

ATLAS ID cooling consolidation plans

The cooling problem

The existing ATLAS ID evaporative plant needs to be consolidated because of HAUG compressors reliability problems.

Evaporation temperature higher than required owing to the excessive pressure drop on the exhaust lines of the detector.

Evaporation temperature 🏠	
Nowadays	- 20 C
Specifications	- 25 C
Future	- 30 C

C3F8 or Blends

The target evaporation temperature leads the fluid choice,

Pure C3F8 will not allow us to reach the required evaporation temperature in the ATLAS ID cooling system.

Blending C3F8 with a lighter fluorocarbon will give us the required properties (a decrease of the evaporation temperature for the same pressure). The most appropriate blend seems to be 20%C2F6 + 80%C3F8

Compressor solution

The requirements for a compressor to be used in the ATLAS ID evaporative plant are: oil-free, hermetic compressor and qualified for the fluid.

A market research has taken place to search for a compressor that fulfills all these requirements.

The Turbocor compressor is oil-free and hermetic but it is only qualified for R134a. Turbocor qualification for C3F8 and blends requires a long process. Timing is incompatible with 2012 consolidation plan. Turbocor will be considered a back-up solution.

Thermosiphon solution

The main advantages are

- Reliability: no active components in the detector cooling circuit. Possible redundancy of the surface installation.
- Accessibility: easy maintenance as the active components are in the surface.
- Safety: separation of the detector cooling circuit (potentially radioactive) and the active components to be maintained.

EN-CV-DC/ATLAS have the required technical competences to build a Thermosiphon station

- The "mini-thermosiphon" test station has proved the working principle of the thermosiphon for fluorocarbons.
- The 2kW PX15 thermosiphon test bench will give us the experience of the working and control conditions of the thermosiphon.

The main issues to be addressed for a future final installation shall be

- Chiller: is the more complex part of the station. It is accessible as is in the surface. An industrial tested reliable solution shall be foreseen. A market survey has taken place.
- Integration: the integration of the plant in the surface.
- Installation of the pipe in the shaft.
- Earthquake calculation of the pipe.

The Haug compressors plant will remain as a full back-up plant.

Cost 🏠	
Fully redundant chiller -80 C	2 MCHF (2009 budget estimation, Italy)
Non redundant -60 C chiller	500 kCHF (2010 budget estimation UK)
Partially redundant -70C chiller	Under investigation

Conclusions

After more than one year of investigation, Thermosiphon is the base line for the consolidation of the ATLAS ID cooling system now.

- The target minimum evaporation temperature of the new cooling system is -30 C on the detector boiling channel.
- The target dead line for the system installation is end of 2011.
- The target test and commissioning phase is spring-summer 2012.
- The process of "Market Survey – Invitation to Tender – Contract" for the installation of a -70 C chiller has been launched.
- Extra resources are needed to keep this project on track.