

## HYDRONIC PRESSURIZATION SYSTEM

Large, Hi-rise, multistory buildings with large water volumes and also ice-storage systems with large brine storage require large expansion volumes. The acceptance volume, the effective volume to accommodate expansion fluid, of the pressurized expansion tank depends on the operating pressure limits, i.e.,  $P_i$  Initial pressure and  $P_f$  - Final pressure. Initial pressure is dependent on the static head of water column and final pressure on the maximum allowable pressure limit of the hydronic system components.

In most of the systems, to keep the cost of hydronic systems components low, the final pressure is kept as low as possible thus reducing the difference between the final and the initial pressures to minimum and this reduces the acceptance volume of a pressurized expansion tank substantially, to as low as 10% - 20% of the total tank volume, necessitating the need for multiple pressurized expansion tanks.

Use of multiple pressurized expansion tanks in such applications is not a very good solution for the following reasons

- It requires large installation space
  - The tank construction has to be changed based on working pressure
  - It is practically difficult to pressurize all the tanks to the same pressure unless the tanks are connected on the gas side through a gas charging manifold

The better solution is to use **Hydronic Pressurization System**. The use of these is quite common in countries with large HVAC systems and it has following features.

- It uses tank with rubber bladder to provide separation between air and water
  - The main bladder tank works at atmospheric pressure and thus its design is independent of system working pressure or static head
  - Only a small pressurized expansion tank is used to compensate for very minor pressure variations
  - A pressure sensor connected to a microprocessor based controller keeps a check on the systems pressure and during expansion excess water is released through a motorized valve from the system to the tank while during contraction the water is pumped from the tank to the system.
  - The minimum volume of water in the main tank is ensured by keeping a check on the level
  - More water is allowed to flow into the main tank, to compensate for water system losses, whenever the level falls below the minimum.
  - Air separator can generally be eliminated, as the air automatically gets purged out when the water flows from high pressure system to ambient pressure main tank.
  - Air in the tank is released through an airvent provided at the top.

## **HYDRONIC PRESSURIZATION SYSTEM**

The Hydronic Pressurization System shall be capable of

- Maintaining the system pressure within +/-0.2 bar of the design value
- Providing isolation between air and water
- Deaerating the system water when the return flow temperature is less than 70°C.

It shall consist of following components

- Pressurized bladder tank
  - Unpressurized bladder tank
  - Hydraulic module
  - Control unit

### **Bladder tanks**

A pressurized bladder tank of approx. 5% of the total expansion shall be provided to take care of small changes in water volume and smoothen the pressure undulations. The tank shall be of steel construction manufactured to IS:2825-1969 standards for non fired pressure vessels or equivalent international code.

The bladder shall be made of EPDM/BUTYL to keep the air permeation at minimum.

The tank shall be coated with corrosion protective paint.

The unpressurized tank shall also be similar in construction and shall also be provided with an automatic air vent, for deaeration, level transducer, for measuring water volume in tank, and swan neck (anti-vacuum).

Tanks shall be of vertical type with steel feet.

### **Hydraulic module**

The hydraulic module shall be compactly designed with ease of access to components and duty protected against corrosion with paint.

It shall have two multistage high-pressure pumps with vibration isolation, duty/standby/assist and automatic run time changeover sequence. Both the pumps shall be provided with adjustable soft start/stop function.

The pumps shall operate in conjunction with two parallel spill-lines. These shall include two Y-strainers and two electrically actuated fail safe ball valves with duty/standby/assist function and automatic changeover sequence.

A separate, additional, manual reset, pressure protection safety device shall be provided to shut the spill lines down when system pressure falls below minimum pressure. This shall be done via a pressure limiter switch and solenoid valve. A safety relief valve shall also be provided.

An electrically operated solenoid valve shall be provided to add make-up water from pressurized water line.

### **Control Unit**

The control unit shall be housed in a plastic/metal box, IP 54 protection, suitable for on-site built-in or wall mounting. The control unit shall be factory installed on the hydraulic module and wired ready for operation.

The microprocessor based controller shall be freely programmable with built-in real time clock. The plain text LCD display shall indicate system pressure, water level and all other relevant operating and error messages, including function diagram. It shall be possible to transfer complete operation information to BMS via an RS485 cable interface.

It shall ensure pressure maintenance within the limits  $\pm 0.2$  bar, pressure dependent tandem operation and automatic error alteration of pumps and spill valves, monitored water make-up with automatic interruption and error message if the runtime and/or the number of cycles are exceeded.

It shall also ensure degassing of a partial flow of the system water according to an optimized time schedule with selectable degassing programmes - a period of continuous, adjustable and depending on the installation volume, at start-up and automatic switch-over to economic, interval degassing, mode.