

SHF-D mechanical seals in an oil pump station

Information **E09102**

Colombia is the 26th largest nation in the world and the fourth largest in South America. In spite of the difficulties, Colombia's economy grew steadily and has one of the highest growth rates in Latin America. The country is rich in natural resources. One of its main exports is petroleum. Columbia produces approx. 588.000 barrels oil per day. The estimated oil reserves of the country are 1.5 billion barrels.

Ecopetrol, formerly known as Empresa Colombiana de Petróleos S.A. is the largest and main petroleum company in Colombia. Ecopetrol belongs to the 35 largest petroleum companies in the world and it is one of the four principal petroleum companies in Latin America.

Process and Equipment

The pipeline "Poliducto de Oriente" comprises of two terminals and three pumping stations to transport refined products like LPG, Jet Fuel, Gasoline & Diesel from Barranca Refinery to Santiago de Cali (the capital of Valle del Cauca State) and the South West States of Colombia. One of these stations is Herveo Pump Station. Located at 2,680 meters above sea level it is one of the highest-located in the country.

The Pump Station is equipped with two main pumps, one with an electric motor and one with a diesel engine. It receives in the suction an average pressure of 14 bar (200 PSI) from Fresno Pump Station and delivers on the discharge an average pressure of 83 bar (1,200 PSI) to Manizales Plant,

with a sealing chamber pressure of approximately 28 bar (400 PSI). The Byron Jackson 11-stage DVMX pumps are directly connected to the engine and valves for flow control.

Operating conditions

Media: LPG, Jet fuel, Gasoline, Diesel

Temperature: 15 ... 40 °C

Media Pressure (max.): 35 bar (500 PSI)

Barrier Fluid Pressure: 41 bar (600 PSI)

Seal type and materials: SHFD1/72-E2 & E3 / AQ2V5GG(316Ti)

Seal arrangement: Dual pressurized, API-arrangement 3CW-FF

Supply system: API Plan 53B

The Problem

For more than 20 years the customer had repetitive technical problems due to failure of competitors mechanical seals caused by multiple factors including the specific gravity of LPG, the improper use of seal materials and inadequate maintenance procedures. Most typical failure was a recurrent flashing or spontaneous separation of seal faces due to the increase of temperature in the seal chambers, which caused loss of fluid lubrication between the seal faces and ended up in dry running.

The average repair requirement was two causes per month, generating high costs of spare parts inventory, repetitive pipeline stops, decrease in time availability of the pump and the most serious, high-

risk situations in the plant when operating under unsafe conditions, since it was generating large emissions of LPG to the atmosphere.

The EagleBurgmann seal solution

Dual pressurized SHFD1/72-E2 & E3 seals have been selected for this very demanding application, connected according to API Plan 53B and equipped with an EagleBurgmann heat exchanger WED 2130/A 100-00 on each circuit (each of the two bearing pumps are fitted with two dual seals). Because of supply conditions at the pump station, it was decided to use Diesel as barrier fluid.

The SHFD seal has a common rotating face for two face-to-face stationary face arrangements, which led to a reduction of stock spare parts. The stationary faces are reinforced on their inside and outside diameter (EagleBurgmann sandwich seal face technology) to be able to withstand high pressures up to 150 bars. The stationary springs provide constant closing force on the seal faces and are damping vibrations at the same time. An internal pumping screw assures optimum heat dissipation throughout the seal while a special multipoint injection ring ensures the homogeneous distribution of barrier fluid to the seal. It has to be emphasized that the described dual pressurized arrangement has zero leakage of product to the atmosphere. All in all, the mentioned features contribute to prevent dry running of the seal and flashing of LPG, extend the lifetime of the seal and provide a remarkable MTBF of 10 years.



The Herveo Pump Station in Colombia (left)



An EagleBurgmann engineered SHF-D mechanical seal (right)