

SUPERHEATED STEAM GENERATOR CONTROL PROCESS

PROCESS OVERVIEW:

The goal of this training system is to familiarize students with the control system of a non-linear, dynamic process in a superheated steam generator. This setup consists of key components, including a Furnace, Boiler Drum, Superheater, and auxiliary equipment such as pumps, control valves, and fans.

Furnace:

The **Furnace Loop** operates with several essential components:

- **Fuel Oil Pump:** Delivers heavy oil to the furnace through two pairs of guns (1/3 and 2/4).
- **Ignitor Oil Pump:** Supplies light oil to ignite the fuel, creating a flame.
- **Forced Draft (FD) Fan:** Provides the air required for combustion.
- **Induced Draft (ID) Fan:** Maintains a vacuum by drawing flue gases from the furnace and expelling them through the chimney.

When the ignitors are switched on, the light oil ignites the heavy oil, generating a stable flame. The FD fan supplies combustion air, while the ID fan ensures furnace draft by removing the flue gases.

Boiler:

The **Boiler** consists of the drum where steam is generated and a boiler feed pump:

- **Boiler Drum:** Heated water is converted to steam.
- **Level Control Valve:** Regulates the water level within the drum.
- **Pressure Control Valve:** Maintains the drum pressure.

The boiler operates in either **1-element** or **3-element mode** for precise control of water levels and steam pressure.

Superheater:

In the **Superheater**, steam pressure remains constant while the temperature is increased to produce superheated steam:

- **Temperature Control Valve:** Regulates the steam temperature by controlling spray water flow from the boiler feed pump.

Overall Process Summary:

The process begins as **Boiler Feed Water** is pumped into the boiler drum, where it's heated to produce steam.

1. **Furnace Loop:** Supplies the heat for steam generation. Heavy oil, ignited by light oil, creates a flame, while FD and ID fans control airflow and maintain vacuum pressure.
2. **Steam Generation:** Heat from the furnace is transferred to the water in the boiler drum, converting it into steam.
3. **Superheating:** The steam flows through the superheater, where it reaches a higher temperature, creating superheated steam.
4. **Control Systems:** Water level in the boiler drum is maintained by the level control valve, and the drum pressure is regulated by the pressure control valve. The boiler can be controlled in both 1-element and 3-element modes for operational flexibility.

SUPER HEATED STEAM GENERATOR

