

ISOPUR OIL PURIFICATION SYSTEM TEST REPORT

DATE :

August 5th, 2004

PURPOSE OF TEST :

To evaluate the "oil purification and equipment internals cleaning" performance of the ISOPUR system -which operates with BCP™ (Balanced Charge Purification) technology- by testing it at one of the plants of EUAS (Turkish Electric Generating Company) and to report the results for the information of all the plants within EUAS.

LOCATION OF THE PLANT WHERE TESTED :

EUAS Tuncbilek Thermal (Coal) Power Plant

INSTRUMENT TESTED :

ISOPUR SYSTEM

EQUIPMENT TO WHICH THE ISOPUR UNIT WAS CONNECTED:

5. Group 3. BFP (Boiler Feed Pump)

TEST START DATE:

The ISOPur system has been installed since January 22nd, 2004.

OIL ANALYSIS DATA:

First sample was analyzed on January 29th, 2004. Following that, samples were taken and analyzed on a weekly basis. All of these analysis data are attached to this report.

FINDINGS:

The ISOPUR system was installed on the 5. Group 3. BFP on January 22nd, 2004 and until July 2nd, 2004, excluding the periods during which the 3. BFP was not operational due to the maintenance of the 5. Group, it operated for a total of **60 days**. Throughout this time, the pre-filter was changed twice, and cleaned occasionally. The fact, that next to the 3. BFP, to which ISOPUR system was connected, 1. BFP was operating, has made it possible to compare the results in two perspectives (3. BFP before/after ISOPUR and 3. BFP vs. 1. BFP).

During the period before the test was started, the existing filtration system of the 3. BFP was producing clogging alarms at least twice a week and cleaning operation was carried out. After the ISOPUR system was installed and operated for one week, no clogging alarm has been recorded.

In the periodic analysis of the oil samples, outstanding improvements have been observed in the color and viscosity of the oil (see attached analysis data), and no water has been found in oil in any of the analysis. All throughout the test period, no new oil was added to the 3. BFP.

Again, during the same period, progressive reductions have been observed in the white metal bearing temperatures of the pump and the Voith clutch, and these reductions have reached 11°C by the end of the 60 days of operation. These findings are recorded in the Plant Operational Data Reports. By looking at these records, comparisons can be made between the values of 3. BFP before/after ISOPUR and between the values of 3. BFP vs. 1. BFP during the ISOPUR test.

During this period, while a comparative evaluation was being carried out, in the 1. BFP, two oil changes were performed (each of them 720 liters) and over 50 clogging alarms were observed at the filter. During the 36 hours right after the second oil change, an oil filter cleaning was carried out every half hour. Nonetheless, the oil color has continued to be dirty.

On June 28th, 2004 the oil of 1. BFP was observed to be light brown and a sample was sent for analysis. The analysis report is also attached. Even though the oil was separated twice before the analysis, the results show as in the attached report (color>8). Although the normal procedure is to change the oil, the ISOPUR system was installed on the 1. BFP on June 29th, 2004. After two days of operation, in the analysis of the sample that was taken on July 1st, 2004, the oil was observed to be clearer than its original color (color=3.5). The analysis reports of the oil of the 1. BFP belonging to the dates July 1st and 2nd, 2004 are also attached.

Both for seeing the performance of the BCP™ technology on cleaning the internals of the machinery and for maintenance purposes, the Voith clutches of 1. BFP and 3. BFP were disassembled and in that of the 3. BFP, the shine on the gears and gearshafts has attracted attention and the influence area of the oil-spraying pipes inside the gearbox has been observed to be in its original manufactured color.



After the disassembling of the Voith turbo, the surfaces and bottom parts of the vanes were also observed to be shiny. Especially, this difference in the turbo vanes disassembled of the two separate gearboxes (1. BFP and 3. BFP) have been photographed. The thickened and sticky oil that has always been observed in the bottom parts of the vanes of the turbo has been observed to be cleaned. Also, the oil that is collected in the oil pockets of the bearings, which is normally muddy and full of particle deposit, has been observed to be clear and transparent (the color of glycerine). The color of the Voith parts of the 1. BFP were black and could not be cleared despite the cleaning with sandpaper.



CONCLUSION :

It has been observed that the performance of the instrument, regarding oil purification and improving and protecting the oil properties, has been better than expected. While the instrument was connected, there has been no oil-related problem and the oil properties (oil color, viscosity values, bearing temperatures going down, the heat exchange in the heat exchanger, etc.) have continually improved.

The internals-cleaning and equipment life-prolonging feature of the instrument has been clearly observed. Low vibration values and the cleanliness of the machine internals that have been seen in the photographs have shown that the instrument not only purifies the oil, but it also prevents the forming of particulate deposits on the internal surfaces that can cause serious problems, and also cleans the already formed deposit.

Another important issue to be recorded is the observed fact that the maintenance and operation costs of the ISOPUR system are negligible, compared to those of other filtration systems like separators.

Signed:

Cemil Demiral
Turbine Maintenance
Foreman

E. Engin Celik
Mechanical
Engineer

Hayri Yaba
Chief Mechanical
Engineer