Elettra Sincrotrone Trieste

ELEFAN SYSTEM @ ELETTRA

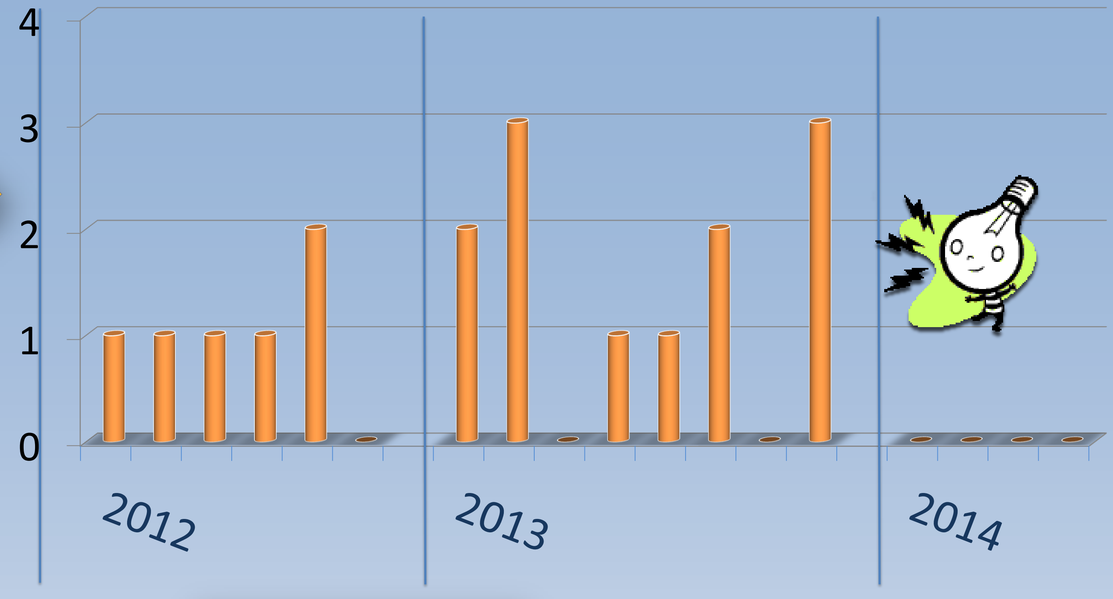
Enzo Benfatto

Elettra-Sincrotrone Trieste S.C.p.A., Trieste

The top-up operation established since 2010 at the Elettra third-generation synchrotron light source has solved the problems related to thermal drifts and beam current dependence with beam accumulated, but other problems related high temperature and cooling became very important.

Project EleFan System

It is usual in the storage ring machine that the hottest area is located immediately after the light exit chamber "UDL" of the bending beamline. Over the years different types of UDL design has been used, but the temperatures recorded after the bending exit chamber have always been very high. These high temperatures damage very often the following gasket causing a vacuum leakage.
With the machine in operation state, the temperature reached in these points are more or less 100° C and the gasket limit is more or less 110° C-120° C, so the working and limit temperatures are very close.



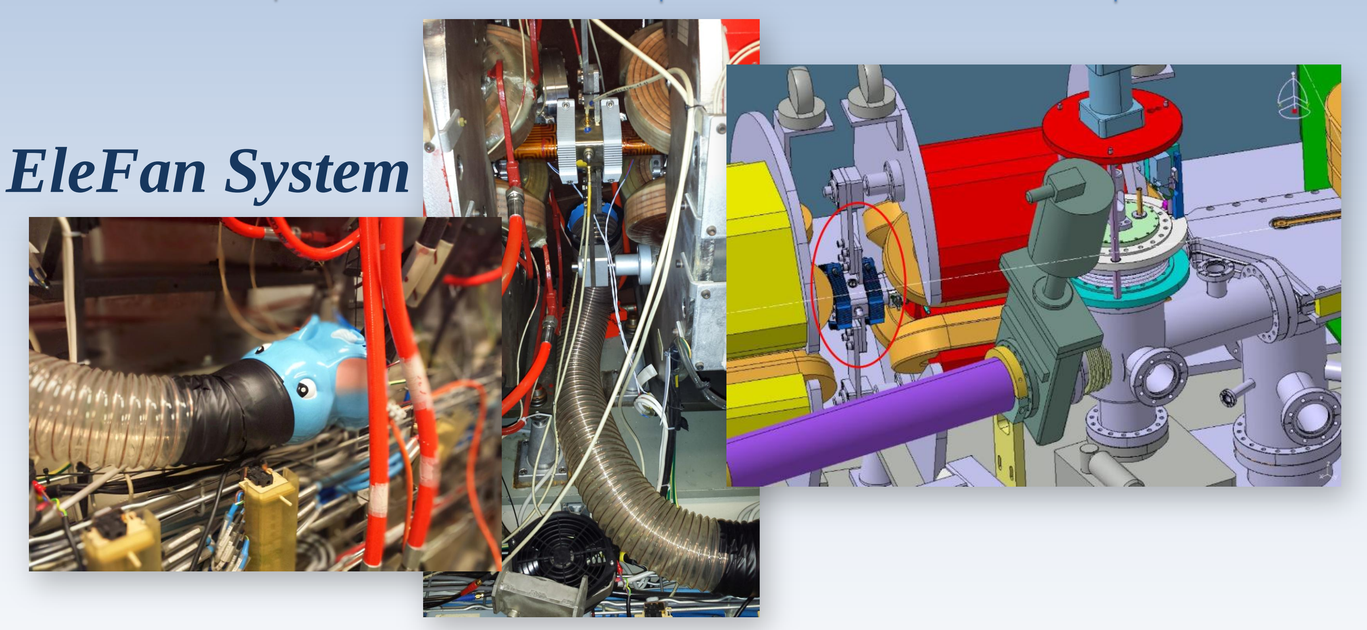
The cost of replacing the gasket is:

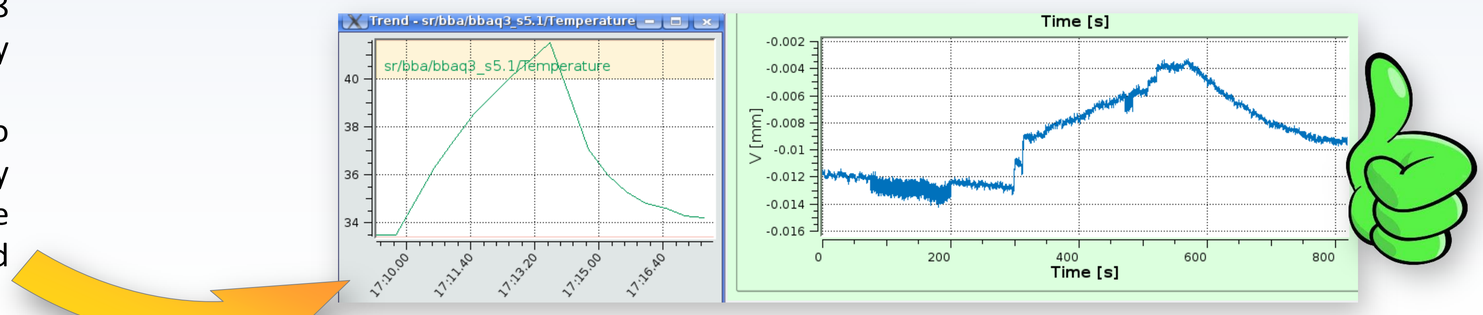
- € 80/150 for single gasket
- 20h to deliver the beam to the users

In 2011 we installed a dissipator and a fan for each BPM after the bending UDL and we apparently solved the problem of the high temperatures, in fact the temperature were 30° C-40° C degree less.
The initial system was not remote controlled, so the fans were working also when the beam was not accumulated. This way the working temperature fell very fast and the mechanical forces generated by the vacuum chamber were too high for the gasket.
Between 2012 and 2013 were necessary 18 interventions due to gasket damages, for a total of 360h of downtime.

Since 2014 we decided to switch off all the fans at every time was possible to preview a downtime longer than 1hour. In the first 8 months of operation following this rule, we haven't recognized any problem with the gasket.
By May we have installed an electronic card to make us able to control the fan rpm and we are working to control all 24 fans by control room. With the new system we'll be able to control the fan's rpm and so we'll make a feedback with the desired temperature and the fan's rpm.

EleFan System

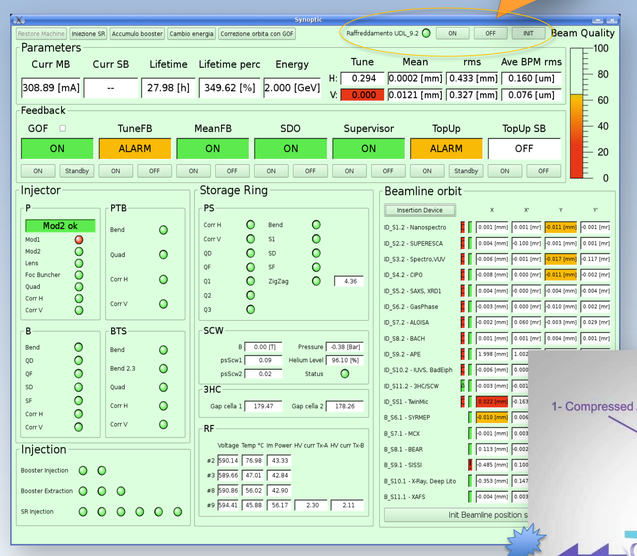


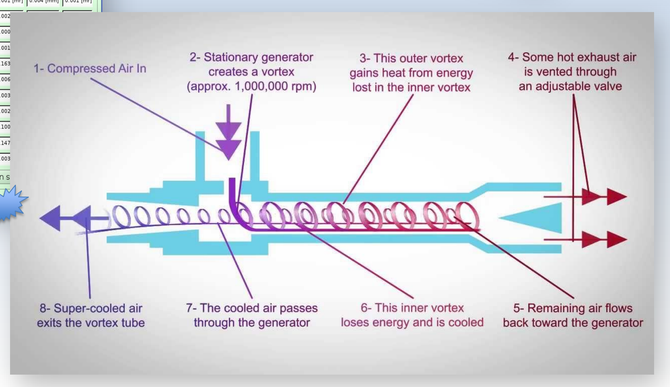


Vortex System for cooling UDL

To overcome some problems encountered over the years with the light exit chamber UDL, we have installed a new cooling system that doesn't use the water. In the past we had many corrosion problems on this part of the machine, as far as we decided to stop to cooling them. Otherwise the temperature was too high, so we considered a new cooling system.
We focused on the Vortex tube: The vortex tube, also known as the Ranque-Hilsch vortex tube, is a mechanical device that separates a compressed gas into hot and cold streams. The air emerging from the "hot" end can reach temperatures of 200° C, and the air emerging from the "cold end" can reach -50 ° C. It has no moving parts.
At Elettra we're using it with a cooling temperature of 10° C.

In the last year we worked with only 1 Vortex and we're planning the installation for all the 12 UDLs. Our last year experience tought us that it's also necessary to stop the cooling system when the beam is not accumulated, in fact during this phase without the thermal power inducted by the beam, the Vortex started to freeze the UDL. For these reasons we interpose the input air with an remote controlled valve that is controlled by the operators directly by the control room panels.
In the next release of the system, the state of the valve will be automatically controlled by high level software, that will close or open the valve depending on the machine status.





For additional information, please contact:
enzo.benfatto@elettra.eu

WAO 2014, Mainz, Germany, Oct 26 – Oct 31