



**SINT**  
**Technology**

***Thermal Plant Evaluator***  
***Performance diagnostic software***

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***Power Generation***

## Main features

- A powerful software for plant management and maintenance plan
- Optimization for economic business plan
- Robust calculation algorithms for performance evaluation and thermodynamic properties
- Proven reliability
- Real time values
- Support for upgrade and optional requests
- Local or remote application
- Historian data interface

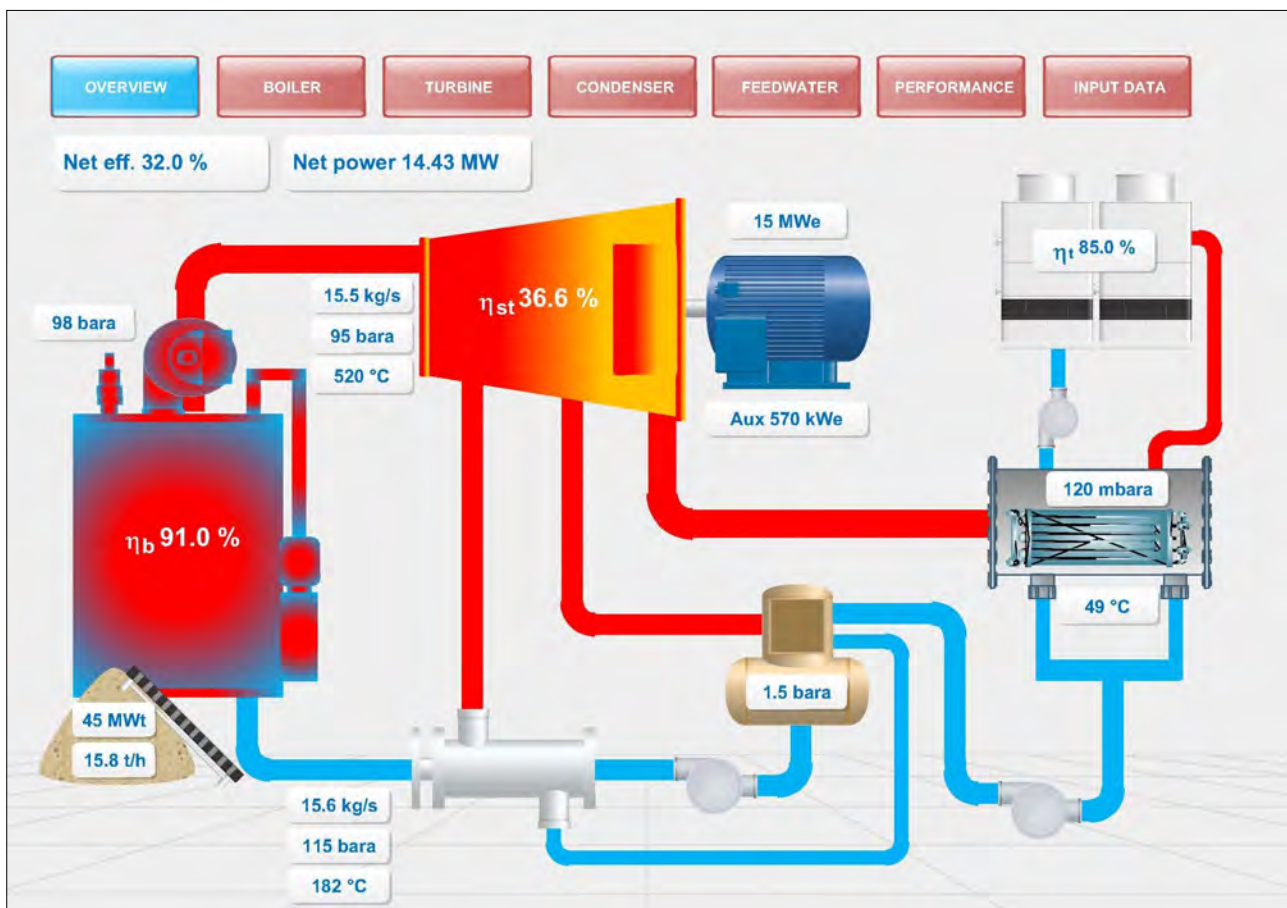
## Performance diagnostic tools for business plan

The cost effectiveness and the plant efficiency are the major parameters on which the plant managers focus their attention to evaluate the plant performance indexes, through long data elaboration.

The challenge was born from the wide experience in field performance acceptance test, and the skills in software, test rigs and data acquisition systems design and development.

**Thermal Plant Evaluator** is a powerful tool, for performance prediction, derived from the field test activity and post processing calculation.

The results are immediately available in a real time format to DCS operator and plant management to set priorities in plant maintenance actions, optimizing efficiency and energy production plans.



## Performance under control

Sint Technology hardware/software integrated system is available on a desktop computer running real-time calculations in your control room.

Performance monitoring system is focused on the **whole plant efficiency and on major single components** behaviour in order to identify the major losses for plant maintenance and setup planning.

### MODULARITY AND CUSTOMIZATION

**Thermal Plant Evaluator** can independently model all types of plant components. If your plant or process is upgraded, new calculations, HMI screens and performance indexes can be added to the system anytime.

Each customer has its own needs and the system is flexible to fulfil them, even calculations can be set according to the plant type and performance indexes of interest.

### ECONOMIC EVALUATION

Thermodynamic performances are important to us, but also your business is. The economic evaluation of the energy market and certificates trading can be embedded in your Sint Technology diagnostic system.

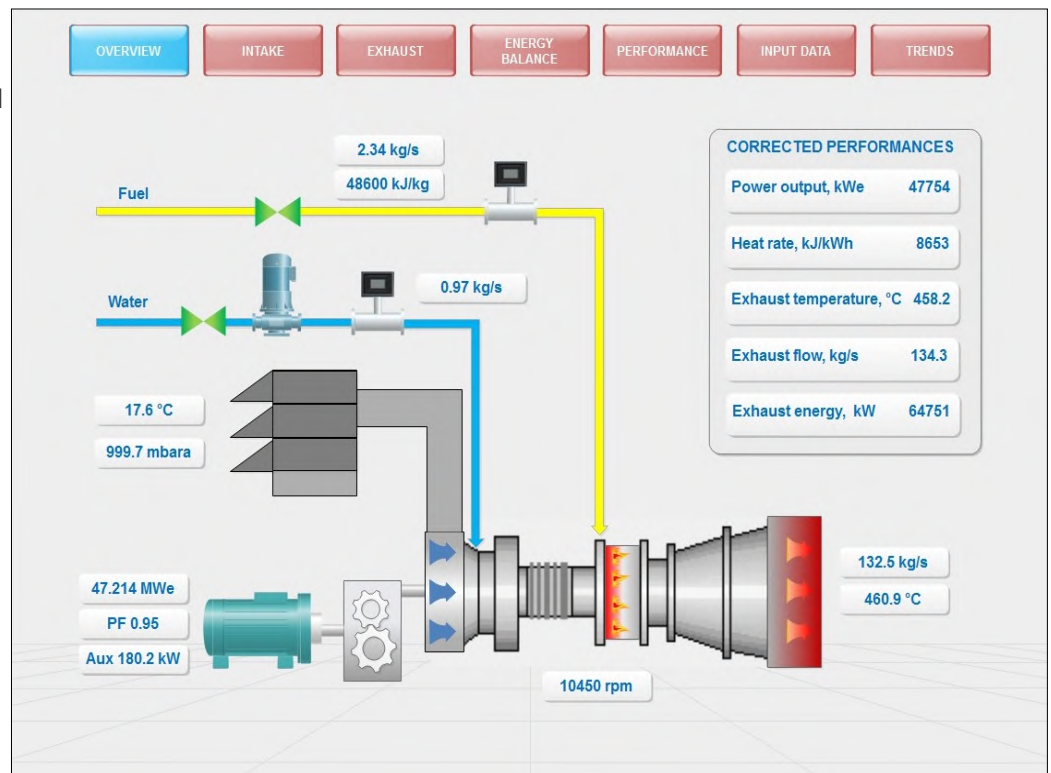
This module can instantaneously give you precious information about load plans, based on the economic balance and revenues from energy sales and fuel costs, to operate the plant in order to maximize the profit.

### Applications

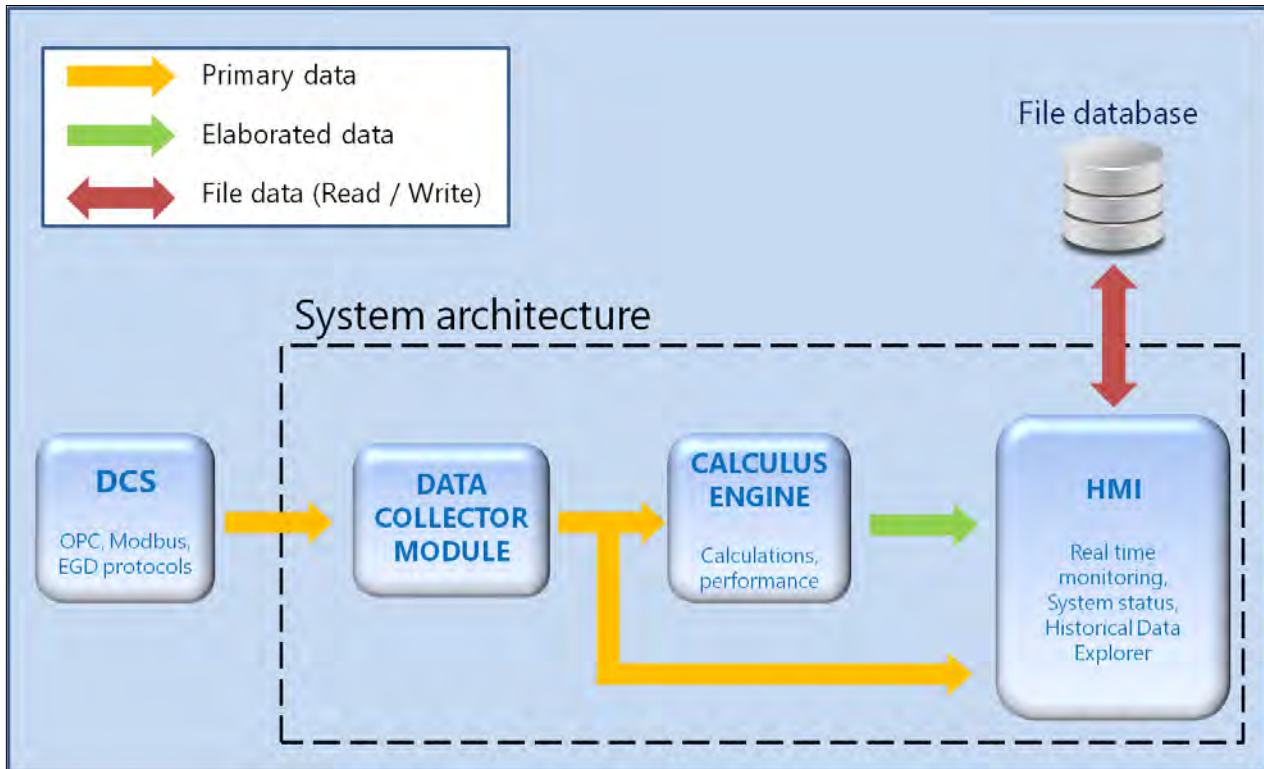
- Gas liquid and solid fuelled power plants
- Steam and gas turbines
- Heat exchangers
- Steam condensers
- Cooling towers
- Compressors

### Key indicators

- Corrected performance
- Pressure losses
- Efficiencies



## How the system works



The primary measurements coming from DCS are acquired by the **Data Collector Module** (running on a PC installed in the main control room) through the common industrial communication protocols as OPC, Modbus, EGD etc. or additional hardware.

The **Calculus Engine module** elaborates all the data for any kind of calculations.

- Plant and components efficiency
- Plant and components mass and energy balance
- Steam, water and gas thermodynamic properties
- Steam, water and gas flow rates
- Boiler efficiency
- Steam and gas turbine efficiency
- Thermal power
- Fuel thermal power
- Fuel mass flow
- Corrected performances
- Energy production

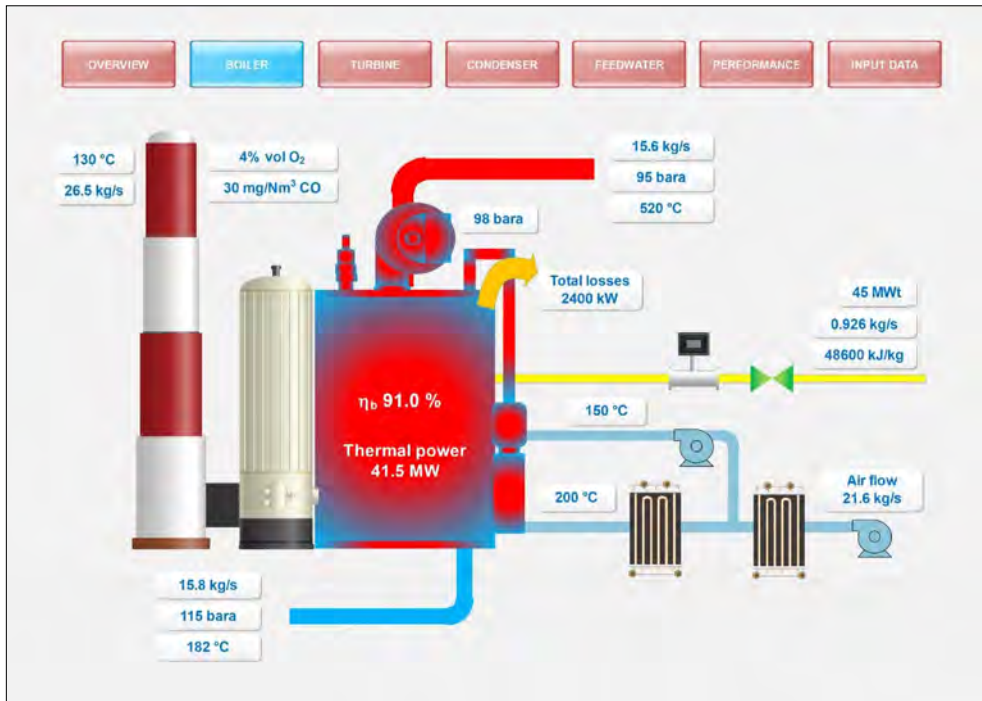
The **HMI module** represents through detailed synoptic screens the major components with real time performance calculated parameters.

Furthermore it organizes recorded and calculated data for historical database, trends and visualizations as graphs and monitors customized on request. The major parameters derived from field or from calculation will be available as historical data base and can be queried anytime with trends and data export.

## Set your plant baseline

The predictive performance model can be fine tuned with dedicated test campaigns in order to embed, in the calculations routines, tested correction curves and components real behaviour, based on experimental data.

Draw a true baseline in your plant performance and use it for your daily analysis. Not only actual process data are important, but also having the proper benchmark for meaningful comparisons is crucial to make right decisions.

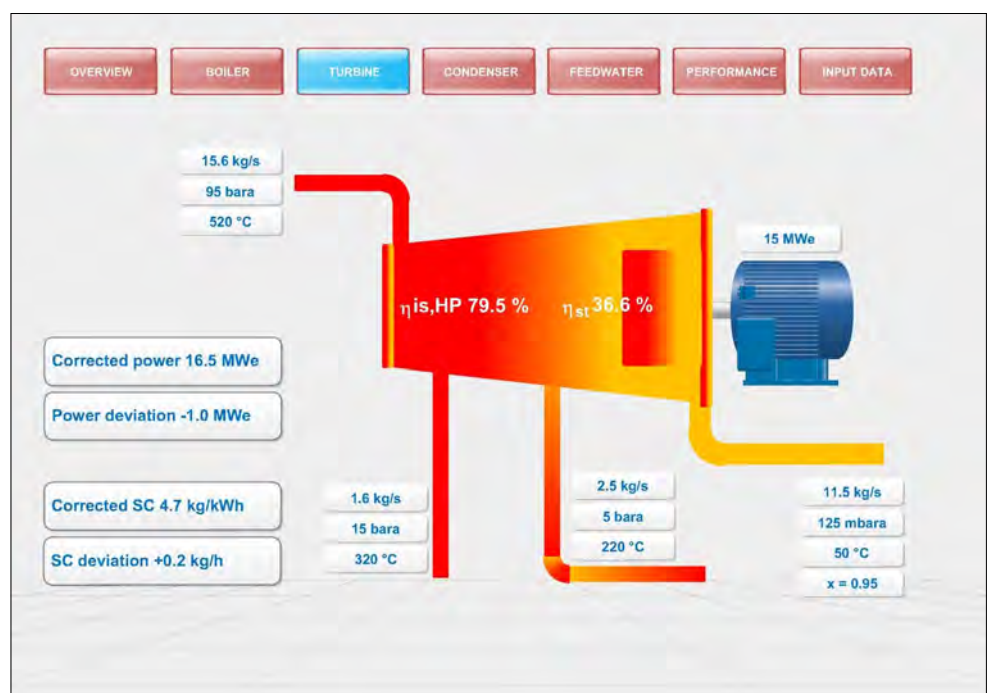


### Boiler

- Efficiency calculation and thermal power.
- Corrected performance
- Real time fuel mass flow calculation, based on indirect method balance (EN 12952-15).
- Steam/water mass balance.

### Steam turbine

- Calculation of turbine steam consumption and power output, corrected to reference conditions (ASME, DIN, IEC codes).
- Turbine enthalpy balance for exhaust steam quality evaluation.
- Turbine isentropic efficiency and expansion line determination.
- Condenser evaluation.



## User Input Data

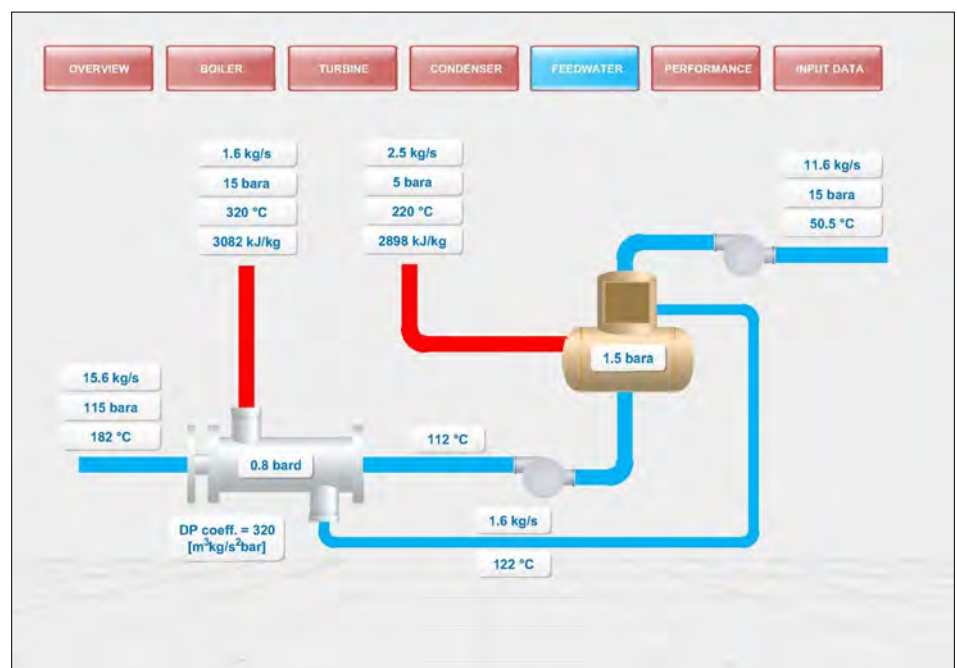
The user has the opportunity to set some input data used for calculations and performance variations.

Components data as boiler losses, unburned fuel percentage or fuel composition can be updated based on periodical analysis. Reference data can be set for monitoring any performance parameters state in order to focus their eventual degradation rate.

OVERVIEW	BOILER	TURBINE	CONDENSER	FEEDWATER	PERFORMANCE	INPUT DATA	
<b>REFERENCE</b>		<b>FUEL COMPOSITION</b>					
Turbine power, kW	17500	Carbon content, %w	30.0	Hydrogen content, %w	4.0	Oxygen content, %w	25.0
Turbine heat consumption, kh/kWh	4.5	Nitrogen content, %w	0.05	Sulphur content, %w	0.05	Moisture content, %w	40.0
Turbine efficiency, %	37	Ash content, %w	0.9	LHV (kJ/kg)	10200	<b>BOILER LOSSES</b>	
Turbine HP isentropic efficiency, %	81	Ash volatile content, kg/kg	0.05	Slag temperature, °C	300	Estimated ash collection efficiency	0.5
Boiler efficiency, %	92	Losses for external cooling system, kW	100	Unburned fuel in dust, kg/kg	0.05	Unburned fuel in ash, kg/kg	0.015
Plant net efficiency, %	33						
Turbine mechanical losses, kW	120						
Turbine leakage, kg/s	0.3						
Generator efficiency, %	98.5						
Cooling tower efficiency, %	84						
Fuel cost, €/t	75						
Energy sales, €/MWh	110						
Energy buy, €/MWh	50						

## Characteristic parameters

Physical behaviour of many components can be controlled through non dimensional or characteristic coefficients as efficiencies or pressure losses which allow their comparison regardless of process conditions.



## On-site and Remote continuous diagnostics

A performance test is an accurate and reliable way to assess the behaviour of a new plant or component, or to check improvements after a maintenance service, nevertheless it is typically carried out only once or twice in the lifespan of equipments, in a particular plant setup.

Our continuous diagnostics software allows you to conduct a performance test on your own, avoiding any outage or other activities required before an acceptance test.

**Live stream data** on the screen provide operators and plant management with a complete analysis for maintenance and business optimization. DCS data are gathered and real-time processed with our proprietary calculation software for immediate results.

Moreover you can ask for our Remote Monitoring & Diagnostics Service, from our headquarter, through the remote data transmission and our consultants support for further elaboration and diagnostic report editing.

The performance prediction can drive the plant Management on the most convenient daily setup, with the best thermal power and surplus energy sales balance and plant setup planning.

OVERVIEW	BOILER	TURBINE	CONDENSER	FEEDWATER	PERFORMANCE	INPUT DATA	
<b>PLANT</b>							
Net power output, MW		14.43					
Net plant efficiency, %		32.1					
<b>TURBINE</b>							
ST Corrected power, kW		16500					
ST Power variation		-5.7 %					
ST Corrected consumption, kg/h		4.7					
ST Corrected consumption variation		+4.4 %					
Turbine efficiency, %		36.6					
Turbine efficiency variation		-1.0 %					
Turbine HP isentropic efficiency, %		79.5					
<b>PRESSURE DROPS</b>							
Condenser pressure drop coeff, $m^3kg/s^2bar$		223					
Reheater pressure drop coeff, $m^3kg/s^2bar$		320					
<b>BOILER</b>							
Boiler Corrected efficiency		91 %					
Boiler Corrected efficiency variation		-1.1 %					
Fuel thermal power, MW		45					
Steam/water thermal power, MW		41.5					
Fuel rate, kg/s		4.9					
Air flow, kg/s		21.6					
Total losses, kW		2400					
<b>CONDENSER</b>							
Condenser pressure, mbara		120					
Condenser thermal power, MW		26.5					
Condenser expected pressure, mbara		116					
Condenser pressure variation, mbara		-4					
<b>COOLING TOWER</b>							
Tower efficiency, %		85					
Tower efficiency variation		+1.2 %					
Tower cooling water DT, °C		9					
Tower cooling water DT expected, °C		8.5					



## Contact us

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## Recognitions

SINT Technology's test laboratory is accredited to standard ISO/IEC 17025:2005 by the Italian accreditation body **ACCREDIA** with **certificate no. 0910**



LAB N° 0910

Certification of conformity to the requirements of standard

**UNI EN ISO 9001:2008**

