DES-CASE®

Case Study

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Offline Filtration Offers Significant Improvement in Fluid Cleanliness for High-Pressure Processing Vessels

OLUW1B Offline Filtration Unit

INDUSTRY:
Food & Beverage

OVERVIEW:

High-Pressure Processing (HPP) is a method used by food processors to eliminate foodborne pathogens from their products and involves pressurizing the food in a specially designed pressure vessel with water at pressures more than 80,000 psi (5,500 bar). Critical to production, HPP is a preferred method of preventing microbial growth in food since it does not use heat or food additives and results in longer product shelf life, better retention of nutrients, less food waste, better taste and enhanced food safety for consumers.

To generate the pressures required for HPP, each vessel is filled with purified water that is then pressurized using specialized ceramic pumps to increase the pressure generated by hydraulic power units (HPUs). Each HPP vessel is supplied by two HPUs which cycle pressure from 500 to 3200 psi (35-220 bar) during the HPP process, using pressure compensated piston pumps. These HPUs run 24x7 and routinely experience mechanical problems related to free and emulsified water as well as particle contamination.

THE CHALLENGE:

A US-based manufacturer of deli meat products was experiencing significant unscheduled downtime on their High-Pressure Processing (HPP) vessels.

Each HPU supplying the HPP vessels holds around 90-110 gallons (350-400 L) of Food Grade ISO VG 46 hydraulic fluid and was typically operating at cleanliness levels around 18/16/13 to 20/18/14 with moisture content frequently more than 500 ppm (>0.05% v/v). Based on the hydraulic life expectancy chart (Figure 1), the customer knew that by reducing particle count levels to less than 16/14/11 and eliminating all free and emulsified water, component life could be extended by as much as 2-3 times, thereby improving system reliability and reducing unscheduled downtime. The customer contacted DXP's Fluid Power Solutions Group, a partner of Des-Case in the USA, for a simple, low-cost solution.

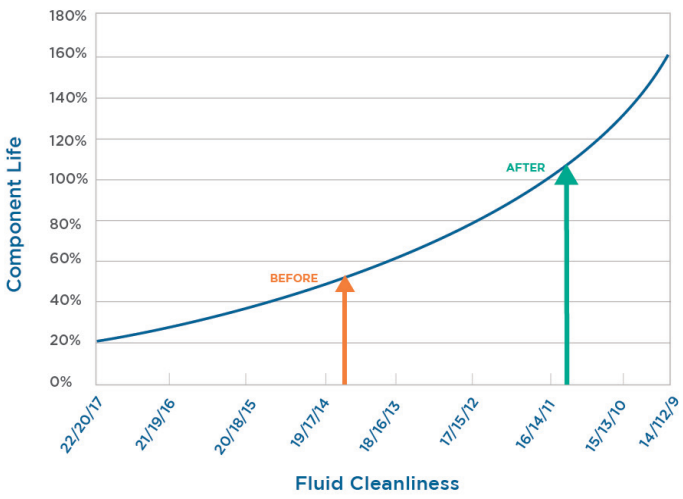


Figure 1: Hydraulic Component Life Expectancy

THE SOLUTION:

While most hydraulic systems include full flow filtration, oftentimes the rate of contamination ingress is too high for system filters to maintain adequate fluid cleanliness. Under these circumstances, offline filtration offers a low-cost option for improving overall system cleanliness.

Offline filtration units draw oil from the reservoir, which is then passed through high-efficiency filters before being returned to the reservoir. As such, they operate independently from the main, full-flow filtration system allowing for much slower flow rates which helps to increase filtration efficiency. This also means that it can be stopped for an element change without interrupting operations and allows the flexibility to use ultra-high efficiency media to remove particulate and insolubles to reach low ISO codes that might otherwise be unattainable.

Based on the application and DXP's insight of the customer's operation, it was recommended to install an RMF Systems Offline Filtration Unit (OLU) OLUW1B on a total of 10 HPUs. Each OLU was equipped with a super absorbent polymer (SAP) pre-filter to remove moisture from the hydraulic fluid, along with a ß>1000 3 um micro-glass filter element. In addition, an EX-2 desiccant breather was mounted on each hydraulic reservoir to ensure that the headspace inside the hydraulic reservoir remained dry and clean.

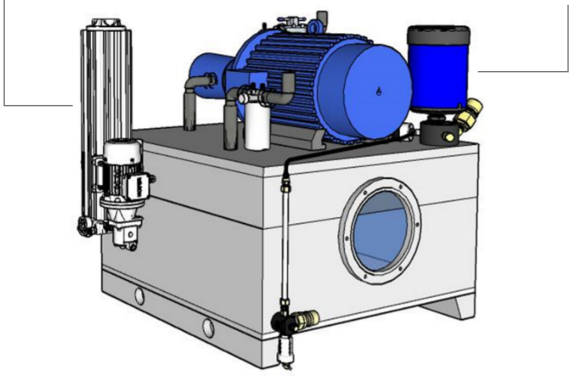
High-Efficiency Micro-Glass Elements

Super Absorbent Polymer (SAP) Water Removal Elements

Specially designed for industrial hydraulic applications, Des-Case's RMF Systems OLUs are available in single or multiple housing configurations and can be adapted to use a variety of filter media.

Offline Filtration Unit (OLU)

EX-2 Desiccant Breather



Hydraulic Power Unit

THE RESULTS:

Within 30 days of installation of the OLUW1B, significant improvements in fluid cleanliness were observed through oil analysis with cleanliness levels dropping below 17/15/10. In the following 30 days, this continued to drop with average cleanliness levels reaching ISO 15/13/10 to 16/14/11 in each of the hydraulic systems. In addition, each HPU which had previously shown more than 500 ppm (0.05% v/v) showed little to no moisture content, with water levels measured via Karl Fischer testing below 10 ppm (0.001 % v/v).

	Typical Fluid Cleanliness	Typical Moisture Content
Before	19/17/14	>500 ppm
After	16/14/10	<10 ppm

Almost immediately, the food manufacturer experienced significant improvements in system reliability and reduced downtime. With less downtime, the plant saw significant increases in productivity estimating an additional throughput increase of 80,000 lbs. (36,000 kg) annually. Based on reduced maintenance and increased productivity, the manufacturer estimated that on an annualized basis, the project yielded an annual financial benefit of $350,000. With a net spend of around $40,000 on overall lubrication improvements plus an additional $4,000 per year to replace filters and breathers, the project was estimated to yield a 3-year Net Present Value (NPV) of $750,000 at an annual rate of return of 850% (Figure 2).

Year	0	1	2	3
Program Benefits	$0	$350,500	$350,500	$350,500
Program Cost				
Total Cost	$40,700	$4,000	$4,000	$4,000
Net Cash Flow	-$40,700	$346,500	$346,500	$346,500
Discount Rate (Cost of Capital)	15%			
Discount Factor	100%	87%	76%	66%
Discounted Net Cash Flow	-$40,700	$301,304	$262,004	$227,829
INVESTMENT ANALYSIS				
Three Year Net Present Value (NPV)	**$750,438**			
Internal Rate of Return (IRR)	**850%**			

Figure 2: Return on Investment (ROI) Analysis

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