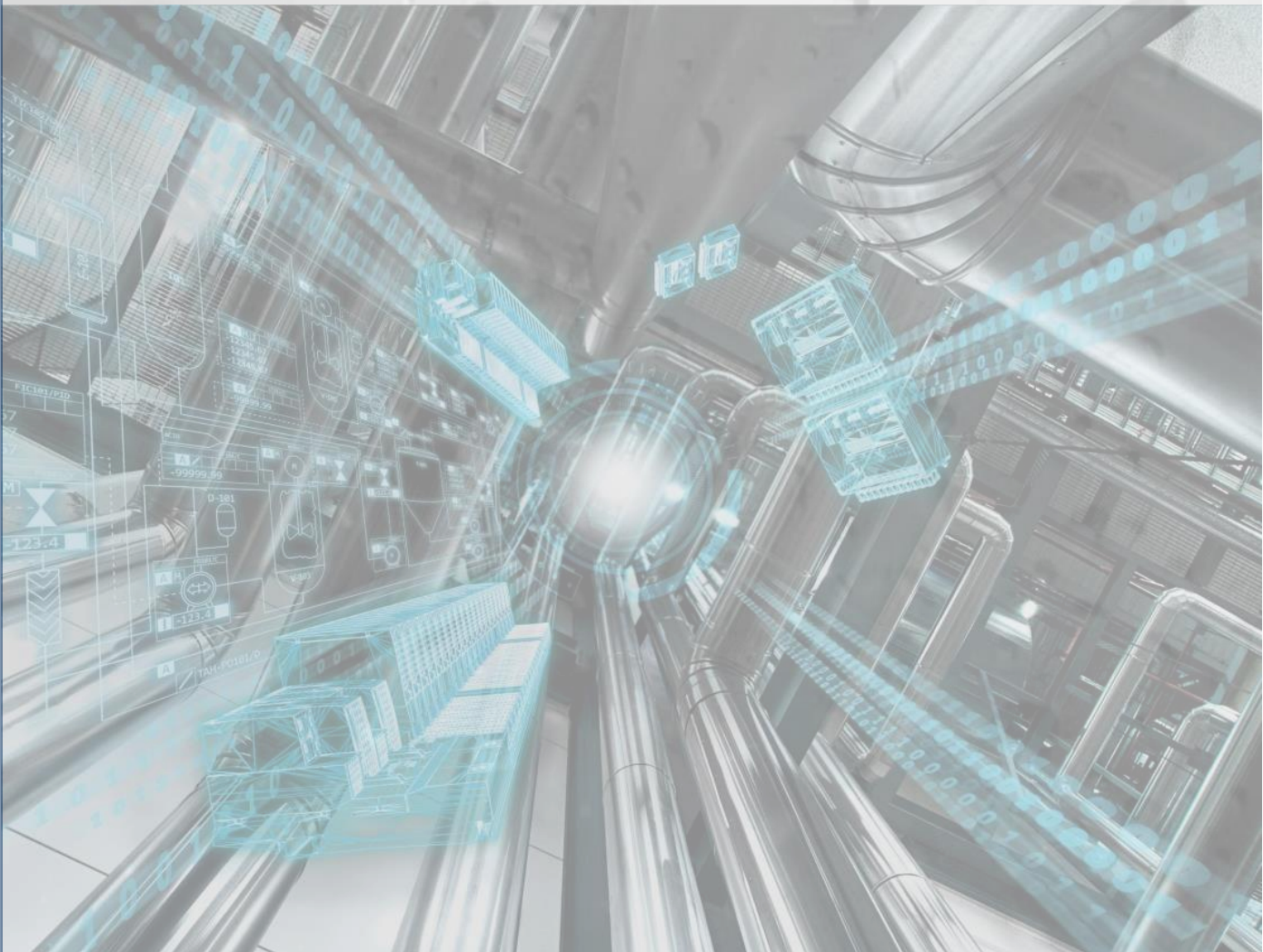


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STEAM 4.0



Self-surveillance and advanced monitoring system RAS

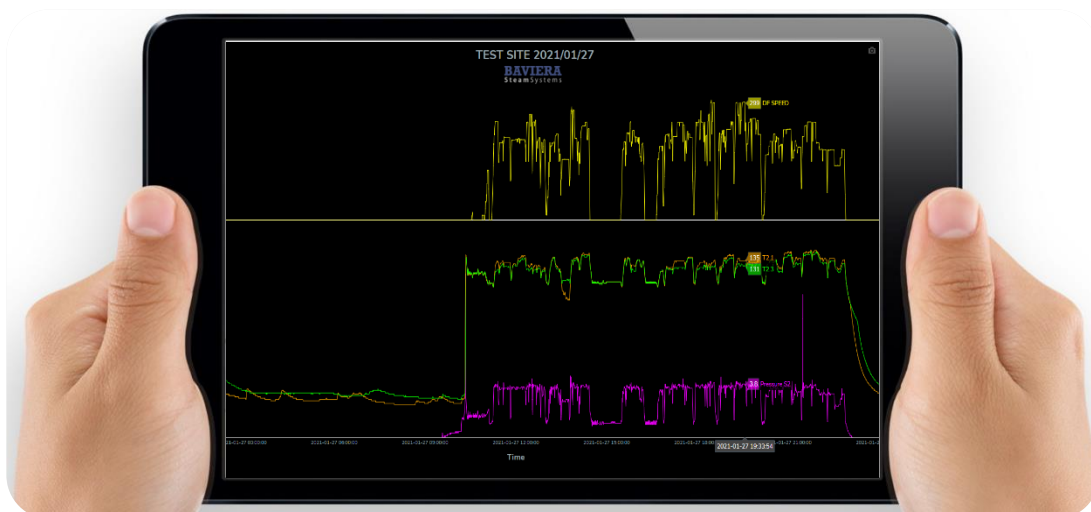
1. Introduction

Periodic internal performance evaluation and/or maintenance done by the plant to the steam system, **in combination with an annual/biannual external site service is highly advisable** in order to ensure optimal performance of heat transfer along the corrugator, thus **optimal production**.

However, it is important to stress and make clear that no type of preventive maintenance can completely prevent from an unexpected mechanical failure of a steam trap/non-return valve/blocked strainer/bad-positioned siphon/etc.

In opposition to other type of typical failures that can occur in a corrugator, such as a mechanical failure involved in a Single Facer, the Double Facer belt roll, etc., **the main difficulty production teams face with a heat transfer problem** is that, unless catastrophic, it won't have an immediate clear effect on production, thus will most likely result at a **first stage in a gradual decrease of production quality and/or speed**, followed by a **modification of the corrugator operational parameters** (pressure set points, wrap percentages, etc., required to achieve a given paper temperature target), as a natural response of the operator to 'go around' the problem (a problem that has not been correctly diagnosed or most times not even evidenced) and minimize the consequences of the heat transfer issue on production. On the long term, **this modification of the operational parameters becomes a habit**, and operators get used to the problem, thus the problem does not exist (until, of course, sometime in the future it is correctly diagnosed and solved, thus affecting once again the operational parameters of the corrugator). In other words: **un-stability and lack of repeatable operational conditions with the consequent non-standard product outcome**.

Such a failure, when it occurs, will most likely have an impact in production that will clearly exceed, in economical terms, the overall steam system preventive maintenance budget, thus the importance or, to be more precise, the need of a complementary approach: **RAS**.



2. RAS

For every possible heat transfer issue that might occur in a corrugator, there are 3 considerations to be borne in mind:

1. The probability of occurring.
2. The impact of the problem in production, should it occur.
3. The ease/time it takes to detect and solve the problem.

As regards point 1 & 2, it is all about process-design and components reliability, both key features of BAVIERA Steam Systems. We design our systems orientated to maximize reliability and to minimize the impact of a possible problem on production. Nevertheless, we are of course aware that no component is eternal.



RAS comes into scene with point 3. But what does RAS provide?

- Continuous heat transfer control with automatic alarms in control room
- Traceability (all heat transfer relevant information is data logged to PC)
- Automatic detection of individual heat transfer issues cylinder by cylinder
- Cylinder siphons performance evaluation
- Remote steam system performance evaluation by BAVIERA (internet)
- Remote software updates/upgrades & customer required changes.
- Process control interface
- Coming soon (under development): statistical-based online life remote (internet) BAVIERA preventive maintenance service.

Please find in the following pages a more detailed explanation, point by point, of each one of the above-mentioned points.



3. RAS in detail

We propose the supply and installation of a RAS system that will make possible to monitor from the control room the whole steam and condensate recovery system of the new corrugator.

By means of the proposed RAS system for the new corrugator, Heat Transfer performance of the corrugator and most important parameters of the condensate recovery system will be monitored in the control room automatically and continuously.

A set of automatic indicators and alarms will be displayed, in order to ease surveillance of the corrugator's heat transfer performance and condensate recovery systems performance.



Proposed RAS system will provide for the corrugator:

- Enhanced condensate recovery system feedback at control room
- Automatic Condensate recovery system alarms in control room
- Automatic Steam & Condensate system datalog to PC (Excel files)
- Active Heat Transfer Control (AHTC) – life analysis of heat transfer
- Dynamic Heat Transfer Control (DHTC) – siphons performance analysis
- Enhanced steam system troubleshooting, both local and remote
- Process control interface

➤ Heat transfer performance

We will install a Pt100 temperature transmitter before each steam trap all along the corrugator, what will make possible to know the purge temperatures of all cylinders, preheaters and preconditionners, real-time.



RAS system knows at the same time all pressures regulated along the corrugator and, therefore, also know the expected purge temperatures (if everything is working OK). The system compares expected temperatures and real measured temperatures, and in case a discrepancy is detected, RAS will show an alarm in the control room that will indicate the operator of a heat transfer issue that could affect production.



➤ Datalog (Traceability)

The proposed system will store periodically and automatically in a local PC all important production parameters (pressures and temperatures) together with a summary of most important system performance parameters into a spreadsheet, in order to facilitate their traceability and to help in quality control tasks.

This information will be stored in an SD card as Excel-type files (CSV), that will be generated automatically on a daily basis.

RAS datalog will enhance:

- Traceability
- Quality control
- Performance evaluation
- Troubleshooting



➤ Remote system checks (performance evaluation & troubleshooting)

RAS system will make possible for BAVIERA to perform, under customers request, remote software modifications, remote software upgrades/updates, remote system performance checks, remote troubleshooting, etc.

This system will therefore provide a useful technical assistance tool with an excellent time-response.



➤ Process control interface

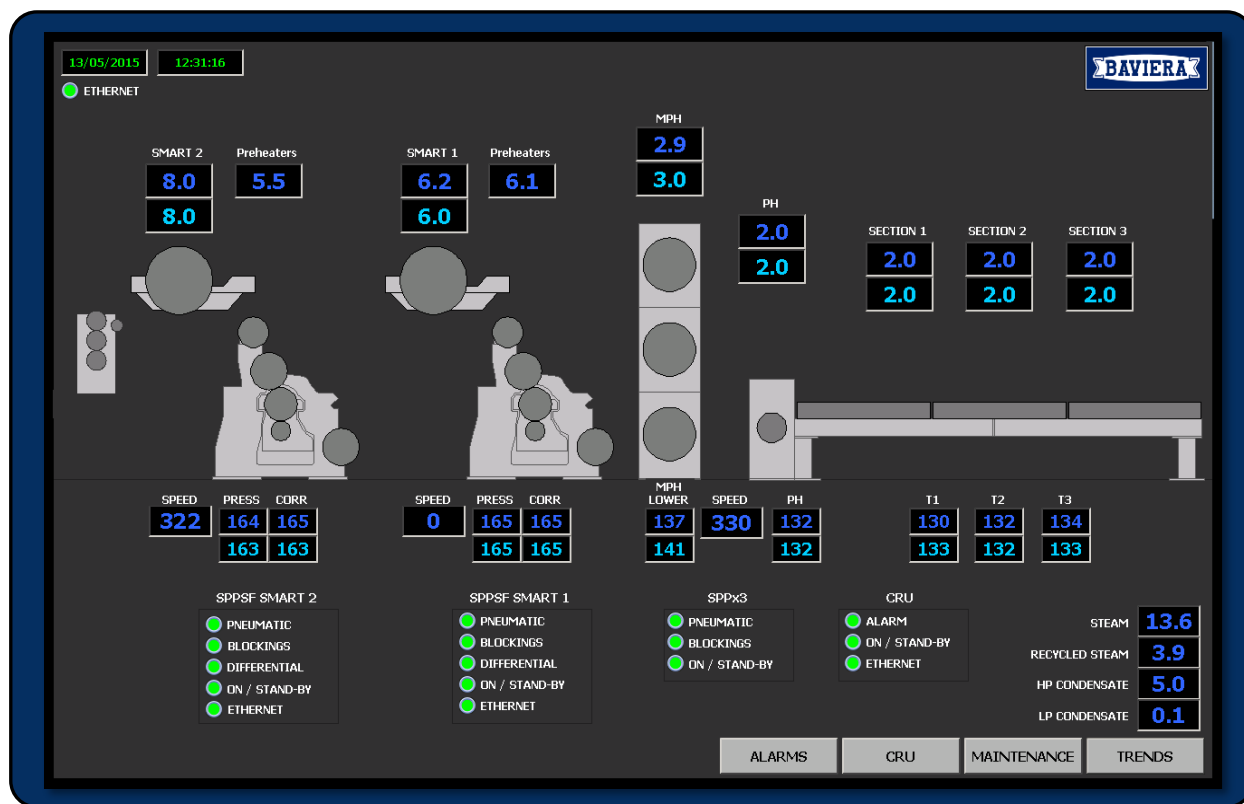
RAS system will make possible interface with external process control in order to exchange:

- **Alarm bit(s):** BAVIERA will send a general alarm bit(s) to the external process control that should be displayed in the main operator production control screen, for the event of any heat transfer issue putting on risk production.
- **Speeds & Pressures:** For RAS to be able to enable the Active Heat Transfer Control, and the Dynamic Heat Transfer control (siphons), it is required to receive (we suggest by means of Modbus/TCP) speed signals of SF1, SF2 & DF. Though not strictly necessary, it is also advisable to receive through process control interface pressures and pressure set points in order to get the most out of the RAS system.



Examples monitoring system RAS

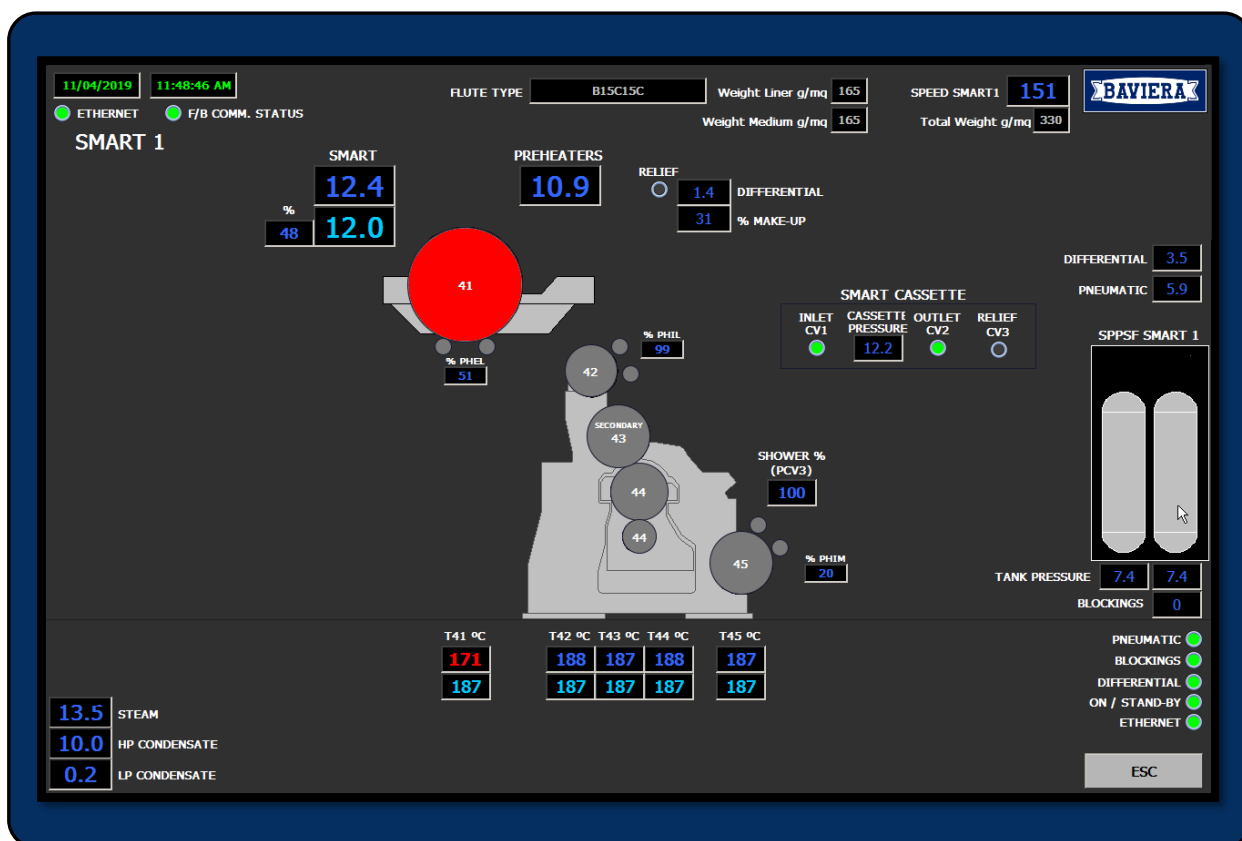
Please find as follows several example screenshots that illustrate the human-machine-interface (HMI) feel of RAS systems installed in several plants.



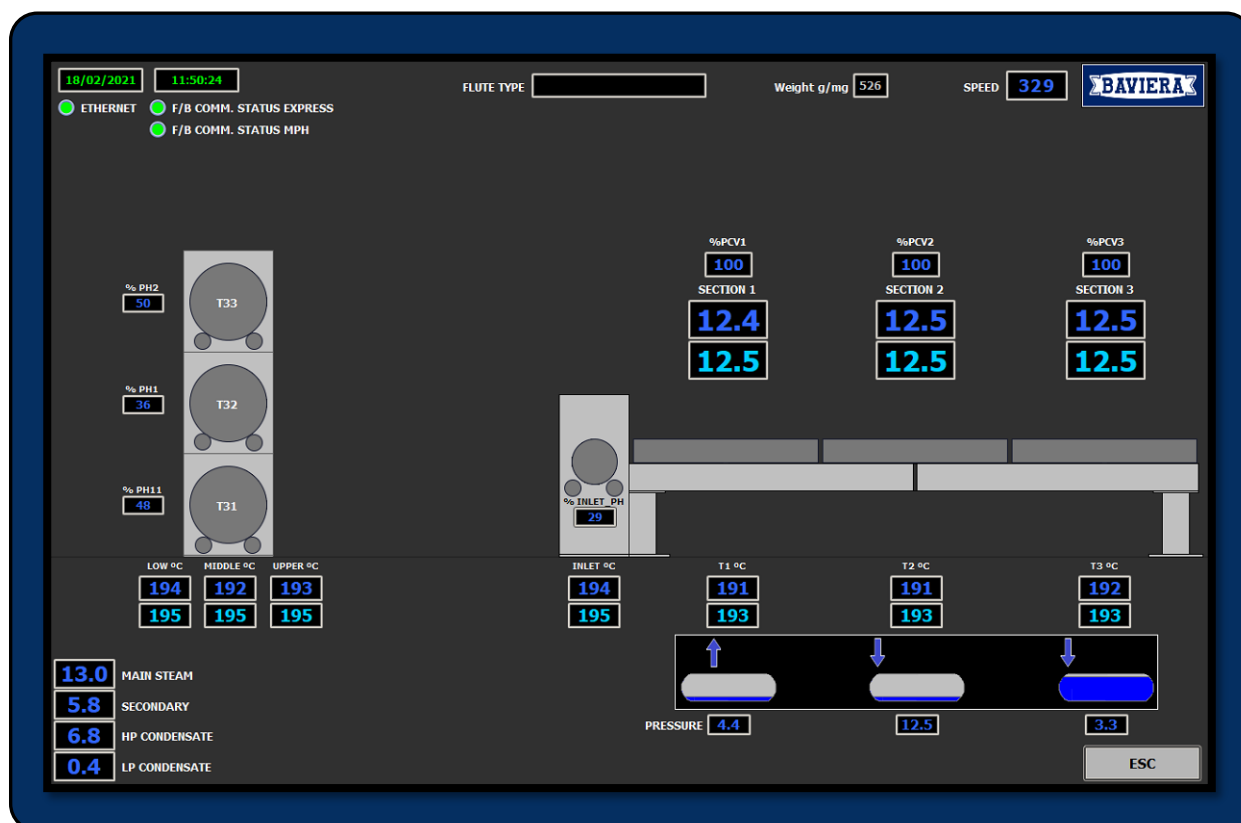
(RAS main HMI – Heat transfer check at a glance)



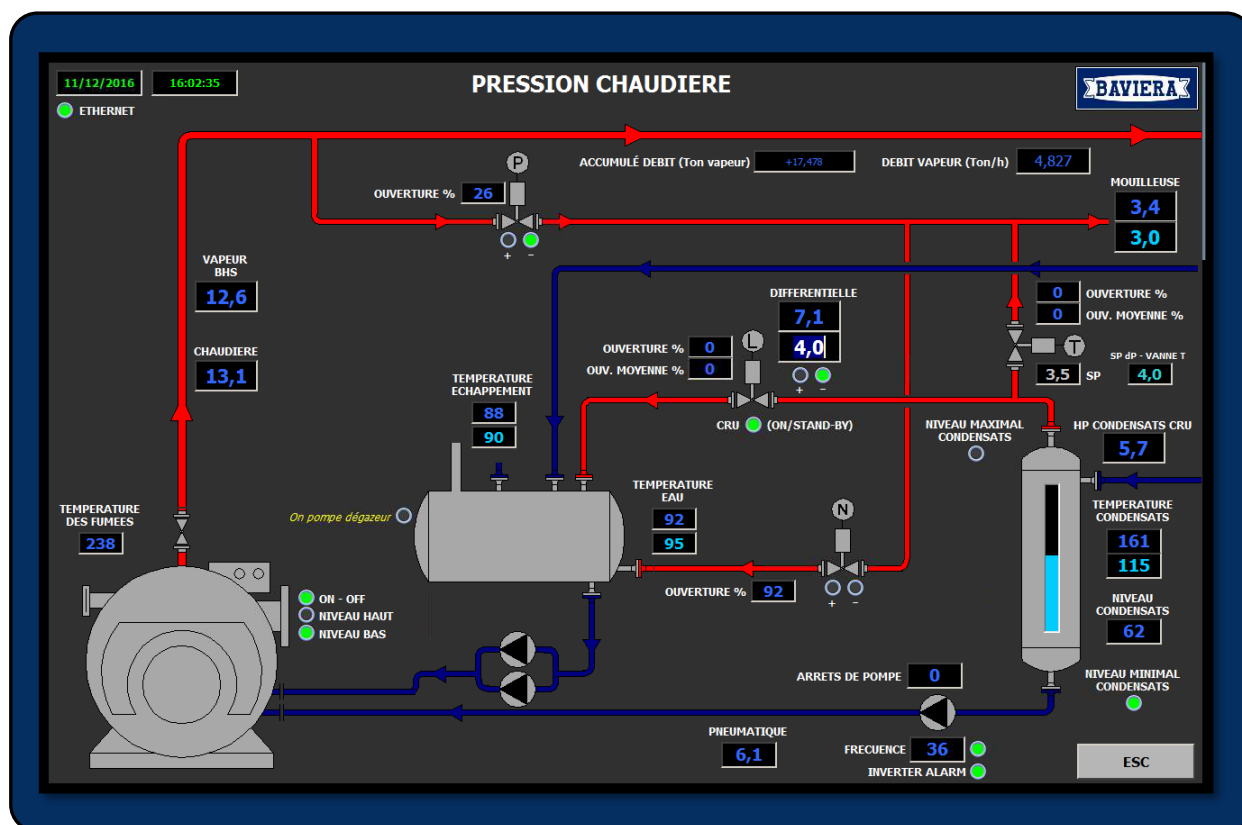
(RAS Single Facer detail HMI – all in one enhanced monitoring)



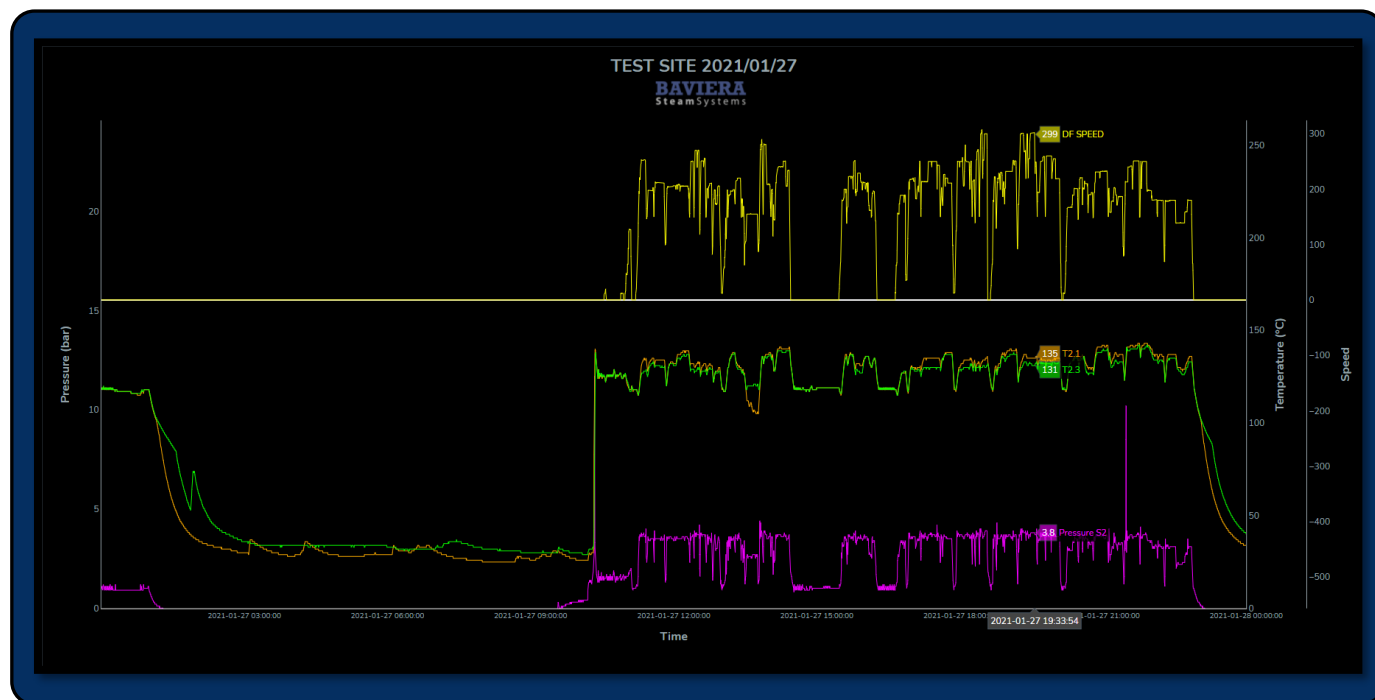
(RAS Single Facer detail HMI – straight forward heat transfer issue alarm prompt)



(RAS Double Facer detail HMI – all in one enhanced monitoring)



(RAS Boiler Room HMI – Bring your boiler room to the control room)



(RAS Datalog – enhanced traceability for performance evaluation & troubleshooting)

BAVIERA

Steam Systems

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