IMPULSE TURBINE

INTRODUCTION

The steam turbine, like any other high grade machine, requires, for sustained efficiency and continuity of operation, a reasonable minimum of care and attention on the part of the operator. In order that the unit may receive such care and attention, it is necessary that the operators become familiar, not only with the mechanical structure of the various parts of the turbine, but also with their purpose, and, in a general way, with the reasons why they are so designed. The following brief instructions have been prepared as an aid to the attainment of this desired information and it is hoped that they may be found to be broad enough in scope for that purpose.

GENERAL DESCRIPTION

This is a straight impulse turbine, designed for high operating efficiencies, thus giving minimum steam consumption. The exact steam conditions with which it is intended to operate, the normal speed, and the maximum load are given on the title page of the instruction book.

The general construction of the entire turbine is shown in the longitudinal section illustration, and is described in detail in the instruction leaflets listed in the contents sheet.

The blade path includes impulse elements (Curtis, Rateau, or both) the exact combination and number of stages being determined by the steam conditions and capacity required. The exact blade arrangement and the number of stages or rows of each type are given on the Title Page. The steam is admitted through the main nozzles and after being expanded through the different stages, passes out through the exhaust.

Each Curtis stage consists of nozzles, two rows of rotating blades and one row of stationary blades. The nozzles are formed either in a nozzle block which is bolted to the cylinder or in a diaphragm which, in turn, fits in a groove in the cylinder. The stationary blades are carried in a blade holder which is bolted to the stationary part. Each Rateau stage consists of nozzles formed in a nozzle block or diaphragm the same as the Curtis stage but has only a single row of rotating blades.

CYLINDER

The cylinder is split in a horizontal plane through the axis, soas to form a base and cover. A complete inspection can, therefore, be made by removing the cover only, and the base need not be disturbed after installation. This turbine has no bedplate except when mounted on the bedplate of the driven apparatus.

The method of support depends on whether the exhaust is downward or to the side. When the exhaust is downward the exhaust end support consists of two members (or chairs) one on each side, bolted solidly to the cylinder near the horizontal centerline and in turn anchored to the foundation or bedplate. When the exhaust is at the side, the support at the exhaust end consists of two arms (or lugs) which are cast integrally at the top of the base near the horizontal joint. These arms rest on and are bolted to a separate support which in turn is bolted to the foundation. In all cases the inlet end is supported by an I-beam section placed transversely so that the flexibility of the I-beam web provides adequately for longitudinal expansion and contraction resulting from temperature changes.

ROTOR

The rotor consists of a steel shaft and discs. The discs are assembled on the shaft with heavy shrink fits and keys. Each disc is further secured against axial movement by a shrink ring on each side. 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 field.

CONTROL

The oil system diagram shows the various parts of the control system and their relation to one another. The detail operation of each particular 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 in the gage glass, is within the limits given on the indicator plate. The amount of oil required to maintain this level is given on the Title Page. Although there is a strainer in the oil system, it is desirable as a precaution to strain the oil either before putting it into the reservoir, or to pour it in through a fine mesh screen or cloth.

The amount of water circulated through the oil cooler should be regulated to maintain the temperature of the oil leaving the cooler between 100 and 110°F. 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 140 to 160°F. 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.

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