



CALFLO INFO

CALFLO HTF

AVOIDING FLUID DEGRADATION AND OTHER PROBLEMS ASSOCIATED WITH ALKYBENZENES

The following text, prepared to serve as an illustration of typical benefits available from the CALFLO product being featured is based on an actual customer application as noted. Further details can be obtained from a Petro-Canada CALFLO Sales Representative

THE COMPANY

Alcan Smelters & Chemicals Ltd. Operates an aluminum smelter in Kitimat, British Columbia. Approximately 142,000 metric tonnes of Soderburg paste are produced annually on-site for use in the electrolytic process by a paste plant dating back to 1983.

The past plant employs a 60,000 litre (15,850 gallons) primary heat transfer system operating at $>300^{\circ}\text{C}/572^{\circ}\text{F}$. Two 10 Mbtu/Hr (7.3 MW) horizontal natural gas-fired coil heaters drive a primary loop at $295^{\circ}\text{C}/563^{\circ}\text{F}$, which in turn heats three secondary loops – one at $255^{\circ}\text{C}/490^{\circ}\text{F}$ and two at $225^{\circ}\text{C}/437^{\circ}\text{F}$.

The heat transfer system is an open non-pressurized design utilizing a chemical aromatic-based fluid composed primarily of alkyl benzenes. This fluid was selected for its good heat transfer properties and flow characteristics.

THE PROBLEM

Degradation of the alkyl benzene fluid was noted after only two years of operation. Along with a dramatic change in colour from clear brown to black, the fluid's viscosity decreased from 22.2 cSt @ 40°C to 16.7 cSt.

Alcan staff also recorded an incidence of pump cavitation and reduced heat transfer qualities, plus serious leakage of fluid from joints and flanges totaling as much as three drums per month. Of more critical concern was a dramatic drop in the fluid's flash point. On two occasions, fires broke out when the flash point dipped to well below $100^{\circ}\text{C}/212^{\circ}\text{F}$.

In an effort to solve the flash point problem – caused by a build-up of “low boilers” – the fluid was heated to $350^{\circ}\text{C}/662^{\circ}\text{F}$ and force-circulated to the expansion tank, where aromatic products were removed by condensation and collected in a storage tank. This proved to be only a temporary solution and by 1989 it was necessary to repeat the process monthly, seriously disrupting production.

Purging the expansion tank with nitrogen helped to stem oxidation of the fluid, but the flash point continued to drop. Increase leakage of fluid at flanges and seals was aggravated when the liquid carbonized and forced open the gaps, requiring a total shutdown for repairs as often as three or four times each year and as frequent as monthly for some pumps. Meanwhile, the leaking fluid produced an irritating aroma and heavy haze in the work area.

THE TECHNICAL EXPLANATION

Degradation of the fluid led to the formation of “low boilers” which caused both the pump cavitation and diminished heat transfer qualities. These low boilers remained in solution, promoting leakage at joints and flanges, and creating the substantially lower (and dangerous) flash point.

Low boilers continued to be created by thermal degradation, even after purging the expansion tank with nitrogen. The concentration of low boilers produced higher vapour pressure, encouraging more leakage at flanges and seals.

THE SOLUTION

In 1989, a decision was made to replace the alkyl benzene with a heat transfer fluid exhibiting four critical properties:

1. Better fire safety through reduced production of low boilers
2. Flow rates in excess of 200 m³/hr/heater
3. Minimal toxicity, odour and environmental impact
4. Capable of extended operation at temperatures of 300°C/572°F, permitting higher production rates and improved efficiency.

Alcan staff chose Petro-Canada **CALFLO HTF**, derived from HydroTreated petroleum basestocks and incorporating a patented multi-compound antioxidant for stability at higher temperatures.

Before replacing the previous fluid with **CALFLO HTF**, it was necessary to drain and flush the entire system, heating the flushing fluid to 100°C/212°F and circulating it for 6 to 8 hours in each loop.

THE ADVANTAGES

Three years after installation the **CALFLO HTF** fluid continued to perform effectively. Regular sampling and testing of the fluid indicated an initial low boiler level of 0.7% due to some contamination from the alkyl benzene material. This rose to about 2% over the initial three-year test period compared with 15% for the alkyl benzene product just prior to its replacement. The fluid's flash point has declined somewhat over the years but remains well above the critical level.

THE BENEFITS

In addition to stemming problems associated with the previous heat transfer fluid; the **CALFLO** material engendered a number of supplementary benefits.

Circulation rate of the fluid is superior, producing more consistent heat levels and improving the preheating stage. Leakage from flanges and seals is dramatically lower and no measure able carbonization has been noted.

Neither any objectionable odour nor vapour fog associated with the heat transfer fluid has been recorded since the installation of **CALFLO HTF**. Alcan continues to employ **CALFLO HTF** in its paste plant and has registered complete satisfaction with the product's performance.

*For more information on any Petro-Canada CALFLO Heat Transfer Fluids,
please contact your nearest CALFLO representative or call Petro-Canada Fluids direct at
1-800-267-5968 or fax at 905-403-6875.*



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