OEM vs. Alternative Hydraulic Oil Filters:

Lifetime cost analysis.

A KALMAR WHITE PAPER

AUTHOR

Stephan Johansson

June 2018

KALMAR

OEM vs. Alternative Hydraulic Oil Filters: Lifetime cost analysis.

EXECUTIVE SUMMARY.

This publication is part of a series of white papers that report the results of a technical study commissioned by Kalmar from the Laboratory of Automation and Hydraulics at Tampere University of Technology, analysing the lifetime cost difference between OEM (reference) spare parts and aftermarket (alternative) copies. The research findings indicate that in many areas there is not only a clear cost difference but also marked variation in quality and performance between the two types of spare parts.

OEM and aftermarket hydraulic oil filters were evaluated on the basis of filtering efficiency and service life. All filters tested were subjected to the same flow and contamination levels of the tested fluid. Despite a slightly higher purchase cost, due to its significantly longer change interval, the OEM filter was shown to be almost 50 % more economical per annum, assuming correct maintenance and service of the machine. The costs savings are even greater when taking into account the servicing cost of changing filters, as well as the additional time that the machine would be out of operation as the alternative filters need to be changed more frequently.

Furthermore, the study concluded that the alternative filters would be blocked much quicker by contamination, and unless the exact servicing intervals were maintained, this could cause additional issues or at worst, system failure. If the filters fail in their purpose of efficiently removing contamination from hydraulic oil, operating costs would likely be increased.

Study background and scope.

In 2017, Kalmar commissioned three studies with Tampere University of Technology in Finland to evaluate the claim that even though OEM parts are generally priced higher than aftermarket parts, the OEM parts are still more economical over the lifetime of the equipment, when both purchase and replacement costs are factored into the calculation.

In the study results summarised in this paper (hydraulic oil filters), they also cover specific cost calculations from the perspective of scheduled parts replacement as part of planned and correctly scheduled maintenance activities. With the aftermarket parts that require more frequent changes due to their shorter product life, ”second-order” service costs as well as the added downtime of the equipment during maintenance can have a significant financial impact on operations. However, this paper explicitly does not take into account potential ”third-order” costs from e.g. equipment damage or injury if lower-performing aftermarket spare parts lead to system failure or safety incidents; or costs from unplanned maintenance or repairs arising for the same reasons. Equipment operators should certainly consider these factors in planning their maintenance strategy, but they are outside the scope of this paper.

> ”...if filters fail in their purpose of efficiently removing contamination from hydraulic oil, operating costs would likely be increased.

Overview of the study.

The study summarised in this paper by Tampere University of Technology focused on hydraulic oil filters, which are an essential component that controls the amount of contamination in hydraulic fluid. The potential costs caused by fluid contamination can include component replacement costs due to wear and blockages; loss of production due to service breaks; frequent replacement and costly disposal of used fluid; as well as increased overall maintenance costs.

The essential characteristics of a hydraulic oil filter element are flow rate and differential pressure; filtration efficiency; and dirt holding capacity.

The filter media is the part of the element that removes the contaminants. The filter media is typically fibreglass and it is pleated to expose more surface area to the fluid flow. This reduces differential pressure while increasing the dirt holding capacity of the element. As the filter captures contamination, the differential pressure across the element increases until it reaches its maximum acceptable level and the service life of the filter element comes to its end. The research report analysed the effect of the dirt-holding capacity of OEM and alternative filters on the service life and lifecycle costs of both types of filters.

Technical analysis.

In the study, the reference and alternative oil filters were evaluated on the amount of effective filter material they contained, i.e. the number of pleats. The number of pleats in the filter element has a direct effect on how effectively the filter removes unwanted material and how long it will remain effective. Consequently, the larger the number of pleats, the longer the time period between filter changes. It should be noted that all filters tested were subjected to the same flow and contamination levels of the tested fluid.

Fig. 1. Example of filter housing and filter element. Area of Fig. 2 shown with yellow square.

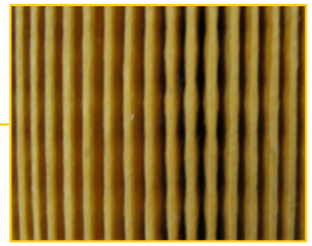

Fig. 2. Pleats in filter element.

Table 1. Filter parameter values used in the analysis.

Parameter	Reference filter	Alternative filter
Amount of filter material (number of pleats)	174	66
Filter cost (€)	14	10

On the basis of the values in Table 1, and assuming that the filter lifetime is directly proportional to the amount of filter material in the element, the analysis showed that:

- The reference filter would need to be changed every 46 days
- The alternative filter would need to be changed every 17 days

Over the nine-year operational period nominated for the test, this would mean that:

- The reference filters would need to be changed 72 times
- The alternative filters would need to be changed 190 times

If maintained and serviced correctly, the annual costs for the two filter types would be:

- Reference filter: 224 € pa
- Alternative filter: 413 € pa

This demonstrates a significant saving in parts costs alone by using the reference or OEM filter. However, the costs savings are even greater when taking into account the service cost of changing filters as well as the additional time that the machine would be out of service with the alternative filters.

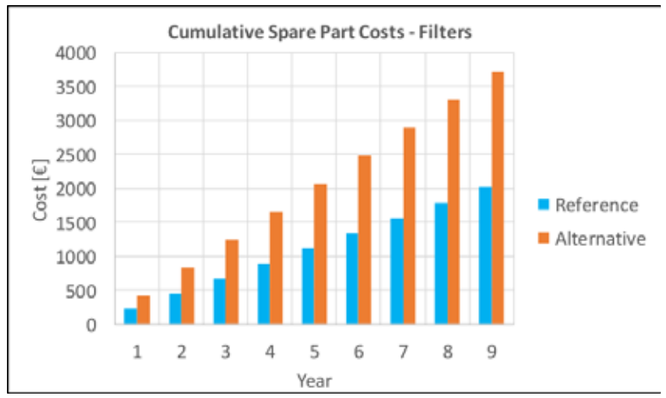

Fig. 3. Cumulative lifetime spare part costs for reference and alternative filters for equipment with two hydraulic oil filters.

The study also concluded that:

- The alternative filters would get blocked much quicker by contamination and unless the exact servicing intervals were maintained, this could cause additional issues that result in system failure.
- Operating costs could increase if filters do not remove contamination efficiently.

> The number of pleats in the filter element has a direct effect on how effectively the filter removes unwanted material and how long it will remain effective.

Further financial analysis / Savings calculation.

More detailed calculations were carried out to quantify the lifetime cost differential of using OEM vs. aftermarket oil filters. The calculations were based on the following parameters:

- A standard service cost of 70 € per hour
- Each machine is operating for 4,000 h/year
- It is assumed that the hydraulic oil filters can be changed with a call-out cost of 70 €
- The reference filters will need to be changed 8 times per year and the alternative filters 21 times per year.

In this case, there is an even more substantial financial impact when the service cost is factored into the lifetime savings calculation:

- Reference filter: Servicing and annual parts cost: 560 € + 224 € = 784 € cost annually
- Alternative filter: Servicing and annual parts cost: 1,477 € + 413 € = 1,890 € cost annually.

Despite a slightly lower price per part, the alternative filters turn out to be more than twice as expensive per annum.

Other considerations.

Fluid filters are one of the most basic maintenance points on any heavy equipment incorporating hydraulic systems. The filters ensure that the hydraulic oil is kept free of any foreign material, reducing the risk of blockages and ensuring that the hydraulic system operates properly. Filter replacement needs to be done on a regular basis at intervals that are shorter than those for many other planned maintenance tasks.

This paper offers a limited analysis of the cost differential of OEM vs. alternative hydraulic oil filters in certain scenarios under a specific set of assumptions about equipment lifetime and service intervals. No attempt has been made to analyse the wider impact that using lower-quality parts may have on operations, whether this impact is financial, operational or related to occupational safety considerations.

Though such questions move from a straightforward cost-benefit calculation into the realm of risk management, prudent operators will consider questions such as whether poor filtration can potentially lead to component damage; whether substandard hydraulic system performance can cause safety hazards; or what impact unplanned machine downtime will have on the entire operation.

Summary of conclusions.

Based on the research summarised above, we can reasonably conclude that:

- There is more to consider than just the price of the filter, and savings calculations need to be based on a realistic lifetime analysis that takes into account both service intervals and maintenance costs
- The performance of various parts can differ substantially from one vendor to another, depending greatly on the manufacturing and material choices of the component
- The quality and performance of the part will influence its longevity, which in turn will impact not only performance levels, but also the time and cost of service and maintenance
- Additional service and maintenance time not only costs more, but also adversely impacts the utilisation of the machine(s).

"Despite a slightly lower price per part, the alternative filters turn out to be more than twice as expensive per annum.

ABOUT THE AUTHOR

STEPHAN JOHANSSON
Over 30 years experience within equipment sales and product management in the industry.Currently Stefan is Vice President for Kalmar Service Sales and Product management.

SOURCE

Report of Tampere University of Technology, Laboratory of Automation and Hydraulics (AUT)

Technical Analysis of Spare Parts for Kalmar's Equipment - Oil Filter, 18.10.2017

Making your every move count

www.kalmarglobal.com