

Consultancy Projects – Website Entries

PROJECT ONE--28 OC COLD ROOM PACK MALFUNCTION

This troubleshooting project was based around a newly designed and constructed Blood/Plasma Cold Store. Two Unit Coolers were employed with interlaced coils, with 50% of each Unit Cooler Evaporator Coil Circuit being served by one of two Refrigeration Packs in order to provide 100% standby (N+1). At low load conditions and start up the Refrigeration Packs and controls were behaving erratically.

Each Refrigeration Pack comprised 2 fixed speed Copeland Compressors and a single Digital Scroll Compressor to provide reasonable capacity control. Heat rejection was achieved via remote Air Cooled Condensers located approx 40 meters distant and incorporating a Liquid Receiver.

Whilst observing plant operation during low load conditions, it was clear from temperature recorders that the Cold Store condition was not being maintained according to design temperature requirements. Moreover, at this time, it was becoming extremely urgent for the installer to get the refrigeration system into proper operation in order to meet the end user client's critical deadlines for Blood/Plasma production.

Consequently, Mike Creamer of Business Edge Ltd was called in to assist the manufacturers Engineers in determining the true cause of the problem in order to bring about a rapid and satisfactory solution.

The refrigeration circuit included oil separation and oil management control for each Compressor and an Economiser Circuit for sub-cooling liquid refrigerant entering the main TEV.

Following an initial evaluation, Mike arranged for a special ClimaCheck Template to be created, this specifically suited to the refrigeration circuitry of the installed system. *(A ClimaCheck Template can be created to suit any format or refrigeration/air conditioning system running on any refrigerant type)*

With ClimaCheck in operation, Mike was able to clearly see the behaviour of every element of the refrigeration system including its cooling capacity, COP, evaporating temperature, condensing temperature and the superheat at both the main TEV and the Economiser TEV. From this he was then able to deduce the cause of the problem, which related to the behaviour of the EEV's (Electronic Expansion Valves) at each Evaporator, coupled with the arrangement of the Unit Coolers, where discharge air from each was being directed and drawn into the inlet of the opposing evaporator thus causing erratic EEV control. Indeed, during the start-up phase, following a short period of stable operation, the cold discharge air from Unit Cooler1, travelling rapidly across the ceiling to the inlet of Unit Cooler 2 caused the Controller in the latter to incorrectly reduce the cooling capacity via the EEV. The Controller relied on entering/leaving air temperatures and coil bend temperatures to control the EEV and this was being corrupted by the very cold discharge air from the opposing Unit Cooler.

The controls were re-arranged to work from the output of a single common sensor and the problem was resolved.

Picture of ClimaCheck and results graph