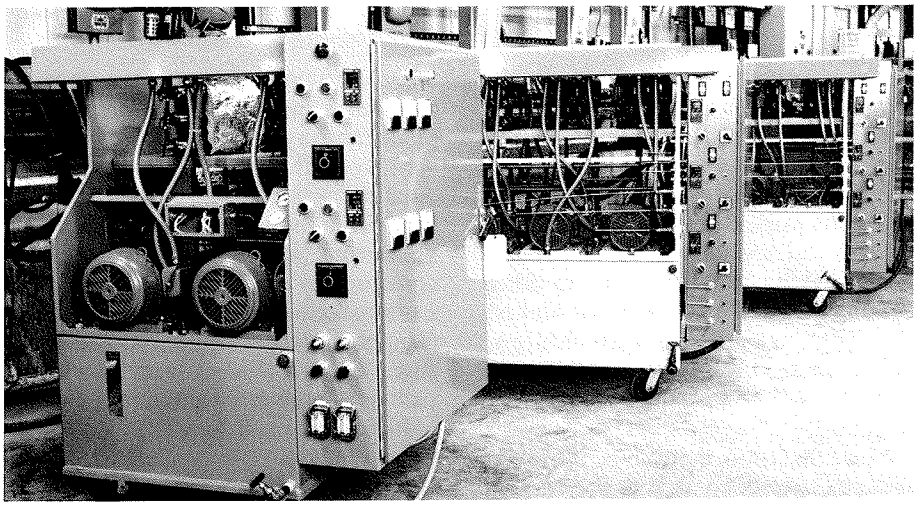
The cool oil reservoir, found only in Mokon system, isolates the heating loop from the cooling loop for more effective cooling and safer operation when in the cooling mode at elevated temperature. By isolating the cooling function outside of the heating loop, a more natural means of cooling the process fluid loop is created, thus eliminating the "thermal shock" associated with in-line heat exchangers.

Thermal shock can cause introduction of steam into cooling water return lines, water hammer and even rupture of the heat exchanger. This reservoir is also utilized as a one-time fill source for the process and is located strategically below the pumping and heating portions of the system to act as a return basin in case of a seal failure or unexpected leak; thus, keeping the processing floor and area free of heat transfer fluid.

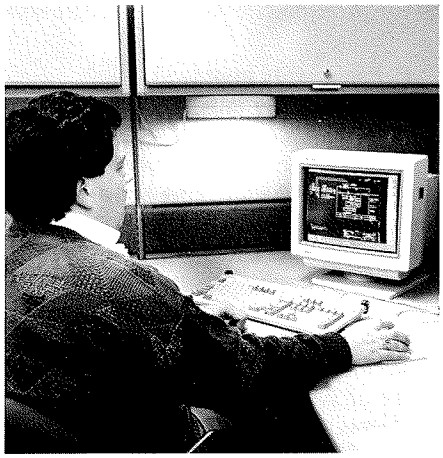
Mokon's heat transfer fluid systems are offered in single, dual and triple zone configuration, with up to 600°F maximum operating temperature. All systems, as standard, are sized with cooling capacities to meet the processing requirements of the customer, or at the very least, a means of cooling for shut-down.



High-temperature oil system, destined for a die casting plant, is shown in Mokon assembly area with oil team lead man, Glenn Wiese working on electrical panel.



A section of Mokon test line where all circulating oil systems undergo rigid, simulated field tests and calibration before released for shipping customers.



Alan D'Ettorre, Mokon senior engineer, at CAD work station, developing customized circulating oil systems.

Keys To Success

In 1983, Protective Closures Company and the Mokon Division were purchased by Mark IV Industries, a Buffalo-area based, Fortune 500 company. Since that time, the current management team was assembled with strong emphasis being placed on product development, continuous improvement, and customer satisfaction.

Heading the team is Mokon's president, Robert R. Erickson, P.E., who possesses 20 years of engineering and management experience between Mokon and a previous position with The Linde Division of Union Carbide. He holds an engineering degree from Clarkson and is a licensed engineer.

Sales and marketing falls under the responsibility of Mokon's vice-president, Thomas D. Valentine. He joined Mokon as its sales manager in 1986 after serving in similar position for a plate and frame heat exchanger manufacturer. He also possesses an engineering degree from the University of Buffalo.

"The key to any company's success in the future and most of the successful ones of the past, is its ability to listen to what the customer wants and satisfy that need," Robert Erickson said. "At Mokon, we have always done it that way, which is why our systems are and always were built to a customer's process with only the options they need and want."

Die Casting Application

Due to the extreme thermal dynamics of all die casting applications, special care is required in properly sizing and constructing a temperature control system. "Mokon representatives are trained to communicate with the customer to learn the actual process and its requirements prior to talking about sizing of systems or the dollars and cents of the equipment," Valentine stated.

"With the information gained from this interaction with the customer, our engineers are able to calculate the requirements of the application, both thermally and fluid dynamically, and propose the right system for the application," said Valentine. "If the system design fits the application, you have a satisfied customer who will receive longer die life, better part quality, and increased productivity."

The basic operation of a Mokon system is to control temperature of a heat transfer medium (usually heat transfer fluid or water) at a set temperature, either by heating or cooling the fluid, to control temperature of a process.

The die caster benefits from the heating capabilities of the system while preheating the dies prior to use (which results in less thermal fatigue to the die, less scrap, and better part quality at initial start-up), and from the cooling capabilities (which results in better part quality and increased productivity).

"With the demand for increased quality control, better productivity, less scrap, and reducing overall production costs in the competitive die casting industry, the need for these systems is ever-increasing, day-by-day," Valentine explained. "Mokon's strength lies in our engineering knowledge of heat transfer related processes and the ability to react to customer's needs with better designed and constructed equipment than available elsewhere."

Continuous Improvement

The commitment to continuous improvement and increased quality needs stem throughout the entire Mokon organization. Engineers, customer service representatives and Mokon technicians interact daily to solve customer problems and look for new ways to improve the Mokon design. "Our biggest asset is our personnel and their commitment to producing and supporting a quality product," Erickson said.

Mokon's new product development and improvements are all results of intercompany communication and customer input. "Improvements in our oil system design as well as newer products, such as The Iceman portable chiller and Leakmaster negative pressure, water leak stopping system all stem from requests from our customers," said Mokon senior engineer, Alan D'Ettorre.

"The need for improvement in our customer's processes doesn't end with what Mokon has to offer from standard catalogs."

Mokon will build a system to meet a customer's requirements even if it has never been done before, or at least they will try. That's how it developed the compact oil system and the full range heater/chiller systems now being marketed.

"Research and development is a living, breathing thing at Mokon," said Valentine. "And we admit proudly that some of the best ideas we instituted into our system were never our ideas at all—they came from our customers."

Without this kind of insight to the needs of customers, Mokon would not be poised as a leader in the industry of circulating fluid temperature control systems today.

For more information on Mokon products, contact: Thomas D. Valentine, vice president, Mokon Division, 2150 Elmwood Ave., Buffalo, NY. Phone: 716/876-9951. **dcm**