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SubCom[®] Case Study: Potash Corporation of Saskatchewan - Potash Brine Project



Location: Patience Lake, Saskatchewan

Year Completed: 1991 and 2011

Deliverables: 10 burner 13 MM Btu/h heating system



Project Overview

The Potash Company of Saskatchewan switched to solution mining in the late 1980s as a result of being unable to contain or de-water their flooded mining operation. In the early stages of solution mining they were able to maintain a reasonable potash extraction rate until they started to exhaust the heat sink in the earth surrounding the mine. In essence the heated barren solution had to be pumped down through the mine and returned pregnant to the surface. The pregnant potash solution would precipitate in the surface lakes when exposed to subzero temperatures during the winter months. In order to save the mine, a novel form of brine solution heating had to be considered, and SubCom[®] solution heating was piloted and proven as the most suitable application.

The Challenge

The challenge was to investigate the possibility of adapting SubCom[®] solution heating to heat the corrosive brine solution. Inproheat initially performed a series of metallurgical tests in order to determine the most suitable alloy choice for construction of the combustion components. The criteria required an alloy choice that would stand up to stress corrosion cracking resulting from exposure at high temperatures in the presence of chlorides. Time at temperature tests concluded that Duplex 2205 was the most suitable alloy to withstand the harsh environment.

The Solution

With suitable alloy choices confirmed, construction began on a ten (10) burner 13 MM Btu/h SubCom[®] Solution heating system, providing a total heat input of 130 MM Btu/h. The system comprised the ten SubCom[®] burners mounted onto a floating tank structure. A specific channel was formed to direct the 15,000 USGPM brine flow directly under the SubCom[®] burners. The burners elevated the brine solution by 15° to 20° C, with a thermal heating efficiency of 98%. This novel application has been in operation since 1990, and as a result of such outstanding performance, PCS was issued the 1991 award from CGA for “innovative use of natural gas”.

In 2011, Potash Corp approached Inproheat to modernize and upgrade the original system to increase the heat input capacity, bring the technology up to current standards, and provide a more operator-friendly work area. Inproheat provided an additional four burners, all-new modular fuel trains with automated controls, and a new process control and burner safety management systems. The new equipment was installed on a refurbished operating deck and commissioned for the 2011-2012 winter mining season. The modernization and upgraded provided the operation with increased heating capacity and better control over the heating process.

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