CONDENSATE RECOVERY UNIT (CRU)

Efficient condensate recovery in corrugator steam systems is achieved through direct injection of recovered condensates to the boiler, feeding the boiler with high pressure & temeperature condensates (tipicaly at 120psi & 350 ºF).

Since condensates of rolls and steam chests along a corrugator are purged with high temperature and pressure, pressurized recovery of these condensates with direct feed to the boiler (avoiding its depressurization and its associated cooling down with the corresponding flash steam production), is the best way to avoid energy losses, maximize energy efficiency and reduce fuel consumption.

BAVIERA's condensate recovery system design is the outcome of over 25 years of experience in this field. The system achieves optimal energy efficiency in condensate recovery and, at the same time, ensures optimal heat transfer along the corrugator, by means of several automatic controls that we describe in this document.

Our journey with this systems has enhanced a design of extremly reliable, long-lasting components and practically exempt of required maintenance.

BAVIERA's condensate recovery unit (CRU) is usually placed in the boiler house. It has a vertical condensate tank, sealed at 300psi, where condensates are recovered an estimated pressure of 120psi, and then fed directly to the boiler at high temperature.

The condensate pump feeds the boiler with the condensates coming from the lower side of the tank. The pump works with high temperature condensates and has therefore, its mechanical seal placed away from the hydraulic. It is designed for natural air cooling at around 120ºF, providing excellent working conditions that result in a long-lasting execution of the pump.

The system is provided with the following main automatic controls:

- Level control: condensate level inside the CRU is controlled automatically by means of an inverter that optimizes electrical consumption of the condensate pump and ensures optimal working conditions for the pump whatever pressure is regulated in the boiler.

- Differential pressure control (heat transfer): Differential pressure working conditions of the condensate recovery system is controlled through a digital differential pressure transmitter in a PLC. This measures the difference between pressure of steam fed to the corrugator and condensates recovered from corrugator: differential pressure working conditions of steam traps.

  Should differential pressure of the corrugator be at risk because of a faulty steam trap, a leaking manual by-pass valve, etc., the PLC will then open a digitally controlled valve (relief valve L) in order to release steam to the deaerator/hot well, re-establishing differential pressure to the

minimum requried value. At the same time, it will display an alarm indicating that the system needs to use up steam to ensure the required differential pressure, guaranteing optimal work conditions for steam traps along the corrugator (very usefull indicator for steam traps maintenance/ check).

Differential pressure is controlled and monitored through a PLC+colour touch screen (HMI) installed in the electrical enclosure.

- Condensate temperature control: During system start-ups, when steam is fed to the cold corrugator after a weekend-stop/ holiday stop, it is important to remove the air inside the corrugator to ensure quick non-condensable gasses removal, favoring a rapid warm-up in the corrugator. Equally important is to avoid feeding these rich- cold oxygen condensates to the boiler, to prevent oxidation inside the boiler.

  Temperature of condensates coming from the corrugator is measured with digital Pt100 temperature sensor, informing the PLC.

  This informaiton (along with steam pressure monitoring) enables the CRU PLC to automatically detect a system warm-up, deviating rich- cold oxygen condensates to the hot well /deaerator during start-up, This way it avoids feeding oxygen and other non-condensable gases to the boiler, and helps achieve an optimal heating-up of the corrugator.

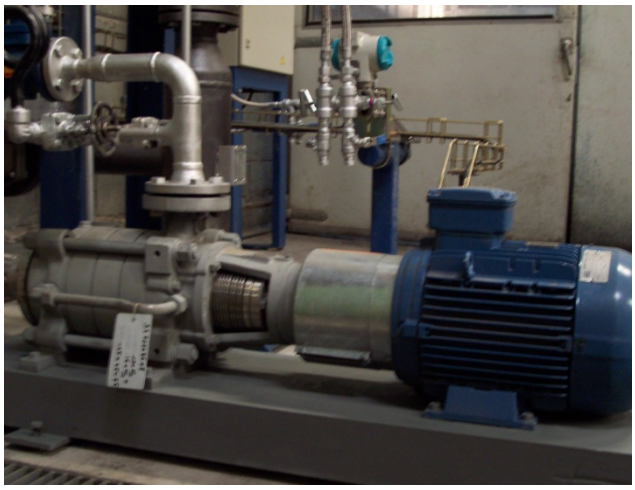
  The CRU detects system shut-downs (closing steam to the corrugator), plus it deviates the condensates coming from the corrgutor to the hot well/deaerator during system shut downs.

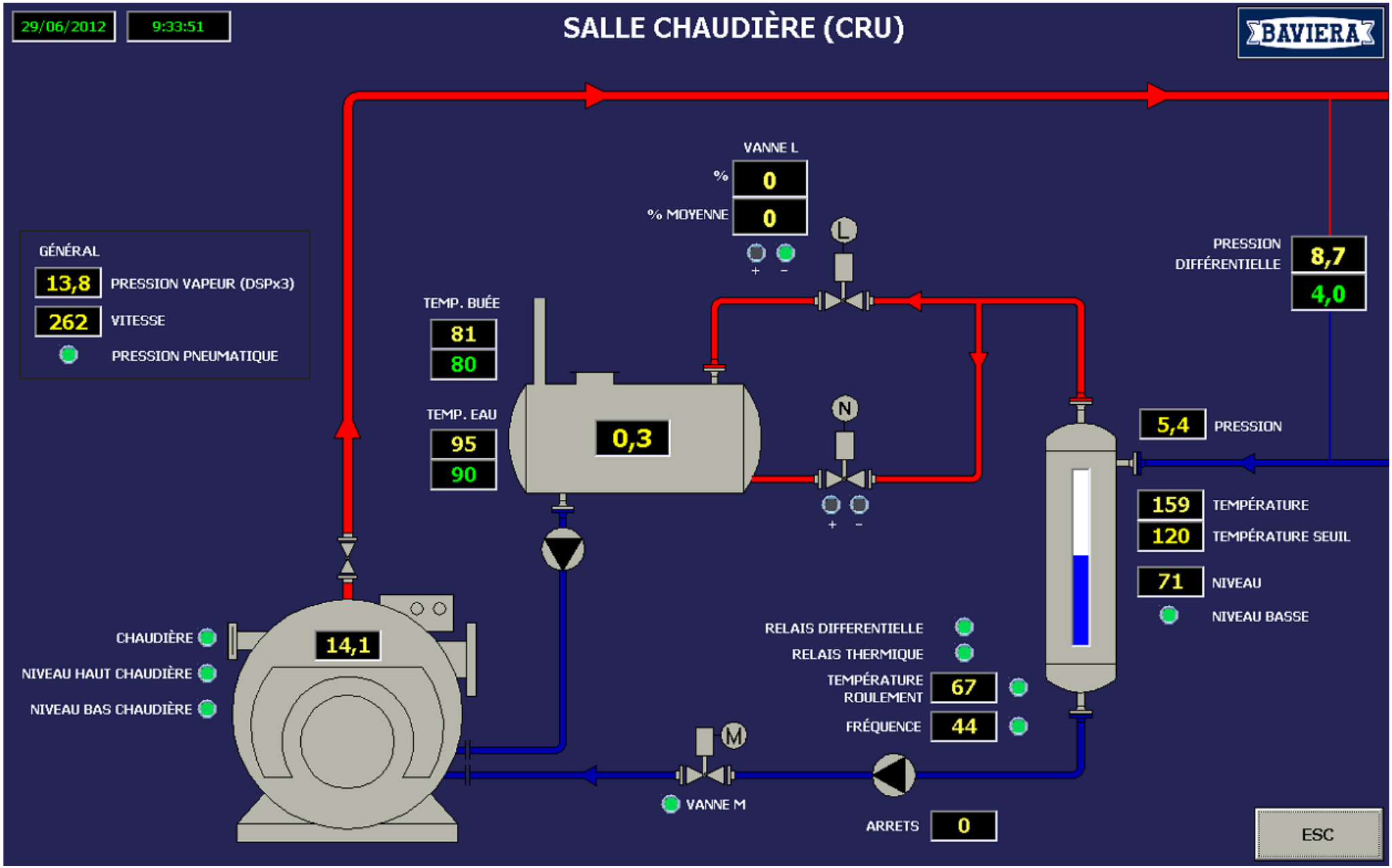
  This helps the optimization of condensate removal during system shut-downs, leaving the corrugator as dry as possible enssuring an optimal startup next time.

- Low pressure steam (flash steam) recycling: If there are low pressure steam services (showers/humidification of fluting, air heating, glue kitchen, etc.), the automatic vale T in the CRU provides the low pressure saturated flash steam coming from the condensates for these purposes.

  This permits recycling of the flash steam coming from the corrugator condensates, and provides a high quality controlled low pressure saturated steam supply line.

- Boiler feed control: The CRU unit comes with connections that sned signals from the boiler to the CRU, when available, indicating low/high boiler level and ON/OFF boiler alarms. In the event of any of these alarms being activated, the CRU avoids feeding the boiler through the control valve M.




29/06/2012
9:33:51
SALLE CHAUDIÈRE (CRU)
BAVIERA
VANNE L
%
0
% MOYENNE
0
GÉNÉRAL
13,8
PRESSION VAPEUR (DSPx3)
262
VITESSE
PRESSION PNEUMATIQUE
TEMP. BUÉE
81
80
TEMP. EAU
95
90
0,3
PRESSION DIFFÉRENTIELLE
8,7
4,0
5,4
PRESSION
159
TEMPÉRATURE
120
TEMPÉRATURE SEUIL
71
NIVEAU
NIVEAU BASSE
CHAUDIÈRE
NIVEAU HAUT CHAUDIÈRE
NIVEAU BAS CHAUDIÈRE
14,1
RELAIS DIFFERENTIELLE
RELAIS THERMIQUE
TEMPÉRATURE ROULEMENT
67
FRÉQUENCE
44
VANNE M
ARRETS
0
ESC