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ADVANTAGES OF THE APPLICATION OF HYDRAULIC OIL FILTRATION ON BARBOT PUMPS

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ABSTRACT

Due to the need of companies to reduce expenses and increase productivity, the study is based on analyzing the effectiveness of the use of filter pumps to improve the useful life of parts, components and hydraulic fluids of application in industrial slip pumps. Samples of the hydraulic oil used in the process were collected, studied and analyzed in order to demonstrate the cost benefit of the application of filter pumps. Through the experiments performed comparative analyzes were performed between the lubricants without the filtration and with the application of the filtration process, observing the results showed the efficiency of the applied process. Based on the studies carried out, the advantages of hydraulic oil filtration in slip pumps were evident, as it allowed a longer time for equipment operation, reduced downtime, reduced maintenance costs and reduced environmental impact. The methods used to improve the system consisted of the filtration of the oil, using a filter pump to retain the wastes that contaminate the hydraulic system, thus reducing the maintenance time and stops of the atomizers, increasing the mass production. The results obtained demonstrate that the filtration did not completely eliminate the contaminations but reduced significantly. The company spends about R$ 12.040,00 (twelve thousand and forty reais) per year for the recovery of each slip pump, with 14 pumps in total. However, by filtering, this value could be reduced, because the contaminants contained in the lubricating oil showed a reduction of 82%, increasing the useful life of the oil and equipment. The main problems encountered were leaks, due to wear caused by contaminants and excess particulates, which cause problems in the gear pump, valves, seal ring assemblies, cylinder liner and filter clogging.

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INTRODUCTION

Slip pumps are hydraulic devices responsible for transporting slip (liquid mass) to the atomizers. These pumps are composed of an electric motor coupled in a piston pump, which is responsible for driving the cylinders through the transport of the hydraulic oil, has a series of cylinders that works in series, when one of the cylinders exerts the upward movement, performs the extraction of the slip from the underground tank (slip site), and transfers it to the conveyor, the other cylinder in the downward movement, conveys the liquid mass through the hoses to the interior of the atomizers. The slip is introduced into the atomizers in the form of droplets through the spray or spray, and upon coming into contact with the high temperatures inside the chamber, they change from the liquid to the solid state in the form of a grain, these grains will be called mass, which will be pressed and shaped by the hydraulic presses. The molds pass through the firing process performed

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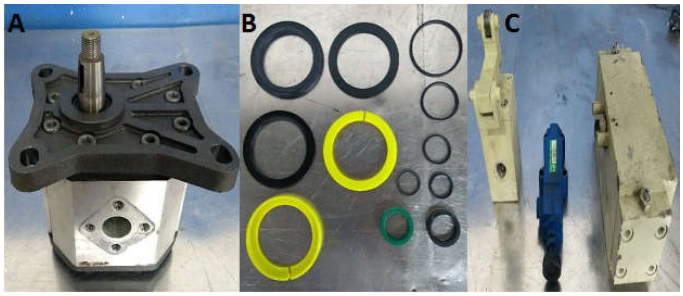
with the help of the furnaces, giving rise to the final product, the ceramic coating (SILVA, 2001). Minor interference may cause a deficiency in the hydraulic system of the slip pumps due to poor oil filtration, resulting in significant production losses, such as machine shutdowns, costs generated by component replacement and frequent fluid replacement, costs of general maintenance and scrap index increase. Contamination of hydraulic oil is a critical problem to be controlled and avoided since it can result in pump failure, valve and cylinder wear, wear of seal rings, delay in switching, inaccuracy in movement, viscosity change, premature aging of the fluid and increased internal leakage, situations that can cause great loss of productivity and increased costs (GRUPOTECNOLUB, 2018). In this context, the proposed work aims to study, apply and analyze the results obtained with the insertion of the filtration system in the hydraulic oil in the slip pumps. The filtering is performed by a set of filters, these are responsible for capturing particles generated by the wear of the internal components. Through laboratory analysis of the samples of the oil used today (without filtration) and after the application of the filtration system, we will be able to analyze the benefits generated and thus choose to keep the solid particle level balanced; make the protection located in a specific line of the hydraulic circuit or increase the lubrication index of the oil. The aim of this work was to increase the useful life of the components, to reduce the replacement of the hydraulic oil used in this system, directly impacting maintenance costs.

Experimental Prodedures

Initially, a history was made to recognize the current situation. At this stage data were collected regarding the useful life of the correlated parts, equipment and oil in the condition. In addition, information related to the cost of components and hand and work required to recover the slip pump was collected. In the next step, the filter pump was installed in one of the slip pumps. This procedure followed a monthly cycle of 5 days of filtering. The samples collected monthly were analyzed in the laboratory by the responsible technician. The main types of problems identified when dismantling the pumps at the time of recovery were premature wear of the gear pump, seal ring assembly and valve assembly (Fig. 1).



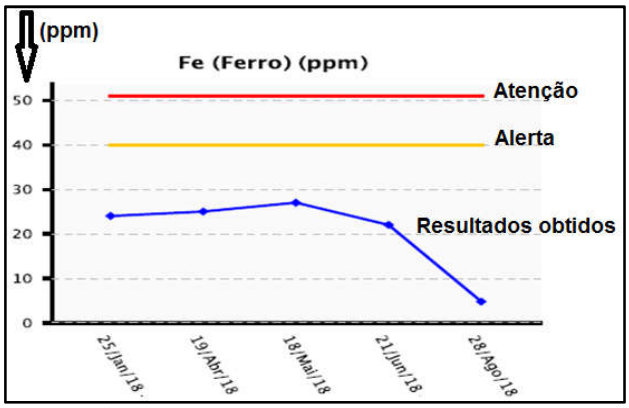
Source: Authors (2018)

Figure 1. Gear pump (A), sealing rings (B), valve assembly (C).

At the time of disassembling the pump, the damage to the piston liner was also evident, grooves on the surface of the chrome were easily identified (Fig. 2). The graph of Fig. 3 shows the fall of iron particles after the beginning of the insertion of the filtration in the system from the month of May. The red line means attention, the yellow alert and the blue the results obtained in the tests. The vertical column represents the particle scale per million (ppm).

Source: Authors (2018)

Figure 2. Grooves caused on the piston liner



Source: Authors (2018)

Figure 3. Graph showing iron particulates

From the return of the technical reports we can already see a significant change in the oil purity by reducing the existence of iron particulates.

RESULTS AND DISCUSSIONS

We collected annual expenses with the recovery of each equipment, where we reached a total of R$ 12.040,00 in twelve months (one year). Our industrial unit has 14 pumps, so the value of the equipment recovery can generate an annual cost of R$ 168.560,00 reais. Gear pumps cost R$ 3.000,00 (three thousand reais), hydraulic oil R$ 840,00 (eight hundred and fifty reais) (considering that the slip pumps require 140 liters of oil for a total load), sealing rings R$ 1.200,00 (one thousand two hundred reais), set of valves R$ 3.000,00 (three thousand reais) and labor of R $ 4.000,00 (four thousand reais). With the increase in equipment life being doubled (from 12 to 24 months), in two years we can save up to R$ 168.560,00. We must also emphasize the importance of environmental impact, as the generation of scrap and discard of hydraulic oil will be automatically reduced. Lubricating oil is a risk to the environment and to public health if it is discarded in an incorrect way, being able to cause great damages to the environment, affecting people, fauna and flora, but this residue is of paramount importance for the operation of industrial equipment, because it is responsible for the reduction of friction between parts and equipment, extending the useful life. One of the biggest problems faced by the present society is due to the residues generated in the diverse human activities. The annual generation of waste on all planet

earth is approximately 400 million tons, of which 80% could be reused (REIS, 2009). Much of this waste comes from the activities practiced in the mechanical sector, part of which is composed of Class I - Hazardous waste in which they pose risks to the environment and the health of the population (NBR, 2004).

Conclusion

In this way, this research aims to search for data, observe the results generated by the suggested system and evaluate the feasibility of the application of the process. With the present work it is concluded that the filtration of the hydraulic oil is of paramount importance, since in this way it was evident that there will be a reduction of contaminants in the fluid, resulting in an increase in the useful life of the pumps, reducing stops and expenses for the company. With the oil filtration, the reduction of costs with corrective maintenance was verified, since the conditions presented in the oil without the application of the filtration show a considerable presence of contaminants causing problems like leaks, premature wear in the gear pump, wear in the valves grooves in the cylinder liner and clogging of the filters. There was also a reduction of waste disposal as spare parts, equipment and lubricating fluid, which becomes of paramount importance in the human, business and environmental issues. The reduction of waste generation will also result in financial savings for the company, as scrap collection is currently performed by outsourced suppliers who charge for the collection of discarded equipment. It was verified that scientific research should always be stimulated in the academic environment, from the initial stages, and also seek partnerships with organizations from the most diverse branches, thus generating interaction, so that we can constantly advance in the matter of machines, processes, environment environment and other factors that are essential for the academic, professional development that will result in the generation of skilled workforce for the companies.

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