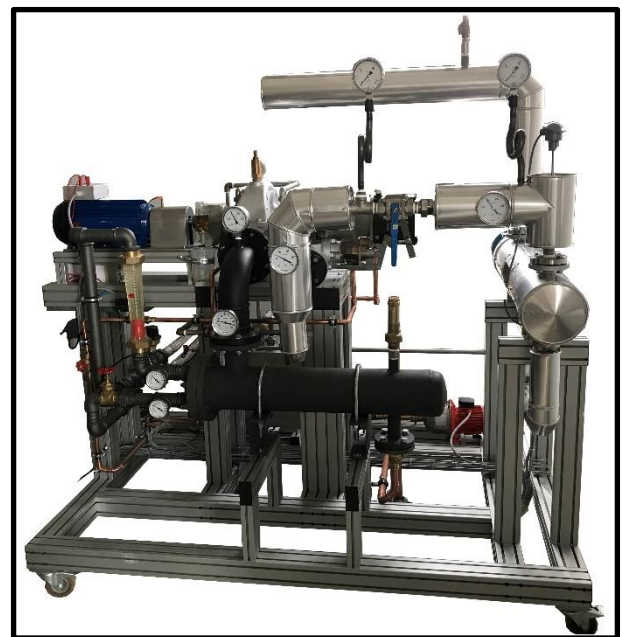


STEAM TURBINE UNIT 1KW

Steam boiler



Turbine, superheater, condenser
and power generator



Cooling tower



Water tank (hotwell),
softener and fuel tank



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EXPERIMENTAL CAPABILITIES

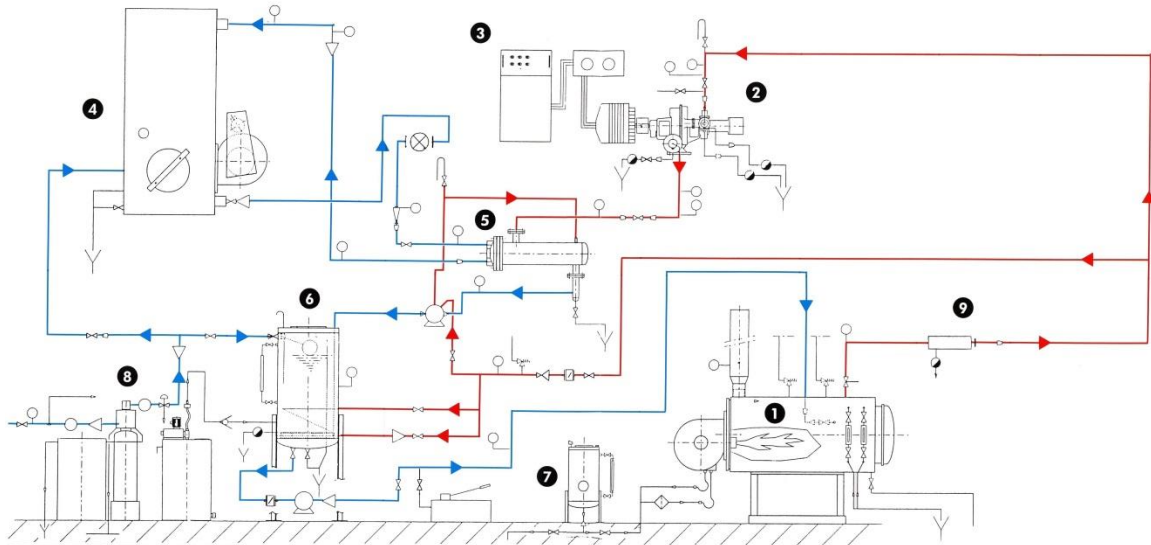
- Study of a steam turbine installation and Rankine cycle, influence of operating parameters on efficiency
- Influence of the use of a superheater upstream of the turbine (superheated or saturated steam)
- Commissioning, adjustments and maintenance
- Electricity production and measurement of all operating parameters (temperature, flow, pressure)
- Cycle plot on Mollier diagram and calculation of thermal power on each element (boiler, superheater, turbine, condenser)
- Study of an open cooling tower and transformation on a psychrometric diagram
- Energy balance and performance of the installation.
- Study of the combustion on the oil burner of the boiler (requires a combustion analyzer not supplied)
- Understanding and identification of specific components for steam networks
- Study and adjustment of a water treatment station by softener and metering pump (injection of anti-oxygen and biocide)

GENERAL DESCRIPTION

The steam turbine unit consists of a steam boiler, a utility group and a turbine-generator assembly for power generation. The bench is delivered complete, instrumented including safety, control and measurement equipment.

The bench in its general design will comply with the machine directive 2006/42 / EC, pressure equipment PED 97/23 / EC, electrical standard NFC 15100 (other standard on demand). The robust design of this equipment makes it perfectly suitable for use in schools. Its anodized aluminum structure on wheels gives it great strength as well as great flexibility of integration into your premises. The manufacture of this equipment meets the European machine directive.

Schematic diagram



Technical specifications

1. Steam boiler

Permanent presence boiler with safety devices
Control box with alarm signaling by siren
Operating pressure 10 bars-Oil burner

2. Steam turbine

1kW steam turbine
Rotation speed: 3000rpm
Supply pressure: 10 bars
Speed and safety regulator
Supply cut-off valve

3. Alternator

Direct mechanical connection to the turbine
Production: 1000W-50hz at 3000rpm
Production control by potentiometer
Energy dissipation on electrical resistors

4. Cooling tower

Open tower with forced ventilation
Continuous water circuit flow rate 7m³ / h

5. Steam condenser

Tubular exchanger (water in the tubes)
Condensate recovery to the water tank by centrifugal pump

6. Water tank

Volume: 250L-Material: Stainless steel
Controls: level, temperature
Steam heating with injection nozzle
High pressure boiler feed pump

7. Oil supply tank

Volume: 250L
Material: stainless steel
Controls: level, temperature
Retention basin in the lower part

8. Water treatment

Automatic softener with regeneration of resins with salt tank
Water treatment by adding specific product using a metering pump (anti-oxygen and biocide)

9. Electric superheater

Steam outlet temperature: 210 ° C
PID digital superheat temperature control

10. Burst pot of purges

Cooling pot for the boiler purges before discharge to the sewer
City water cooling

11. Electrical box

Machine power supply box with start-up button, operation lights and indication of the speed of rotation of the turbine and the power produced.

INSTRUMENTATION

- **Steam flow rate in kg/h with vortex flowmeter for steam**
 - o Scale: 0-200 kg/h of steam
 - o Local display on digital indicator

- **Cooling water flow rate on the condenser with float flowmeter for water**
 - o Float flowmeter
 - o Scale : 1500-15 000 L/h

- **Temperatures: 9 needle thermometers with dial diameter 100mm**
 - o Condenser input water side
 - o Condenser outlet water side
 - o Steam boiler outlet
 - o Steam superheater outlet
 - o Steam turbine inlet
 - o Steam turbine outlet
 - o Temperature of the condensates
 - o Water temperature of the tank
 - o Fuel oil temperature in the tank

- **Pressure: 7 needle pressure gauges with dial diameter 100mm**
 - o Steam pressure boiler outlet
 - o Steam pressure turbine inlet
 - o Steam pressure turbine outlet
 - o Steam pressure circuit utility
 - o Water supply pressure
 - o Steam pressure condenser inlet
 - o Steam pressure condenser outlet

- **Turbine speed with display on digital indicator**
 - o Scale : 0-4000 rpm

- **Electrical power display on digital indicator**
 - o Scale : 0-1500 Watts

- **Steam outlet temperature superheater on digital indicator**
 - o Pt100 sensor type
 - o Scale : 0-250°C

Possible variants

- Replacement of the smoke tube boiler by a water tube boiler
- Replacement of the oil burner by a gas burner
- Replacement of the open cooling tower with an external air heater
- Addition of digital instrumentation with touch screen display on the cabinet
- Software data supervision system
- Installation control system by computer

TVT1KW



Services required

Documentation

- Electrical supply : 400 Vac – 50 Hz – 40A
- Electrical network : 3 phases + Neutral + Earth
- Water supply : network (3 bars-15L/min)
- Smoke exhaust : smoke of the boiler (diam 125mm), Safety valve discharge ducts
- Water drain : on the floor
- Dimensions : (LxWxH mm): 5000 x 5000 x 2200
- weight (Kg): 3000
- User's manual
- Pedagogical manual
- Technical documentation of the components
- Lab exercises
- Wiring diagram
- Hydraulic diagram
- Certificate of conformity CE

Note : if the equipment installation is operated by our staff, all supplies and exhaust connections required must stand at less than 2m from the machine

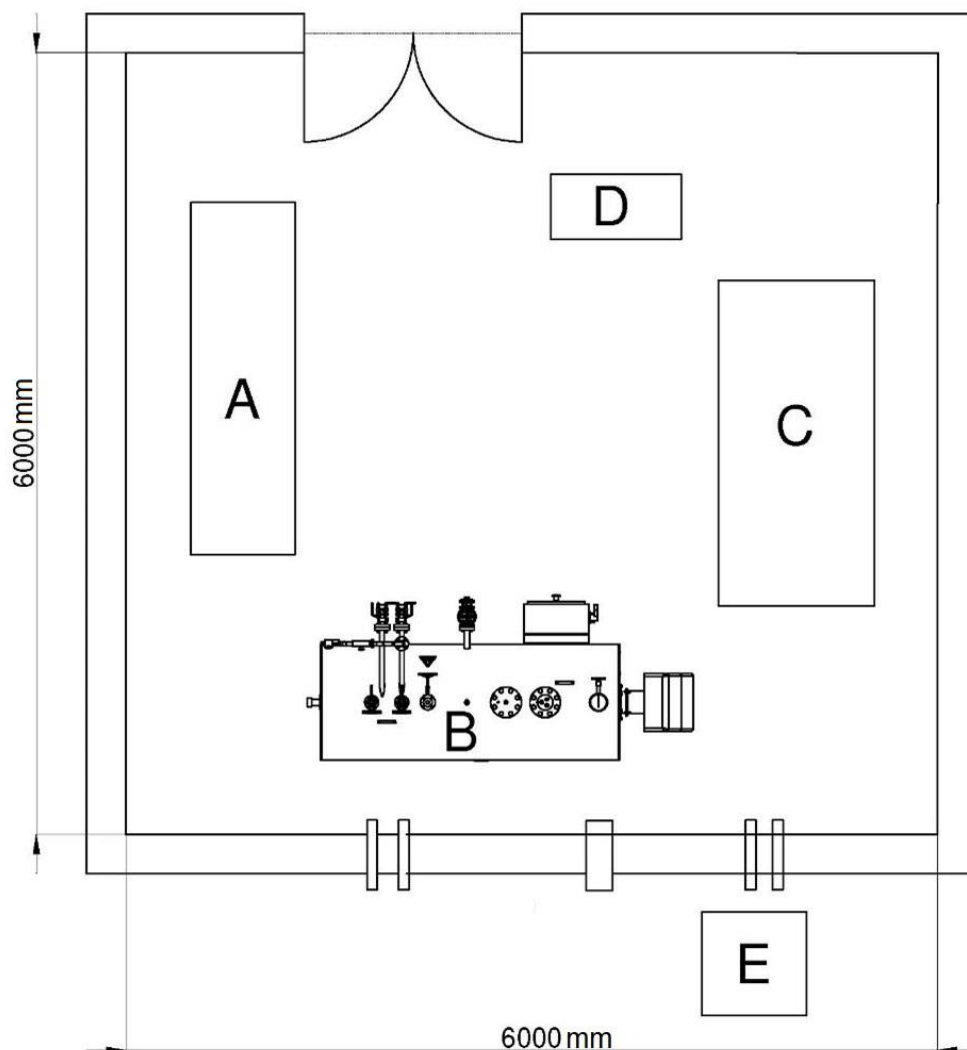
A - utility module (2700x800)

B - boiler (2960x1269)

C - turbine (2500x1200)

D - electrical cabinet (1000x500)

E - cooling tower (800x800)



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