Westinghouse

VOLUME 1

Instruction Book No: CG-2025

MODEL DN 326B-15 STEAM TURBINE GENERATOR SET

WITH WOODWARD 43027 ELECTRONIC GOVERNOR

BUILT FOR

POLYSAR LIMITED

SARNIA, ONTARIO

General Order No. 26-8711

WESTINGHOUSE CANADA INC.

HAMILTON, CANADA

DOC 0924A

June, 1982
SPECIAL DATA FOR TYPE DN326B-15 STEAM TURBINE BUILT ON S.O. 26-S-8711-10

REFERENCE DRAWINGS:

Outline 3666D06

OPERATING CONDITIONS:

<table>
<thead>
<tr>
<th>POWER</th>
<th>SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Rated: 28 750 kW</td>
<td>3 600 RPM</td>
</tr>
</tbody>
</table>

Rotation (Facing Governor End) Clockwise

STEAM CONDITIONS:

<table>
<thead>
<tr>
<th>NORMAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inlet Pressure: 1 250 PSIG</td>
</tr>
<tr>
<td>Inlet Temperature: 950°FTT</td>
</tr>
<tr>
<td>Extraction Pressure: 420 PSIG</td>
</tr>
<tr>
<td>Exhaust Pressure: 165 PSIG</td>
</tr>
</tbody>
</table>

GOVERNOR SETTINGS - NO LOAD

Refer to Test Setting & Inspection Data Form 20-401

For Renewal Parts and/or service, contact:

Westinghouse Canada Inc.
Steam Turbine Department
Turbine & Generator Division
P.O. Box 510, Hamilton, Ontario
Canada
PERFORMANCE CURVES
NET POWER VS. INLET STEAM FLOW
FOR 28.75 MW AT 3600 RPM
DN-1326 B-15 T-G SET

MAXIMUM INLET FLOW = 600,000 LB/HR

EXTRACTION PRESSURE
UNCONTROLLED TO LEFT OF THIS LINE

EXTRACTION PRESSURE
EXCEEDED TO RIGHT OF THIS LINE

STEAM CONDITIONS
INLET: 8618.4 kPa G; 510°C IT
(1250 psig; 950°F TT)

EXTRACTION:
DESIGN: 2895.2 kPa G; (420 psig)
OPERATING: 2895.2 kPa G; (420 psig)
EXHAUST: 1137.6 kPa G; (165 psig)

STAGING: 1 Curtis + 2 Rateau/4 Rateau

GENERATOR: 33824 kVA; 0.85 I.P.F.
13800 V, 3 Ph, 60 Hz
3600 RPM

NET POWER - M.W.
<table>
<thead>
<tr>
<th><strong>WESTINGHOUSE CANADA INC.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SERIAL</strong></td>
</tr>
<tr>
<td>26S8711–10</td>
</tr>
<tr>
<td><strong>INITIAL PRESS.</strong></td>
</tr>
<tr>
<td>1 250 P.S.I.G.</td>
</tr>
<tr>
<td><strong>No. 2 EXT. PRESS.</strong></td>
</tr>
<tr>
<td>165 P.S.I.G.</td>
</tr>
<tr>
<td><strong>INITIAL TEMP.</strong></td>
</tr>
<tr>
<td>950 °F</td>
</tr>
<tr>
<td><strong>No. 1 EXT. PRESS.</strong></td>
</tr>
<tr>
<td>420 P.S.I.G.</td>
</tr>
<tr>
<td><strong>INSTRUCTION BOOK</strong></td>
</tr>
<tr>
<td>CG 2025</td>
</tr>
<tr>
<td><strong>RATED KW.</strong></td>
</tr>
<tr>
<td>28 750</td>
</tr>
<tr>
<td><strong>R.P.M.</strong></td>
</tr>
<tr>
<td>3 600</td>
</tr>
<tr>
<td><strong>MAX. KW.</strong></td>
</tr>
<tr>
<td>28 750</td>
</tr>
</tbody>
</table>

NAMEPLATE FOR DN326 STEAM TURBINE S.O. 26-S-8711

HAMILTON, CANADA
This is a straight impulse turbine, designed for high operating efficiencies. It is arranged for automatically-controlled extraction operation to supply steam at the desired pressure for heating or process work. The exact steam conditions with which it is intended to operate, the normal speed and load are given on the Special Data sheet in another part of the instruction book.

The construction of the entire turbine is shown in the longitudinal section. It should be noted that the illustration shows a side view below the horizontal centreline and a longitudinal section above the centreline.

The blade path includes impulse elements (either Curtis, Rateau or both) arranged as indicated on the longitudinal section and given on the Data Sheet. Steam is admitted through the main nozzles and passes through the high pressure section of blading to the extraction zone where part is led out of the system to supply the extraction line. The remainder, which is not used in the extraction system, passes through the low pressure blading to exhaust.

The steam chests and nozzle chambers are integral with the turbine cylinder thus eliminating joints between these parts.

Depending on the size of the turbine, one or more openings may be provided in the cylinder through which steam can be extracted non-automatically, if desired for additional feedwater heating or process work. The sizes of these openings, when provided, are given on the turbine outline drawing. Since extraction at these points is not automatically controlled, the pressures and quantities available are determined by the load being carried by the turbine and the quantity of steam being extracted automatically.

CYLINDER

The structural shape of the cylinder and the method of support are carefully designed so that thermal changes shall produce symmetrical movements and thereby reduce to a minimum the possibility of distortion.

The complete cylinder is made in sections and each section is split in the horizontal plane to form a base and cover. During the initial assembly, the vertical joints are made up permanently and thereafter is handled as a single piece. A complete inspection can therefore be made by removing the cover only and the base need not be disturbed after installation.

The outline drawing and the section elevation drawing illustrate the general arrangement. The governor end bearing bracket is attached to the inlet cylinder base with an I beam which flexes with changes of temperature. The coupling end bearing pedestal is also attached to the cylinder base with an I beam section. The mounting pads on which the turbine is mounted is illustrated by the outline drawing.

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The I beam maintains the correct axial and transverse position of the cylinder with relation to the pedestal or bracket. The inboard bearing pedestal being anchored to the foundation definitely locates the axial position of the turbine exhaust.

The base and cover of the cylinder are bolted together by large studs or bolts. In order to obtain the proper stress in each of these studs, they must be tightened sufficiently to stretch them a definite amount. The correct method to obtain this stretch is described under "Bolt Tightening".

ROTOR

The rotor consists of an alloy steel shaft with integrally machine discs. The inlet end of the rotor carries the thrust bearing collar, the overspeed trip weight and spring. The turbine rotor is carried in two bearings. However, in the case of a three bearing unit, the coupling end or No. 2 turbine bearing carries also a portion of the generator rotor.

CONTROL SYSTEM

The control and oil system shows the various elements of the control system and their relation to one another. The detailed operation of each part is described in its respective leaflet.

Enough oil should be provided so that when the turbine is running at full speed, the oil level in the reservoir, as shown by the gauge, is within limits given on the indicator plate. Although there is a filter in the oil system, it is desirable as a precaution to strain the oil through a fine mesh screen or cloth just before putting it into the reservoir.

The amount of water circulated through the oil cooler should be regulated to maintain the temperature of the oil leaving the cooler at 49°C. The correct criterion of oil cooler water supply is, of course, the temperature of the oil leaving the hottest bearing. This temperature will vary with different units and operating conditions. However, in general, oil return temperatures of 60°C to 71°C are considered good practice. When starting a turbine the oil cooler water should not be turned on until the oil temperature has increased to the approximate limits given above.

OPERATION AND MAINTENANCE

A recommendation for operating the turbine is given in a separate instruction book leaflet. While these instructions are quite specific it is impossible to cover all details. Hence, they do not in any way relieve the operator of using sound judgment and exercising due caution.

Likewise, it is impossible to give a detailed procedure for maintenance work. It is believed that the illustrations and descriptions of the detail parts, as given in the instruction book, should enable the Maintenance Engineer to care for the apparatus properly.
The turbine rating, capability, steam flow, speed regulation, and pressure control are based on operation at rated steam conditions. The turbine is capable of operation under the following variations in initial steam pressure and temperatures which may occur separately or simultaneously, but performance may not necessarily be in accordance with standards established for operation at rated steam conditions. These permissible variations recognize conditions encountered in operation and are not intended to permit operation at loads in excess of the guaranteed capacity of the turbine.

**PRESSURE**

The initial steam pressure at the turbine throttle valve inlet flange shall average not more than rated pressure plus 5% for any 12 month operating period. The initial pressure shall not exceed rated pressure plus 10% in maintaining this average.

During abnormal conditions, the initial pressure may swing momentarily to rated pressure plus 20%, but the aggregate duration of such swings shall not exceed 12 hours per 12 month operating period.

**TEMPERATURE**

The steam temperature at the turbine throttle valve inlet flange shall average not more than rated temperature over any 12-month operating period. In maintaining this average, the temperature shall not exceed rated temperature plus 15°F.

During abnormal conditions, temperatures shall not exceed rated temperature plus 25°F for operating periods not more than 400 hours per 12-month operating period, nor rated temperature plus 50°F for swings of 15 minute duration or less, aggregating not more than 80 hours per 12-month operating period.

**STEAM CLEANLINESS**

The turbine rating and specific steam consumption rate is based on the use of clean steam i.e. uncontaminated by carry over of steam generator compounds and/or elements present in the make-up water supply and on the absence of deposits, or such contaminants in the turbine. Experience has shown that such steam contamination and deposition on blades are generally most serious during the first few weeks of operation. If make-up water is clean, it can be expected that clean steam from stable boiler operation will be provided after the first several months operation.

Normal machines are for use with clean, dry steam and no responsibility for corrosion or the effects of electrical action caused by contaminants can be accepted.

NEW INFORMATION MAY, 1969.