Summary of BoNuS Target Purge and Fill Issues

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This summary covers the mass flow controller (MFC) issues experienced during the recent BoNuS experiment, and briefly discusses the auto mode vs manual mode for gas flow.

An issue with purging the BoNuS target is that if the set parameters are changed to purge the target when the control program is in auto mode, the program enters a fault state. The fault state is caused by the controls program monitoring the system’s pressure and MFC flow in the “background” during normal operations to ensure read back values do not fall outside the fault limits set in the program. Hence, if set parameters are changed without also changing the fault limits, the normal behavior of the system towards the end of a purge will cause the system to enter a fault state. This control behavior was added by design to ensure the system is in a safe state when leaving auto-purge mode.

The solution to this feature is not to change purge parameters on the fly when the controls program is in the auto mode, without modifying the fault limits. Purging in manual mode does not give rise to the fault states.

A controls system change that could help resolve some of the “faults” would be the addition of a timer on the flow in auto mode. The timer would allow for flow to still be there when transitioning from the purge fill to auto mode states, without causing a fault state.

Another issue is that when the three valves SVBT100, SVBT102, and SVBT108 (Fig. 1) are closed, there is still flow measured by the MFC. Since, in principle, there should be no flow, this behavior may point to the MFC being faulty. However, depending on the closing order of those three valves, there is enough line between the MFC and SVBT108 so that gas can still flow to pressurize the line between the MFC and SVBT108. In addition to this, if there is a problem with the MFC, it could be caused by incorrect gas settings or by ambient temperature—if the MFC gets too cold, it could have problems correctly measuring the mass flow of the gas passing through it. This issue could be resolved by locating the MFC in a temperature controlled location.

Despite these issues, the controls and monitoring system software performed reliably during the run.

FIG. 1. Simplified BoNus target gas flow diagram.