

# SALES OFFER FOR TURBOGENERATOR

## *General information*

Anwil S.A. presents sales offer for steam turbogenerator set constructed by PBFT – Brno, together with Skoda generator having rated power of 35 MW, installed in ANWIL Power Station and designated as TG-3.

This unit consists of extraction & condensing turbine with vapors condenser, synchronic generator 7H 610840/2 type and set of auxiliaries that create turbogenerator equipment.

## *Machine description*

The turbine is constructed as two-cylinder device. First cylinder is High Pressure [HP] part and is equipped with two-stage regulation wheel and 22 reaction stages. Medium Pressure [MP] part and Low Pressure [LP] part is located in second cylinder. Medium Pressure part is equipped with one-stage regulation wheel. Steam flow to condenser is regulated through moveable strangler flap located between MP part and LP part, that is coupled with turbogenerator control unit. There are 16 reaction stages in MP and LP cylinder.

Superheated steam under 9,6 MPa pressure is supplied to the turbine. Reduced steam is discharged by one uncontrolled extraction 4,0 MPa and two controlled extractions operated at the following pressure levels:

- I<sup>st</sup> controlled extraction – 1,9 MPa,
- II<sup>nd</sup> controlled extraction - 0,12 MPa,

Minimum steam flow to condenser is equal to 10 Mg/h.

Rotor of HP part is made of full roller and rotor of MP & LP part is drum rotor type. Rotors are connected by means of rigid coupling and they are protected from axial displacement by two-sided action axial bearing. Shaft packing is made as labyrinth type packing.

## *Control system*

Control process is carried by means of electro-hydraulic control unit (EHR). This control unit consists of electronic safety control unit (ERB), electronic protective system (EUZ) and thermal limitations block (BOT), and other elements as control station of ADVANT 160 system, measuring transducers of controlled parameters, electro-hydraulic transducers (PEH), filter of regulation oil and pressure relays.

## ***Technical data***

### **Steam turbine**

- rated power - 35 000 kW,
- max power during operation without controlled extractions - 20 000 kW,
- rated rotation - 3000 rpm,
- min pressure of inlet steam - 8,83 MPa,
- max pressure of inlet steam - 11,46 MPa,
- min temperature of inlet steam - 535 °C,
- max temperature of inlet steam - 545 °C,
- rated pressure of controlled extraction I - 1,9 MPa,
- max steam flow of extraction I - 160 Mg/h,
- rated pressure of controlled extraction II - 0,118 MPa,
- max steam flow of extraction II - 90 Mg/h,
- max steam flow through LP part - 162 Mg/h,
- min steam flow through LP part - 10 Mg/h,
- max discharge of MP part - 130 Mg/h,
- total discharge of turbine - 230 Mg/h

### **Generator**

- generator type - 7H 610810/2,
- apparent power - 43 750 kVA,
- active power - 35 000 kW,
- rated current - 2406 A,
- rated voltage - 10 500 V +/- 5%,
- power factor - 0,8,
- rotation - 3000 rpm,
- phase configuration - star,
- frequency - 50 Hz,
- critical rotation - 1350 rpm.

### **Turbine condenser**

- cooling surface on water side - 1400 m<sup>2</sup>,
- volume of cooling water - 4180 Mg/h,
- max pressure of cooling water - 0,294 MPa,
- temperature of inlet cooling water - 25 °C,

### *Overhauls and modernizations*

<b><i>Year of construction</i></b>	1978
<b><i>Start of operation</i></b>	1985
<b><i>Conducted overhauls</i></b>	
Current overhaul	1993 overhaul scope: <ul style="list-style-type: none"> <li>- Overhaul of HP and MP rotors</li> <li>- Overhaul of bearings and valves</li> <li>- Oil system cleanings</li> <li>- Replacement of EHR and special measurement systems</li> <li>- Overhaul of generator rotor and cap replacement</li> <li>- Overhaul of generator stator and re-wedging</li> </ul>
General overhaul	1998 overhaul scope: <ul style="list-style-type: none"> <li>- Overhaul of HP and MP rotors</li> <li>- Overhaul of bearings and valves</li> <li>- czyszczenia. układu olejowego</li> <li>- Replacement of EHR and measurement systems</li> <li>- Overhaul of generator rotor and cap replacement</li> <li>- Overhaul of generator stator and re-wedging</li> </ul>
<b><i>Conducted modernizations</i></b>	
	1998 modernization scope: <ul style="list-style-type: none"> <li>- Implementation of EHR system</li> <li>- Diagnostics of AIDA system – conducted by ABB</li> </ul>

### *Working time of turbogenerator*

<b>Total working time [ h ]</b>	<b>30 257</b>
Working time up to moderniaztion in 1998[ h ]	23 522
Working time after modernization [ h ]	
- 1998	3342
- 1999	2966
- 2000	172
- 2001	10
- 2002	62
- 2003	172
- 2004	11
- 2005	1032
- 2006	270
- 2007	264

**Information referred with offered turbogenerator are available in ANWIL Power Complex – please contact Chief Power Engineer – phone: +48-54-237-26-00.**