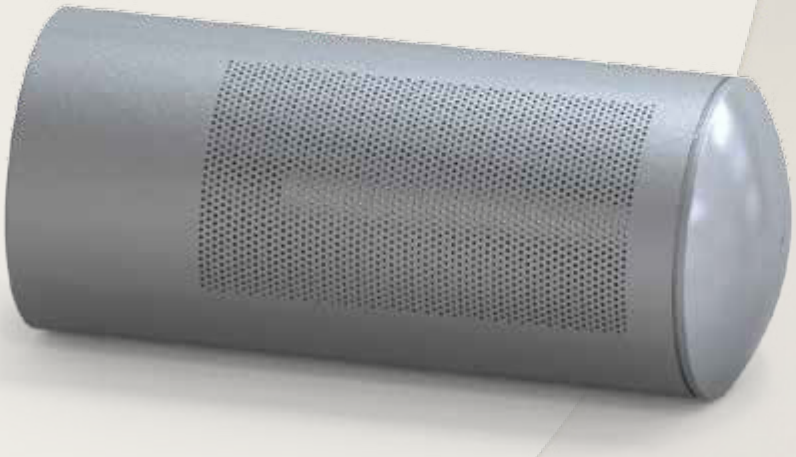
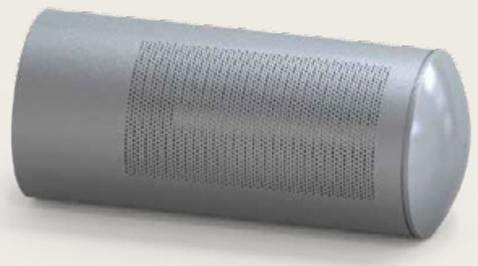
Process Automation

IMI CCI

Dump Tube
System for Dumping Steam into a Condenser



Breakthrough engineering for a better world



Dump Tube

System for Dumping Steam into a Condenser

The dump tube is used together with a steam conditioning valve in applications such as turbine bypass where steam is dumped into a condenser. IMI has experts in the field of dump tubes, with experience from thousands of plants, that can provide support at the design stage.

Key features

- The dump tube is welded to the steam pipe downstream of the bypass valve.
- The dump tube is a fixed orifice, which reduces the bypass steam pressure down to the pressure of the condenser.
- Our dump tubes are carefully calculated to allow it be used as flow meter.
- There are two main applications for the dump tube:
  - Water-cooled condenser
    The dump tube is mounted in the condenser.
  - Air-cooled condenser
    The dump tube is mounted in the bypass line which is connected to a header going from the turbine outlet to the air-cooled condenser.

Benefits

– Each dump tube is specifically designed for each application. The steam entering the water-cooled condenser from the bypass valve can be directed to avoid damage to the condenser internals or to the steam turbine internals.

– The expensive large diameter pipe between the bypass valve and the condenser can be reduced and made very short.

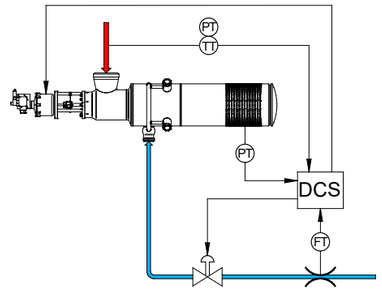
– Accurate steam temperature control.

– Optimised size of bypass valve and dump tube gives low investment cost

– Dump tubes are sized together with the bypass valve to minimise cost while maximising performance

System

The cooling water required for reducing the live steam temperature to condenser condition, is injected into the steam conditioning valve. Using our design, no cooling is required on the condenser.
This system design is superior to temperature control since action can
be taken before any deviation can be measured. Control can also be designed to provide superheated steam before the dump tube.
The steam flow through the dump tube contains a percentage of free water, due to the overspray in the valve to ensure condenser condition after the dump tube.
Therefore, it is not possible to measure the outlet steam temperature after the bypass valve. IMI CCI has developed feed forward control algorithms, which is part of the scope of supply together with the bypass valve and dump tube, for calculation of the required spray water flow. The algorithm is to be used in customer's Distributed Control System - DCS. Inlet steam pressure (P), temperature (T), and bypass valve outlet pressure (PT) give the actual steam flow into the valve.
Required spray water flow, to reach the desired outlet temperature, is calculated and compared with the actual spray water flow, measured via a flowmeter, FT. The result is a control signal to the positioner on the spray water valve.
The pressure transmitter, measures the steam pressure before the dump tube. Since the dump tube is a fixed orifice, the signal from PT 2 indicates the flow through the dump tube.



Design

The dimensions of the dump tube and the orientation of the orifice area are determined by the following factors:

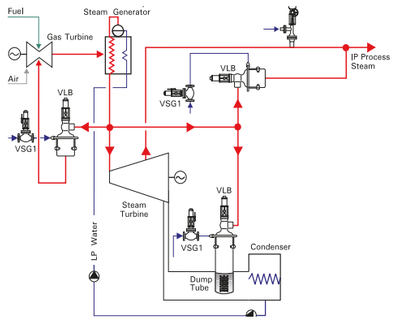
– Operating conditions of the steam conditioning valve (pressure, temperature, flow, pipe dimensions and percentage of free water through the dump tube).

– Operating conditions of the condenser (pressure, temperature)

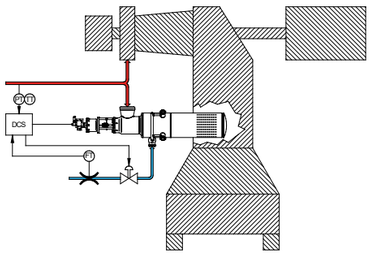
– Condenser design.

In most cases, the dump tubes are made in single-tube versions. For special applications, double-tube versions can be made. Alloy steel is always used for our dump tube design, as carbon steel is unsuitable. Stainless steel is available upon request.

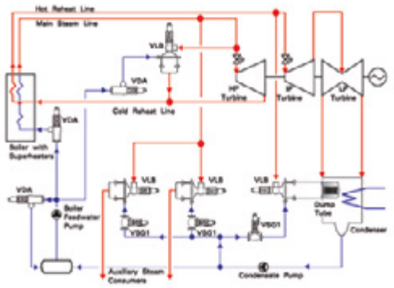
Installation examples



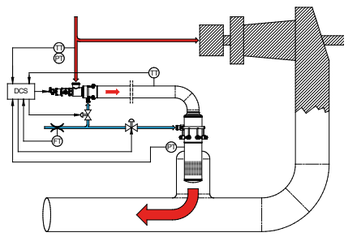
Dump tube together with extraction turbine



Dump Tube installation for water-cooled condenser with close to condenser bypass installation



Typical installation of steam conditioning valve type VLB with dump tube in a reheat type thermal power plant



Dump Tube installation for air-cooled condenser with a two-stage design where the bypass valve is close to the Heath Recovery Steam Generator (HRSG)

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