

Alarm rationalization: practical experience rationalizing alarm configuration for an accelerator subsystem

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Abstract

A new alarm system toolkit has been implemented at SNS. The toolkit handles the Central Control Room (CCR) annunciator, or audible alarms. For the new alarm system to be effective, the alarms must be meaningful and properly configured. Along with the implementation of the new alarm toolkit, a thorough documentation and rationalization of the alarm configuration is taking place. Requirements and maintenance of a robust alarm configuration have been gathered from system and operations experts. In this paper we present our practical experience with the vacuum system alarm handling configuration of the alarm toolkit.

Applied to the vacuum system, we decided to create **three types of vacuum alarms:**

1) Elevated vacuum pressure:

Might, for example, indicate a leak in the vacuum vessel.

2) Valve status:

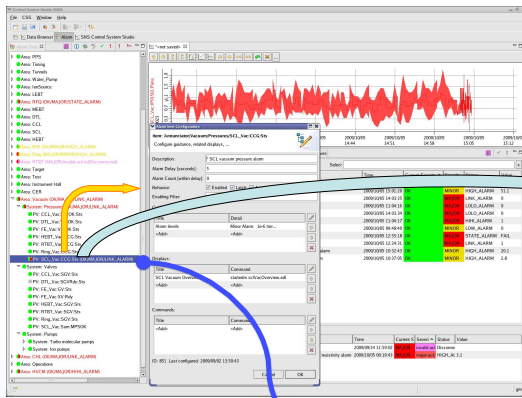
A valve that is supposed to be open is found closed.

3) Pump status:

A pump that is supposed to be running is found off.

Along the SNS linac, there are many pressure sensors, valve and pump readbacks. Instead of adding each one individually to the alarm system, we decided to summarize them for **7 areas:** Front end, CCL, DTL, SCL, HEHT, Ring, RTBT.

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SNS vacuum Major Alarm levels

Subsystem	Major Alarm Level
Front-End	5×10^{-4} to 5×10^{-5} Torr
DTL, CCL, SCL	1×10^{-6} Torr
HEBT, Ring, RTBT	5×10^{-6} Torr

The rationalization for an alarm on wiki page

Purpose of Alarm
Notify operators of vacuum valve closure.

Operator Guidance
For source, check if pumps are operating, if ok then open the PV (pump isolator valve). If pump or gauge is off, by restoring, if unit will not start and line vacuum pressure is affecting operations - notify vacuum beam immediately.
For the rest of the machine, check vacuum that the vacuum pressure is ok on both sides of LV (line valve). If pressures are ok, open LV. If vacuum pressures are not ok - notify vacuum beam immediately.

Failure Consequence
For source, beamline vacuum pressure might degrade over time and trip the beam off.
For the rest of the machine, beam off.

Operator Response Time Available
See operator guidance above.

Contacts

Alarm configuration

The decision to configure an alarm must meet the following three criteria:

- The event requires operator attention and action
- The alarm is the best indicator of the situation's root cause.
- The alarm is truly resulting from an abnormal situation.

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For each area, vacuum system experts can control which of the vacuum sensors are used to compute the alarm and at what level. They can disable alarms from pumps which are temporarily not required, or disable alarms from faulty sensors. In case of a severe vacuum problem, for example, in the DTL, operators receive one "DTL Vacuum Pressure" alarm instead of one alarm from each vacuum sensor in the DTL.

The real alarm PVs are running in VME IOCs, and some of the calculation records used for alarm summaries are running in the Linux soft- IOCs.