Cryogenic Problems during HERA week #8 2005

F. Willeke, Mar 01, 2005

On Monday morning, Feb 21 at ~2:20h, the cryogenic supply for the HERA South half ring was interrupted by a failure of the warm compressors. Up to now, the reason of the failure could not be clearly identified. During the 5 hour attempt to restart the system, the magnet temperatures in HERA South rose to 30K and the liquid He reserves in the entire system evaporated.

Cool down of the system started on Monday morning, Feb 21. The superconducting cavities and the IR South as well as the cryogenics supply for ZEUS became available by Tuesday morning. HERA was then operated with electrons for polarization tuning.

While it was possible to cool down the magnet octant SL within 24 hours to below 10K, the cool down of the octants SR, OR, WL was unsuccessful and the temperatures inside the HERA dipole magnets in SR eventually exceeded 75K by Tuesday afternoon, Feb 22.

The reason for large amounts of He evaporating on Feb 21 and the reason for the system getting out of control on Tuesday is still unclear and is still under investigation.

On Wednesday, the cooling of the superconducting cavities, the South IR, and the experiment south was interrupted to use any available resource to support the magnet cooling. .HERA beam operation was stopped completely. On Wednesday morning additional pumps needed to be installed to keep the insulation vacuum under control. In the following two days the octants SR, OR and WL were cooled down one by one to temperatures below 10K concentrating this way the entire cooling capacity to single octants. Meanwhile, the magnet temperatures in WL exceeded 80K before the magnets were cooled down.

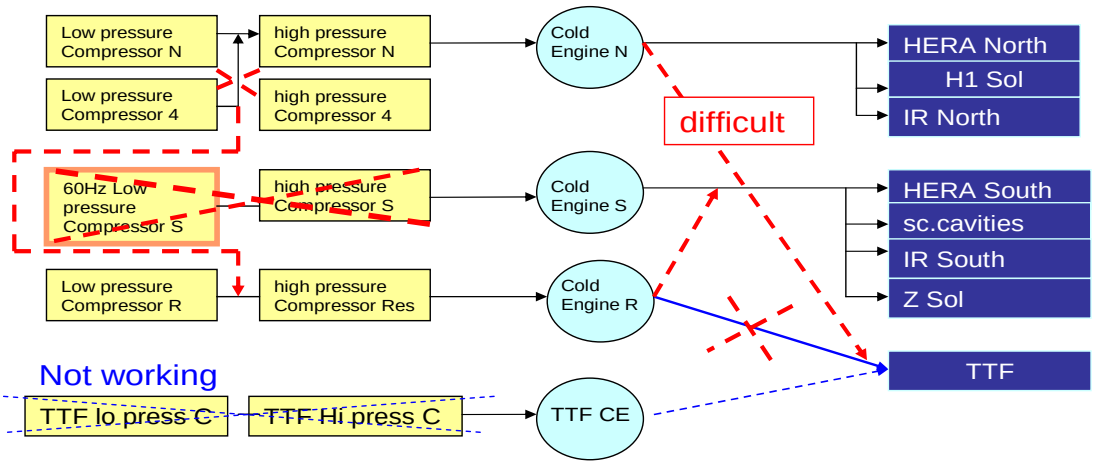
Starting on Friday afternoon, the cryogenic systems could be filled with liquid He. However in order to completely recover from the incident, two further days were required and it was not before Monday morning, Feb 28 before all systems were back to normal and beam operation could be resumed.

Unfortunately, several experts were not available during the week which might have contributed to the delay of the recovery.

Part of the problem is that the HERA cryogenic system is not fully redundant any more due to additional cryogenic needs and due to some technical constraints and complicated procedures needed to work around them. Therefore HERA is now more vulnerable with respect to compressor failures compared to previous years.

A full week of HERA operation was lost due to the incident. There will be a full report on the incident after all the investigations will be completed.

Redundant HERA Cryogenic Supply in case of failure of the Compressor Street South



This scheme was not applied since:

- It is too intricate and it takes too much time, experts not available
- Cannot afford interruption of Cryogenic supply of the VUVFEL cryo system