SERFILCO® CASE HISTORY

HYDRAULIC FLUID FILTRATION

Trans-O-Filters reduce maintenance costs 85% on injection molding machines at Polymar

Today's quality injection molder using statistical quality control is still bothered by the unknown factor of solids in the hydraulic system of this precision machine. Unlike electronic devices which can be power checked to identify failure modes, the hydraulic system is the hardest to troubleshoot.

Why are hydraulics such a problem? The answer could be dirt. It is estimated that 75% of molding machine hydraulic failures are directly related to contamination of the system oil in the machine.

The oil can become contaminated in numerous ways. First, during construction of the machine, the system is exposed to weld spall which introduces burrs that can come loose during run-in. Also, the system is exposed to a residue of sandblasting grit. Machine manufacturers attempt to remove these potential contaminants along each step of the machine building process. They completely flush the hydraulic system during initial operation. However, neither method can insure that all of the harmful contaminants are removed before shipment.

Another source of potential contamination is the oil that is used to fill the system at the time the machine is installed. Even new oil in sealed drums, or particularly in bulk containers, can contain moisture and some particles.

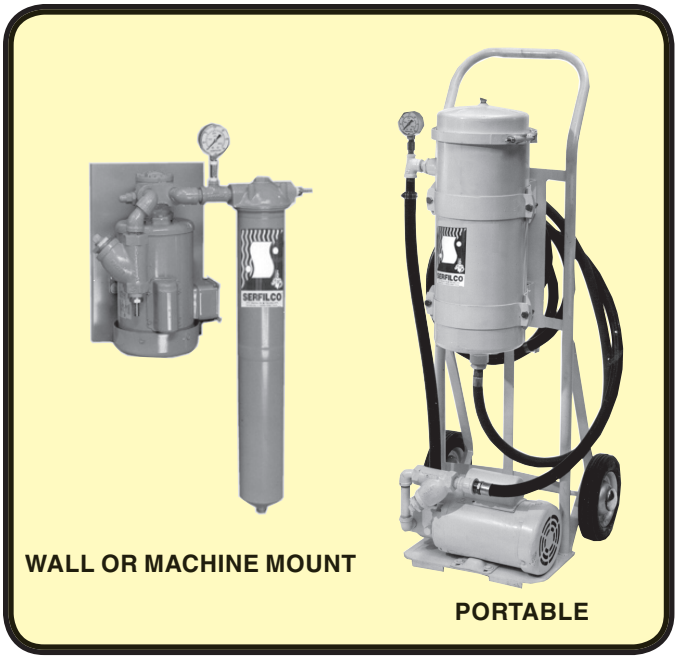
Then, during molding, new sources of contamination are present. Most molders acknowledge that particles exist constantly in the machines' operating environment. Dust from material grinding and transfer are common. Molders fail to recognize, however, that these contaminants are actually sucked in past the air breather on the reservoir of each machine. Also during molding, the hydraulic rams are extended and retracted continuously, allowing the dust to settle on them and work their way past the packings.

Last, but certainly not least, are the opportunities for contamination during repairs to the hydraulic system. Regardless of how diligent the best maintenance crew may be, a machine is certain to pick up particles at some time during its overhaul.

So how does a molder combat the potential for downtime that is caused by the constant battle against oil contaminants? A means of supplemental and independent oil filtration is the answer, and a must.

To meet this problem, John Wolf, General Manager of Polymar (Div. of ASM Industries, Inc.), Leola, PA, consulted with the supplier of his hydraulic fluids and service men from the manufacturer of the in-house molding machines under his care. All agreed that wear in a hydraulic system is inevitable, but since it is caused by dirt, problems could be minimized through the use of filter media to stop the particles as they move from the reservoir to the pump through piping, valves, ram and back to the reservoir.

Wolf felt that he needed more filtration capacity. His aim was to circulate the oil through a filter on a bypass basis, using denser filter media which could trap smaller particles.



He recognized how increased flow and dirt holding capacity in the filters would work to his advantage and provide additional insurance for his operation. Therefore, several SERFILCO Trans-O-Filters were purchased and fitted with quick connects to operate independent of the hydraulic system's pump.

Prior to the installation of the Trans-O-Filters in Polymar's twenty machine shop, the maintenance foreman experienced what he considered to be one major hydraulic breakdown per quarter. Each time, the root cause of the breakdown was related to excessive wear of hydraulic components, or contaminants obstructing the operation of the pumps and valves on the machines. An average monthly incidence of five hours of downtime for such breakdowns was the norm. The unnecessary expense of this downtime was estimated to be $250 per month in lost molding hours alone. The maintenance expense for parts and labor averaged $75 per month. Thus, machine hydraulic breakdown averaged 60 hours of downtime annually at an expense of $3900.

The case history of one machine in particular best demonstrates the improvement realized by the installation of the Trans-O-Filters. The molding machine was a 1979, 300 ton hydraulic that was used exclusively to process filled engineering resins.

Although the operator changed the filter media regularly in the filter chambers provided by the machine builder, hydraulic problems persisted in spite of his efforts. The machine was plagued by erratic operation of the hydraulic core system. The contaminants in the oil were obstructing the spools of the directional valves that control the core system. This

variation in, or complete lack of, hydraulic pressure caused countless cycle interruptions, not to mention the frustration of the operator.

It was apparent that dirt was getting into the oil from the exposed ram, past the seals, and possibly, past the small filter media in the breather cap, as well as from the transfer of new oil to the system. In addition, the heating and cooling of the oil invited the presence of condensate which, in turn, caused rust particles to form and join in the recirculation parade of particles circulating at high velocity, causing wear on unprotected surfaces.

At the time of installation of the side-mounted Trans-O-Filter system, the oil was ten years old, with only additions (5 gallons approx.) for make-up as necessary, on a 315 gallon reservoir. It was sampled and analyzed at this time. The dirt content was reported to be "high", causing cartridges to be changed at 6-week intervals. The next sampling was scheduled at one-half the usual interval. The second sample showed considerable improvement. The third sampling of the oil found the dirt content was no longer present, color was good, and the sampling interval returned to normal.

After installing the Trans-O-Filter, it became obvious that the properly filtered oil did not contain the contaminants, and the core system began to function properly. Since the Trans-O-Filter cleaned up the oil, such interruptions are almost non-existent.

In the second year of operation of the Trans-O-Filter units, the yearly pace dropped to ten hours of downtime at an expense of $650, or an 85% improvement. This was, as they say, really only the tip of the iceberg. The real cost of downtime for any molding shop is difficult to calculate.

The machine operator indicates that a malfunction is occurring. This may be because of some abrupt action, or simply on a "hit and miss" basis. This means that products produced may or may not be acceptable. Consequently, the floor foreman is alerted for service, and the machine maintenance engineer is brought in to assess the problem and analyze what might have to be done. Since no one can determine exactly how long the machine will be down, the production scheduler is alerted, possibly the customer might be called and, if necessary, the mold switched to another machine. Parts might have to be ordered, and if not readily available from the stock room, parts would have to be ordered from the supplier. Therefore, purchasing time is involved, air freight bills incurred, and sometimes the machine manufacturer's service department has to be called in.

The significance of reducing downtime to only 15% is certainly a giant step in itself and, although improvement had been significant, untimely interruptions continued to occur. Consequently, the plan at Polymar was to double up on flow and filter size to reduce downtime to a zero goal.

Upon questioning, Wolf found that while the portable systems worked fine and really were a big help, success depended upon the manual attention necessary to schedule and move the portable rigs from machine to machine.

The answer seemed to require the fine filter media, but also some unattended operation which would filter day and night. This was necessary to assure the overall clarity of the fluids and to assure that the quality of hydraulic oil in the machine would no longer be suspect.

He again called on SERFILCO who designed different systems to accommodate the various sizes of hydraulic reservoirs of the 28 to 500 ton machines in his shop. The oil reservoir capacities ranged from 50 to 600 gallons. Two of the molding machines had OEM filters of 5 micron, the remaining eighteen ranged from 8 to 15 micron. By installing a separate SERFILCO pump and filter on a bypass rated at 5 micron on each machine, the filter immediately improved the hydraulic system performance.

These systems were permanent, piped in place installations which were wired in conjunction with each machine's main motor start. Thus, when the hydraulic pump was in operation, the Trans-O-Filter was also doing its duty. Although permanent installation required a little extra initial effort, the benefits were certainly worth it. The "piped in place" filter/pump assured that every machine that was "up" was constantly having its oil filtered.

Polymar chose a system which utilized a 5 micron, 20 inch disposable type depth wound cartridge. The continuous recirculation of the reservoir allowed the cartridge to actually remove particles that were as small as 1 micron. The filtration pumps were rated at 3 GPM, thus the slowest reservoir "turnover" on the 500 ton, 600 gallon machine was 3.3 hours, or more than twice per shift.

After the first four weeks of operation, the filter media on each Trans-O-Filter was changed. The results and benefits were not only immediate, but visual. The cartridges that were removed from the filter of the two oldest machines in the plant were actually blackened with trapped debris.

The oil from the reservoir of one of these machines was sampled and analyzed. This was done when the filtration unit was installed and again at the time of this initial cartridge change. The results documented the fact that the Trans-O-Filter had removed 75% of the original sample's dirt content, and 50 to 100% of the other contaminants which included heavy metals and calcium.

One year after Polymar installed the filtration units, the oil analyses indicated that the reservoir hydraulic fluids were being maintained in like-new condition. The life of the seals on the hydraulic rams of the machines practically doubled, creating less maintenance and oil leakage and a cleaner environment for the employees. Also during the year, service and repair to the high pressure hydraulic pumps and solenoid valves in the plant were non-existent.

The economic advantages of the Trans-O-Filters were quite evident. For a few cents per gallon, every machine's hydraulic oil, with a value of $2.85 per gallon, was being maintained in like-new condition. Plant wide, the lack of hydraulic problems due to contaminated oil enabled Polymar to increase "up" time, efficiencies, and insure that critical customer delivery dates were met.

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