A.3: Development of software for baking application in UHVTS

Considering the essential requirement of conducting baking cycles in UHVTS on regular basis, the process was simplified & made reliable using a distributed 40-channel temperature controlling system developed in-house. The system includes five 8-channel Temperature Controlling Units (TCU) and one 8-channel Pressure Monitoring Unit (PMU), distributed over RS-485 multi-drop network. GUI was developed for data logging, supervision and overall control of temperature of the system under test. The pressure monitoring unit provides data logging of vacuum of the system under test by supporting various types of pressure gauges used in UHVTS. The GUI (screenshot shown in Fig.A.3.1) for this setup was completely redesigned, redeveloped for adding more user friendly features also providing compatibility with earlier & latest windows OS using VB.NET.

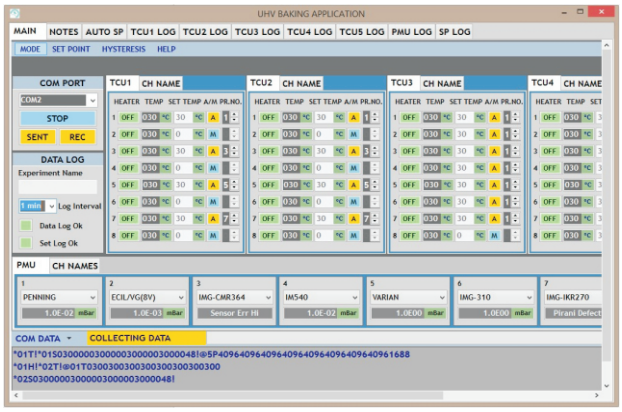

Fig.A.3.1: Screenshot of software showing overall GUI

The requirement of baking cycle for vacuum qualification test of various components is vital and needs to be done for achieving desired vacuum, starting from atmospheric pressure. In this process the temperature of the component is elevated from room temperature to the required level at a pre decided ramping rate, which is then maintained at that level for about 24-48 hours. Subsequently, the temperature is ramped down to a pre decided temperature after which it is allowed to free fall to room temperature. In this period, a turbo molecular pump is used to evacuate the vacuum system, bringing down the pressure to a level around $1.0E^{-06}$ mbar. The vacuum level is further improved by using an ionisation pump. Experimental data of a cycle using this application is shown in Fig.A.3.2.

One of the main highlights of the newly added features is that users can configure eight sets of profiles, defining starting & maximum temperatures. Additional settings which are common for all profiles like ramp time, temperature band, free fall temperature etc. are to be set before starting of the cycle. After starting the cycle, the set point for each channel for full cycle is updated automatically as per selected profile, maintaining the temperature difference in all channels within required limits. This overcomes the need of manually updating the set points by the operator at required intervals. The software also auto detects at start, the serial port to which the system is connected and the number of units connected, minimising further inputs required from the operator. Data is logged in .CSV providing widespread compatibility.

The software has some more user friendly features like observing serial data communication status & information, data logging status etc. Any channel can be set for one of the profiles and if required, switching between profiles during operation of cycle is also possible. The state of cycle & running time duration including time required for starting ramp down of the cycle is also displayed. A provision for saving operator notes, channel names have also been provided. Provision is also made for auto set point or manual set point configuration for any channel. The channels which are used only for monitoring temperatures must be set in manual mode. The PMU interface now supports selection among eleven types of vacuum measuring gauges used in the UHVTS.

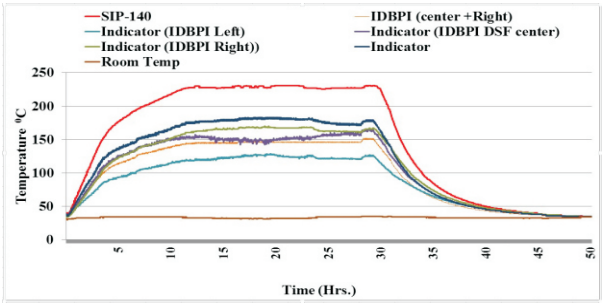

Fig. A.3.2: Result of a baking cycle conducted for ID BPI

The software auto detects power failure and provides option to the operator of auto reloading after restarting. If user opts to reload the software, it restores all the previous settings, channel names & starts appending data log in the file in which it was being stored. This developed software had been successfully used in the baking cycles conducted for the commissioning of Undulator U1, U2 & U3 in Indus-2 as well as in various setups for performing vacuum qualification tests in UHVTS.

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