EXPLANATION OF BOOSTER PUMP SYSTEM

Booster pump system

Symbol

3 CDL 8 – 60 – I – 65A – 200L

- 3 — Quantity of pump
- CDL 8 – 60 — Model of pump
  - CDL : Vertical multistage pump
  - CHLF: Horizontal multistage pump
- I — Inverter control
- 65A — Diameter of Manifold
- 200L — Volume of pressure tank

※ Note) The standard for pressure tank is 10 Bar.
If pressure exceeds this value, it is required to discuss separately.

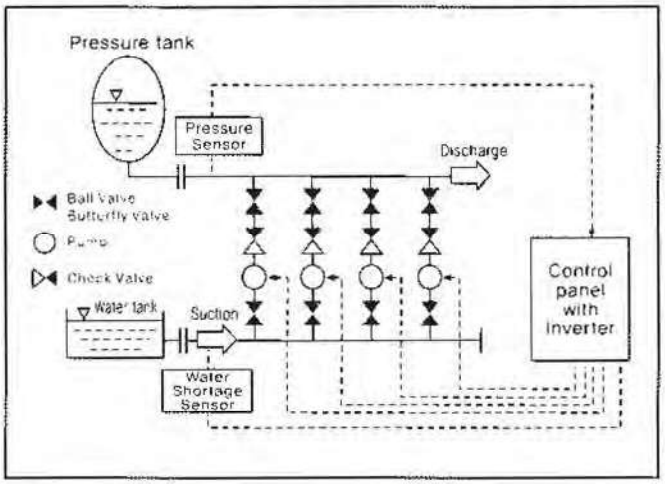
General specification

Control type	Inverter control
Installing place	Indoor
Surrounding temperature	+5℃~+40℃
Type of liquid	Clean water
Temperature of fluid	0℃~80℃
Maximum use pressure (Suction head + Total head)	20Kg/㎠
Minimum suction	0.2Kg/㎠
Tolerable suction	Limited depending on the maximum use pressure
Pump	Vertical/horizontal multistage pump
Quantity of combined pumps	2~6 units
Power supply	3 phase x 220/380 V x 60 Hz
Material of header	Stainless steel 304

Features

- Intelligent computer control of high quality
  –As exclusive controller is independently developed, diverse functions are provided and the most advanced and precise control is ensured.
- Energy saving system
  –Since the operation of required quantity of pumps is controlled in accordance with necessary water supply quantity, electricity charge is saved by more than 30%.
- Maintaining constant discharge pressure.
  –In spite of radical fluctuation of water supply quantity, constant discharge pressure is maintained, thereby ensuring convenient use of water.
- Component of high quality material
  –Since pump and main component is designed and made of high quality stainless steel, corrosion is prevented, thereby supplying clean water.
- User–oriented product design
  –The standardized design and parts guarantee prompt delivery and LCD menu in Korean/English/Chinese enables users to use the product with ease.
- Quality assurance
  –Perfect quality is assured by thorough production inspection and performance test in the factory.

Conceptual drawing of Booster pump system



EXPLANATION OF BOOSTER PUMP SYSTEM

Main Components

PID Controller
(LCD Display)

PID Controller Board

Pressure tank with Bladder

OUTLINE OF BOOSTER PUMP SYSTEM

General

This variable speed PID controlled booster system is a sophisticated system, composed of latest technology PID variable speed control cabinet and more than two sets of parallel pumps. It can be automatically adjusted to fulfill the requirement of constant pressure, variable flow water supply. The pressure of the water supply pipe network keeps constant, and the whole water supply system always keeps the best state of high efficiency and energy saving. There are two types of water supply, one is by frequency conversion, the other is by pressure. Water supply by frequency conversion can automatically adjust the rotating speed of one pump or start/stop pumps, which is the best way to keep the pipelines constant pressure, easy to operate.

Application

Resident water for living: such as high-rise building, resident community, villa
Public places: such as hospital, school, gymnasium, golf court, airport
Commercial building: such as hotel, office building, department store, large-scale sauna
Irrigation: such as park, amusement park, orchard, farm
Manufacturing industry: such as production manufacturing, washing device, food industry, factory.

Advantages

Solve the problem of low hydraulic pressure

- The booster system keeps the water pressure stable in the hole building.

uoid water pollution caused by roof tank

– Replace the traditional roof tank water supply way, eliminate the source of water pollution.

Reduce the construction cost and enlarge the space

– Eliminate traditional roof tank, reduce the stress for the building, structure is simple, lower cost.

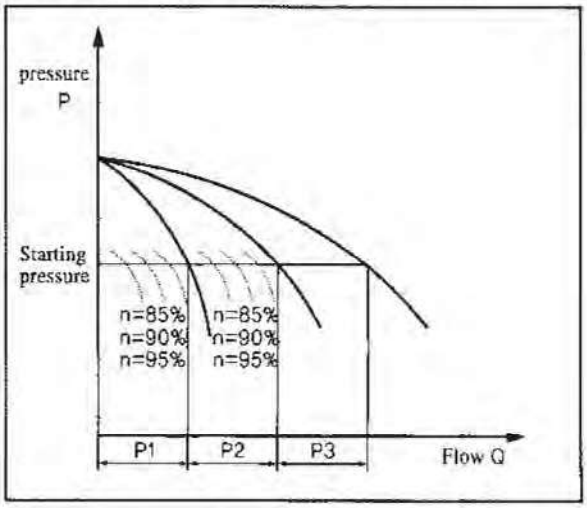
Save power, less space

– Compared with common water supply equipment, it may save more than 30% electric energy. This equipment covers less floor area, its installation simpler and construction period shorter.

Characteristics of Control Mode

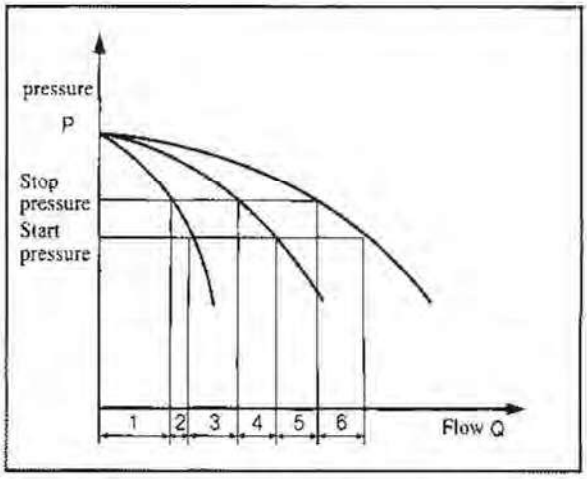
Controlled by frequency conversion	Controlled by air pressure
● Operation mode – Keep the pressure of water supply constant through the change of the rotational speed of the water pump	● Operation mode – Control the pressure by the pressure tank and pressure switch
● Characteristics – Higher cost than common equipment – Stable supply pressure – Electricity saving and low operation cost – Long life of water pump and motor – Without the phenomenon of water hammer, stable operation	● Characteristics – Lower price – Larger deviation of water supply pressure – Simple control mode and convenient maintenance – Short life of water pump and motor

Frequency conversion control



Keep the pressure of pipe network constant by adjusting the rotational speed of the water pump. When the pressure inspected at the outlet pipe of the system is smaller than the start pressure value of the water pump, it is able to automatically adjust the rotational speed of the water pump to keep the outlet pressure constant. In case the pump is operated at the rotational speed of power frequency while the pressure can't reach setting pressure, the system will start P2, P3 pump in turn; With the reduction of water consumption, the outlet pressure increases, and the rotational speed of the water pump goes down gradually. If the rotational speed of the water pump reduces to the lowest speed set by the system, the system will stop the operation of the water pump in the turn of P3, P2, P1.

Pressure control



In case the pressure of the pipe network is larger than that of start setting value, the pressure tank connected with outlet pipeline supplies water. In case the pressure of the pipe network is equal to that of start setting value, start the pump. When the pressure of the pipe network reaches stop pressure during operation, stop the operation of the water pump. After the pump starts, when the pressure of pipe network exceeds the start pressure, not reaching the stop pressure, the water pump continues operating; After the water pump is operated at full speed, when the pressure of pipe network has not reached the start pressure, the spare water pump start.

EXPLANATION OF CONTROL PANEL

Control panel(Exclusive for Booster System)

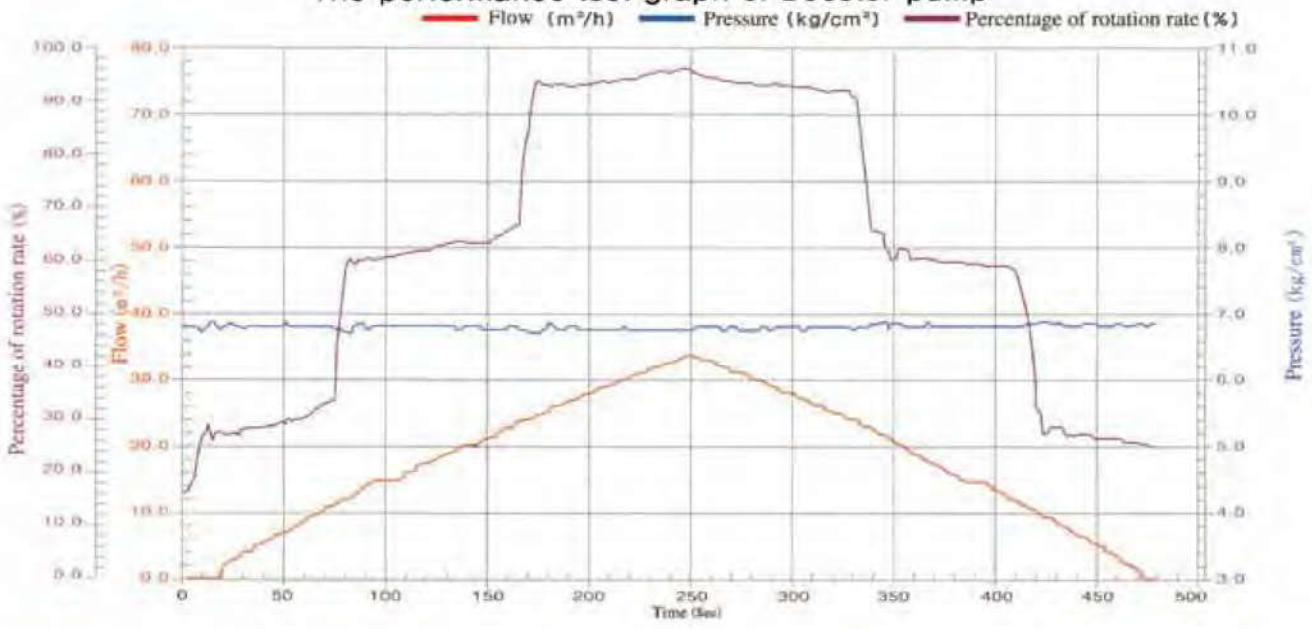
Specification

Description	Description
Run Mode	Auto and Manual
Display	Specification LCD Display
Inverter	1HP ~ 125HP(50Hz, 60Hz)
Pressure transmitter	2wire, 4~20mA, 0~25Bar

Main Function

Function	Description
Inverter movement type	Select from MENU for inverter fixed and movement control type
LCD display	Display on wide LCD with variable information data.
Selection language	It can selection 3 language (Korean/English/Chinese)
PID control	Latest PID control with Microprocessor.
Step operation	Step operation for each pump will saving energy.
Dry Running Prevention	Prevention from water shortage
Skip failed pump	Automatically skip
Lead pump change	Lead pump change by setting time.
High pressure alarm	Automatically stop when high pressure compare with high pressure setting value
Low pressure alarm	Automatically stop when low pressure compare with low pressure setting value
Self diagnosis	Self diagnosis system will provide ideal operation condition.
Protection from over current	Protection from motor over current
Emergency operation	Automatic control method change when emergency to step1 and step2 operation.
Schedule operation	Monthly, weekly daily the different setting pressure and operation
Fault Display	Inverter, Over current, Water shortage, Low pressure, High pressure
Recording data	Recording the operation term and time, also alarm, failure
Parallel Operation	Combined Operation by Max. 6 pumps

The performance test graph of Booster pump



Diaphragm Type Pressure Tank

Selection of Pressure Tank

The capacity of the pressure is selected according to the flow of pump, delivery head and start frequency.
The pressure level of the pressure tank is selected according to the system pressure.

1. Calculation of effective capacity (Vesp)

$V_{ESP} = 16.5 \times Q/n$

Q : Flow of pump (LPM)
n : Start frequency (Times/h)

Motor power (HP)	Below 5HP	7.5~10	15~30	40~75
Start frequency(Times/h)	Below 30	Below 20	Below 12	Below 8

2. Calculate the effective capacity coefficient (Z) based on the features of pump's start and stop

$$Z = \frac{Pi + 1.033}{Pf + 1.033}$$

Z (Effective flow coefficient) = the ratio of occupying coefficient of effective capacity for pressure tank under the condition of assigned start, stop pressure of pump

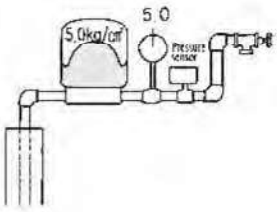
Pi (Start Pressure of Pump) = Actual head + Pipe Loss + System Required Pressure

Pf (Stop pressure of Pump) = Generally, (Pi+1.0~2.0kg/cm²)

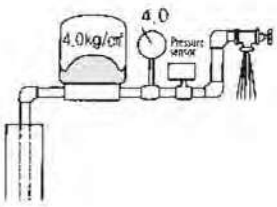
3. Calculate the capacity of pressure tank V_T from V_{ESP}

$V_T = V_{ESP}/Z$

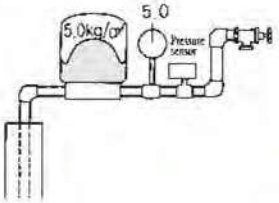
Working Principle of Pressure Tank



● At the initial operation of the pump, fill water in the pressure tank. After it reaches setting pressure with the increasing of the pressure, the water pump stops.

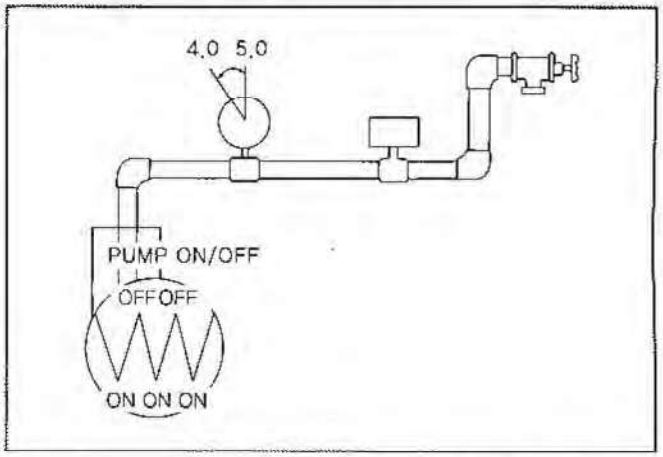


● For initial water consumption, the water is supplied by the pressure tank. With the gradual reduction of the internal pressure of the pressure tank, the water is supplied by the frequency conversion.



● When the supply volume is small or stopping water consumption, the water pump continues filling the water in the pressure tank. It will stop until it reached setting pressure.

Operational situation of the system in case of without pressure tank



Water is non-compressive fluid so the pressure will change rapidly when little water flows into or out. For the pressurization water supply, without pressure tank or small capacity, the change of water consumption volume will start the water pump frequently and result in the great increase of fault rate for pressure controller, relay, contactor, etc. and large damage and loss for the pump and motor, lowering the reliability.