The Challenge

Emulsifying oil in transfer

Changes in fluid conditions causing pump breakdown

Loss of pump performance due to abrasive wear

The Discflo Solution

No emulsification due to Discflo pump's laminar action

No loss of performance due to abrasive wear

Versatile enough to handle varying fluid conditions

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Case Study

Solving Oil Emulsion Pump Problems

El Dorado Refining Co, Kansas

El Dorado Refining Company is a division of Equilon Enterprises LLC, a joint venture of Texaco Inc and Shell Oil Co. The plant is the largest oil refinery in Kansas rated at 110,000 barrels/day of crude oil processing capacity. Peter Hanas has been working at the El Dorado refinery for 9-1/2 years (as of 1997) as a staff reliability engineer. He is responsible for improving the plant's overall mechanical reliability. He was the first to recommend the use of disc pumps at the plant and has seven years' experience with this type of pump.

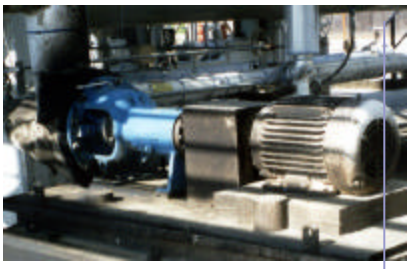
The first disc pumps were installed at the El Dorado plant in 1993 for sludge oil transfer and CPI oil transfer at the wastewater treatment unit. In the six years since start-up, the pumps have performed well with very little maintenance required and no unplanned downtime due to pump failure.

The fluid in the sludge oil transfer operation is moderately viscous (40cP), with no solids, and has a specific gravity of 0.877. The oil is in an emulsion state, which makes it difficult for a centrifugal pump to handle. The disc pump's laminar, pulsation-free flow, however, allows it to pump the fluid without losing prime and without cavitating.

Two 402-14-2HHD (4" suction and 2" discharge) disc pump models, with a disc assembly trimmed from 14" diameter to 12.95", were installed in March 1993. Each unit is on a Texaco Type API base. The pumps each handle 100 GPM at 50 psig with a flooded suction.

In the CPI oil transfer application, the disc pump is moving a heavy slop oil containing some solids - grit, dirt, etc. The fluid is somewhat abrasive and viscous (40cP) with a specific gravity of 0.877. A pump model similar to the above sludge oil transfer is employed. The pump conditions are 50 GPM at 40 psig with a flooded suction.

All three pumps installed in 1993 were new units and did not replace any previous pumps. However, for similar oil sludge applications at the plant, the company has used centrifugal type pumps and has encountered problems with erosion due to solids and operating problems due to the changes in pumpage composition and viscosity. Based on the above experience, the El Dorado plant has found disc pumps to be a much better fit for oil sludge applications.



Case Study

The tough challenge in pumping this fluid is the variation in fluid conditions. At different times, the viscosity, solids concentration and size, suction pressure and flow rate can all vary: the viscosity can be as high as 200 cP or as low as 1cP; the solids content can include sand, pieces of plastic and anything that enters the system earlier in the process; the pressure in the discharge line can swing by as much as 20-25 psig; and the flow rate can reach a high of 2000 barrels/day (58 GPM) or a low of 450 barrels/day (13 GPM).

For 40 years, the work of moving the slop oil had been performed by a reciprocating steam-driven pump. It had become, in the words of the Peter Hanas, "a reliability nightmare", generating over 30 work orders for maintenance in its final year of operation. The company then installed two electrically-driven centrifugal pumps operated in series to replace the old pump. These also proved unreliable; the solids in the slop oil would frequently clog the pump, causing either seal failure or loss of prime in the pump.

Next, the company tried a skid-mounted, self-priming centrifugal pump. It was an improvement over the previous centrifugal pumps, in that it had sufficient prime, however, the pump still suffered frequent seal failure due to clogging and loss of seal flush. “By that point, we were desperate” says Peter Hanas. “The slop oil transfer is a critical application and must be kept moving to ensure the plant remains running.” He suggested using a disc pump.

A 402-14-2HHDL model horizontal end-suction pump, with disc assembly trimmed to 11.26" diameter, was installed in December 1997. It was constructed in CD4MCU, with an API base, and the disc assembly was Maxalloy 350. The unit had a 40 HP explosion-proof motor, running at 3450 rpm and a John Crane Type 2800E dry running gas cartridge seal.

The pump was designed with a capacity of 35 GPM at 429 ft TDH (185 psig). There were however some start-up problems because the 185 psig was a “worst case” value and in reality, the system needed only 110-130 psig of pressure. The problem was solved by installing an inverter to achieve the lower discharge pressures required.

"We successfully proved to our very skeptical management that the disc pump would work in this application" says Peter Hanas. The inverter was installed in February 1998. Since then, the pump has performed very well, with no downtime or unplanned maintenance required.

Call Discflo now to find out how our pumps can solve your problems.

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Disc Pumps

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