# TRANSFORMING AN INTERMITTENT INTO24*7 WATER SUPPLY SYSTEM IN SECTOR NO. 4 & 6 OF PCMC PUNE'

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***ABSTRACT: Drinking water is not only a basic need of life but its supply is also important for achieving the goal of health for all. The primary aim of this project is to provide wholesome water to the consumer for 24*7 hours by framing the legislation on regulation of drinking water through a scheme which is named as 24 *7 water supply scheme with the help of PimpriChinchwad Municipal Corporation (PCMC) , Pune .Various case studies from the different municipal corporation namely Latur , Amravati, Malkapur (district- Satara) and sector no. 26 Pune, were studied to get the detailed idea about the management of 24*7 water supply scheme. It helped to identify the factors for the successful implementation of continuous water supply system. The factors are quality of water, leakages in the pipelines, 100% metering, pressure monitoring and public awareness. The case studies helped to draw an inference that wastage of water can be reduced by avoiding the storage of water in the pots and also saving in electricity bills, by maintaining appropriate water pressure throughout the water supply pipeline.This work started by PCMC in July 2016. The main focus of this work was to provide quality water in a continuous way to the consumers by overcoming all the lacunas of intermittent water supply system in Zone C2. The work was completed successfully in Dec 2016. For the quality of water, PCMC preferred Central Public Health and Environmental Engineering Organization (CPHEEO) standards.For the successful execution as well as maintenance of 24*7 water supply scheme, pressure and flow variation with respect to time was continuously observed in different area of Zone C2 to keep the system under positive pressure for 24*7 hrs.***

***Keywords: 24*7 supply, water leak detection, pipe lines, Helium gas leak detector, water quality management, vaccum pressure, successful implementation***

## I. INTRODUCTION

The water which is treated chemically but not injurious to the human health is called as 'wholesome water' or 'safe drinking water'. It is important to maintain the standard of drinking water, because essential chemicals are supplied to the human body by the treated water. The quality of water can be improved by using different standard of water. The responsibility of drinking water supply agency is to ensure drinking water quality before supplying water to the consumers, so that the level of risk for human health would be negligible and consumers feel safe while drinking the water. The World Health Organization (WHO) guidelines for drinking water quality, defines safe drinking water as water that does not represent any significant risk to health over a lifetime of consumption. Health risk from unsafe drinking water can be reduced to a negligible level by the following approaches:

- Protecting water sources from pollution
- Preventing contaminants from reaching consumers. This can be achieved through preventive and curative measures at different stages.
- Prioritizing safety of drinking water.
- Effective drinking water treatment if necessary.

These steps rely on effective monitoring of drinking water quality, as well as management of the various systems involved in protecting and delivering drinking water. All of these must, of course, takes place by good governance, suitable legislation and policies, clear guidelines, standards and objectives, effective research and technology development and meaningful public involvement and awareness.

Types of Water Supply Systems:

Two water supply systems exist, includes:

- Intermittent Water Supply System
- Continuous Water Supply System

*1. Intermittent Water Supply System:*

Generally, in India Intermittent Water Supply System is used to supply drinking water to people by the Local bodies. In this system water is supplied to users for less than 24 hour in a day for specified hours i.e. in the morning or evening or as per available time. Water is supplied to the consumers usually at the peak hours of the water usage.

*2. Continuous Water Supply System:*

24*7 Continuous, pressurized water supply system is a system supplying water round the clock for all 7 days a week and all weeks of year. The water is adequately pressurized to reach the consumer at a pleasant pressure and flow. In this system, consumers need not store water for their usage and it generates excellent consumer satisfaction. Chances of wastage are comparatively less. Advantages of 24*7 continuous water supply schemes are as follows:

*Requirement for 24*7 Water System:*

For 24*7 water supply system following are the minimum requirements:

- Adequate availability of water and system design for a long term
- Continuous availability of electricity
- Strong power of the political and administrative wing of the Municipal Corporation.
- Whole hearted contribution for demand management by the consumers.

Principal Features of Water Supply Scheme: Following table shows the features of study area:

| Description | Units | Values |
|---|---|---|
| Total No. Of Households | Souls | 40000 |
| Daily Water Supply Level (Summer Season) | LPCD | 150 |
| Daily Water Supply Level (Normal Season) | LPCD | 150 |
| Capacity of Water Treatment Plant (Phase-1) | MLD | 114 |
| Water Requirement (Population)*(Rate of Supply of Water In LPCD) (40000*150) | MLD | 6 |
| Water Requirement Considering Future Population Growth | MLD | 7 |
| Pure Water Sump of Capacity | Liters | 120*10^5 |
| Length of Distribution Network from WTP At Durga Hill to Headwork at Ravet | Km | 4.5 |

Table: Features of the water supply system PCMC, Pune

Zone $C_2$ is well planned and quite free of slums. The details of configuration of pipes are shown in Table.

| Diameter, mm | Length, M | Material | Thickness, mm |
|---|---|---|---|
| 1053 | 4200 | Mild Steel (MS) | 10 |
| 600 | 1400 | Mild Steel (MS) | 10 |
| 600,400,300,200 | 27000 | Ductile Iron (DI) | 10 |
| | | | |
| 150,100 | | | 8 |

Table: Configuration of Pipes

Reasons for Selecting Zone 2 as a Pilot Zone:

This area was selected as pilot because of the following reasons:

It is near water treatment plant (WTP), so water can be easily supplied by existing elevated service reservoir (ESR) through separate pipelines.

Availability of total residential area with 100% metering system.

- It is fully developed area, so no further growth in population.
- Total volume of water supplied to this area can be easily measured.
- The major reason for selection of zone $C_2$ for 24*7 water supply system was the water problem in the area.
- It can be easily isolated from entire area.
- The zone can be easily divided into sub-zones because of the difference in the elevations.

Principal features of the Water Supply Schemes in PCNTDA: Since the inception of PimpriChinchwad New Town development Authority (PCNTDA) in seventies, the Nigdi area was included in the development Plan which comprised of total 42 sectors, out of which sector no. 4 & 6 which covers sumptuous area of Nigdi has undergone development with respect to its infrastructure as early as in nineties. After the infrastructure development and sale of plots of that sector by PCNTDA, the area is handed over to PimpriChinchwad Municipal Corporation (PCMC) for maintenance. The zone $C_2$ is stated to have been ideally developed which has a good network of roads, sufficient power, water supply and sewerage scheme under PCMC. However, over the years the zone $C_2$ has undergone rapid development in respect of building construction due to coming up of many IT parks and auto industries and other business establishments. This has created demand for the housing, industrial and business buildings. The physical face of the area is totally changed now since almost all single storey units have been converted into two storey or multistoried buildings adding pressure on the water supply arrangements by PCMC. The problems identified are as follows:

- Inequitable supply of water, poor demand coverage and poor water pressure.
- Poor asset maintenance and management of water supply account.
- Lack of meters and illegal tapings on rider mains.
- Water leakages.
- Non-Revenue Water (NRW).

Objectives of the Project:

The main objective of the study is to study quality management of 24*7 water supply scheme at zone $C_2$, PCMC, Pune. The sub-objectives to achieve above are:

- Four case studies of 24*7 water supply scheme in different parts of Maharashtra.
- Monitoring treated water quality at zone $C_2$.
- Leak detection surveys at zone $C_2$.
- Hemethods of leak detection.
- Monitoring of flow and pressure variation.
- Public awareness for water conservation and organizational credibility.

## II. LITERATURE SURVEY

Dr. Sanjay and V. Dahasahasra has studied on the water crisis, millennium development goals, access to safe water – Indian scenario. According to the World Water Development Report, 1.1 billion people worldwide do not have access to safe drinking water. This figure is expected to touch 2 billion by 2050. 1.6 million die every year due to diseases related to poor sanitation and polluted water supply and 160 million are infected with Schistosomiasis while 133 million suffer from high- intensity intestinal helminth infections.

Rutva N. Gohil has analyzed the critical responsibility of declining availability of water supplies is one of the most important environmental issues facing various countries at the present time. Climate change, affluence and population growth have resulted in vast requirements of water for use in domestic, industrial and agricultural settings. Water has remained the most severe issue confronting the Urban Local Bodies (ULB), whether they are located in water abundant or water starved region. Most of the issues are related to

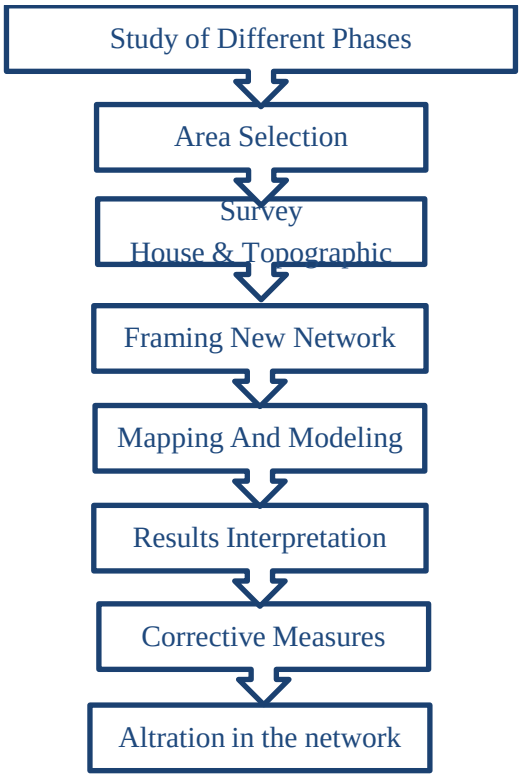
  

improper operation of the system. Serious efforts with utmost concentration ought to be the top-most priority of the Local Authority to emerge out of the severe critical water issue.

Ms. Namrata B Patil and Dr. W N Deulkar has researched on the primary aim of PimpriChinchwad Municipal Corporation (PCMC), Pune is to provide water to the consumer for 24*7 hours by framing the legislation on regulation of drinking water through a scheme which is named as 24*7 water supply scheme, Hence before provision of continuous water supply, we have considered 'leakages' in the distributaries as it is the most responsible factor for water contamination. For detecting leakages and to provide safe qualities of water, a sample of water from consumer water tap was analyzed for chlorine and turbidity test. Helium gas was used to detect leakages in the water mains. It is seen that, this technique is safe, easy to operate and have accurate results to find leakages in water mains.

Yogendra P Joshi1, M. B. Tadwalkar has worked on Flow sensor based water meter presents very low cost, reliable, quick water meter system accompanying with existing GSM networks. Paddle wheel flow sensor JT121 measures the water flow accurately with the help of rotating paddles. Monthly water usage can be sent to municipal corporation office within fraction of seconds in the form of text message by using existing GSM network. Such metering system reduces manpower, with higher accuracy and less power consumption. It gives better results than any other metering systems such as mechanical, ultrasonic, electro-magnetic systems. By using this system water consumption can be observed in real time with controlled use of precious water resources. Water resources to be managed for future planning. Non-revenue water will be detected and loss can be avoided in distribution system.

METHODOLOGY:




Area Selection:

The study begins with a brief account of the industrial growth and development of Pune and Pimpri-Chinchwad area and streamlines the main industrial growth areas in the region. It also explains the various factors in Pune-Pimpri – Chinchwad and its environs that have facilitated the industrial growth of the Pune Region. There is a brief description of large scale industrial organizations in Pune-PimpriChinchwad and its environs. PCMC has been divided PimpriChinchwad area in no of 15 Zones on the basis of area. Out of which we have selected sector no's 4 and 6 which lies in Zone C2. The necessary information of these two sectors is as follows:

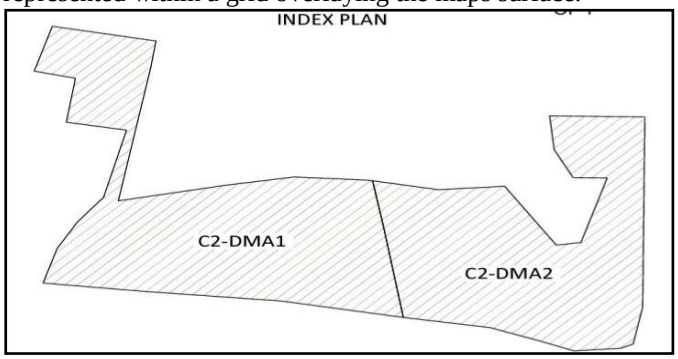
Population of the sector 4 and 6 = 30000

| Existing Capacity | Proposed Capacity |
|---|---|
| GL=613.918m | GL=604.550m |
| LSL=625.918m | LSL=616.550m |
| FSL=690.918m | FSL=621.550m |
| Capacity=1.2 ML | Capacity=2 ML |


Image: Area under Sector No. 4 and 6

Index Plan:

Index plan are a type of finding aid that allow users find a set of maps covering their regions of interest along with the name or number of the relevant map sheet. An index lap provides geospatial popsicles on either a sheet of paper or a computer screen. In this way, a map acts as a kind of gazetteer, with the location (such as a call number) represented within a grid overlaying the maps surface.




Index Plan of Zone C2

Key Plan:

Used to indicate that a particular location is known by a particular name, to indicate what sort of "place" it is. A place tag should exist for every significant human settlement (city, town, etc.) and also for notable unpopulated, named places.

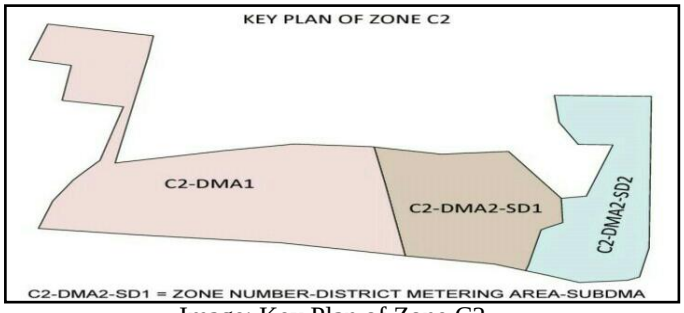


Image: Key Plan of Zone C2

Consumer Survey:

We have carried out Consumer survey with the help of consumer surveyors and achieved it in following way:

- Mapped each house and consumer in GIS
- Carried out house to house survey
- Collected information related to no. of inhabitants, Water requirements, income, connection size, etc.
- Attached database of each house to GIS
- Found out the unregistered /illegal connections

For this, we have used a consumer form.

Objectives: -

- To Know Daily Demand of Water.
- To Know Existing Situation of Water Supply.
- Opinion and Expectations.

No. Of Houses Covered: - 102.

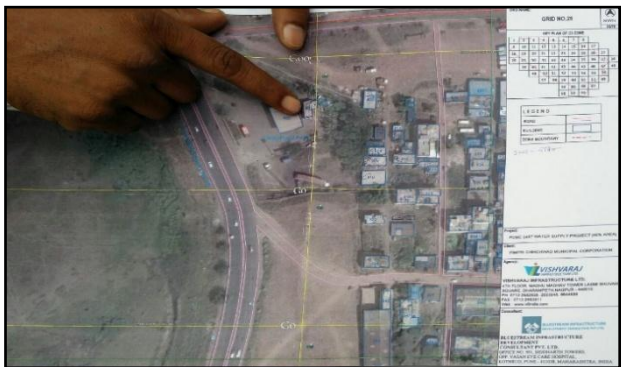


Image: GIS map of Aadarsh Nagar (sector 4)

Topographic Survey:

Topographic maps are used to identify and map the contours of the ground and existing features on the surface of the earth or slightly above or below the earth's surface (i.e. trees, buildings, streets, walkways, manholes, utility poles, retaining walls, etc.)

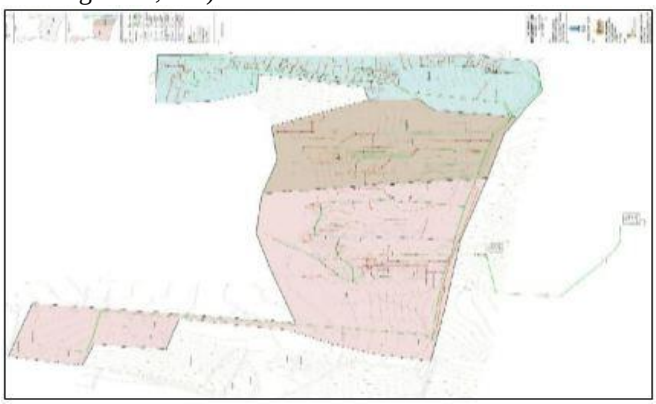


Image: Contour Map of Sector 4 and 6

Existing Water Supply Network:

A water supply system or water supply network is a system of engineered hydrologic and hydraulic components which provide water supply. A water supply system typically includes:

- A drainage basin (see water purification - sources of drinking water).
- Water purification facilities. Treated water is transferred using water pipes (usually underground).
- Additional water pressurizing components such as pumping stations may need to be situated at the outlet of underground or above ground reservoirs or cisterns (if gravity flow is impractical).

Framing New Pipe Network:

The product, delivered to the point of consumption, is called potable water if it meets the water quality standards required for human consumption.The water in the supply network is maintained at positive pressure to ensure that water reaches all parts of the network, that a sufficient flow is available at every take-off point and to ensure that untreated water in the ground cannot enter the network. The water is typically pressurized by pumps that pump water in to storage tanks constructed at the highest local point in the network. One network may have several such service reservoirs.In small domestic systems, the water may be pressurized by a pressure vessel or even by an underground cistern (the latter however does need additional pressurizing). This eliminates the need of a water-tower or any other heightened water reserve to supply the water pressure.These systems are usually owned and maintained by local governments, such as cities, or other public entities, but are occasionally operated by a commercial enterprise (see water privatization). Water supply networks are part of the master planning of communities, counties, and municipalities. Their planning and design requires the expertise of city planners and civil engineers, who must consider many factors, such as location, current demand, future growth, leakage, pressure, pipe size, pressure loss, firefighting flows, etc. using pipe network analysis and other tools.New water supply pipe network has been proposed with the help of software named as Water GEMS: Bentley Water V8i (SELECT Series 6).

Water GEMS:

(Water Distribution Modeling and Management)

Water GEMS is a hydraulic modeling application for water distribution systems with advanced interoperability, geospatial model building, optimization, and asset management tools. From fire flow and constituent concentration analyses, to energy consumption and capital cost management, WaterGEMS provides an easy-to-use environment for engineers to analyze, design, and optimize water distribution systems.

Streamlined Model Building-

Engineers can leverage geospatial data, CAD drawings, databases, and spreadsheets to jumpstart the model building process. WaterGEMS provides synchronized database connections, geospatial links, and advanced model-building modules that connect with virtually any digital data format. WaterGEMS includes Load Builder and TRex modules to

help engineers allocate water demands and node elevations based on geospatial data found in shape files, geodatabases, various types of DEMs, and even CAD drawings. These modules help engineers avoid potential manual-input mistakes. WaterGEMS also provides drawing and connectivity review tools to guarantee a hydraulically coherent model. Skelebrator automatically removes network complexity, while maintaining hydraulic equivalence, to efficiently tackle a wider range of modeling applications.

Optimized Model Calibration, Design, and Operations
WaterGEMS includes state-of-the-art genetic algorithm optimization engines for automated calibration, design and rehabilitation, and pump operations. Darwin Calibrator evaluates millions of possible solutions to let users quickly find a calibration hypothesis that best matches measured flows, pressures, and on/off status, empowering users to make reliable decisions based on accurate hydraulic simulation of the real world.
Water GEMS' SCADA Connect module lets modelers automatically acquire supervisory
control and data acquisition (SCADA) data, creating a real-time system simulator that accurately represents current system conditions. It also enables Water GEMS model results to be published to a utility's existing SCADA control room screen(s), helping to forecast operating conditions and potential issues. Darwin Designer automatically finds maximum benefit or minimum-cost designs and rehabilitation strategies, based on available budget, construction cost, and pressure and velocity constraints. Engineers can also analyze energy consumption to identify the most energy efficient pump scheduling strategy. Darwin Scheduler optimizes the operations of fixed- and variable-speed pumps, and tank storage, to minimize energy usage or energy cost, based on pressure, velocity, pump start, and tank level constraints. Energy costs can be aggregated across pumping stations and factor in complex tariffs as well as non-model-related energy costs, to perform net present value analyses of their operating scenarios.
Water Distribution Modeling and Management
Hydraulics, Operations, and Water Quality

- Steady-state simulation
- Extended-period simulation
- Constituent-concentration analysis
- Multi-species water quality analysis
- Criticality analysis
- Combination pump curves
- Carbon emission calculation
- Optimization of pipe renewal with Pipe Renewal Planner

Pipe and Cable Detection:
The Basics of Cable Locating
Cable locating is not an exact science, yet. To do a good job, you must know your equipment, and use your intuition and good judgment. Certain techniques can alert you to potential problems and make the difference between a good locate and a bad one. In this manual, we discuss the basics of locating buried cable or pipe by using a Transmitter to apply a signal to the conductor, and tracing the conductor's path using a Receiver.

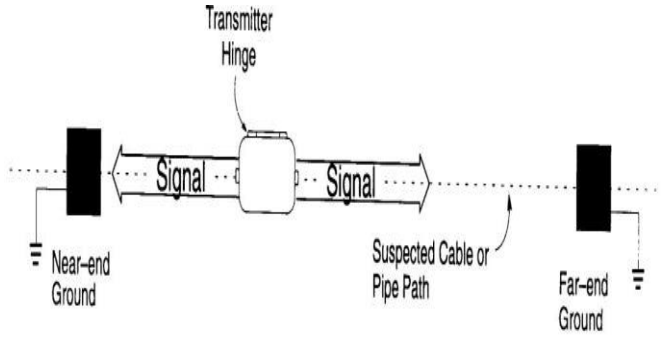



Image: Cable Locator

There are three methods of applying signal with a 3M™ Dynatel™ Transmitter:

- Direct connect method
- Induction method
- Dyna-Coupler method

With any method of applying signal, frequency choice is important to get the "most" signal on the cable. Any signal applied to an insulated, buried cable or pipe leaks off to ground; as it gets farther away from the transmitter, the signal gets weaker and finally disappears. How fast it leaks off is determined by:

- Cable diameter,
- wet or dry soil conditions, and
- Signal frequency.

Applying the Signal:
*i) The Direct-connect Method-*
Connecting directly to the cable or pipe you want to trace (power cables only if they can be reenergized) is the most accurate method of cable locating. Connecting the Transmitter directly isolates the signal to one cable.

*ii) The Induction Method-*
The simplest way to put signal on a buried cable or pipe is with induction, where you merely set the Transmitter on the ground directly over the cable and turn the Transmitter on. The Transmitter induces signal current (tone) into any parallel conductor within range.

*iii)The Dyna-Coupler Method-*
The easiest way to put signal on a cable is with the Dyna-Coupler. When its jaws close around a cable or pipe, the Dyna-Coupler couples the Transmitter signal onto it.

Excavation:
In general, excavation means to loosen and. take out materials leaving space above or below ground. Sometimes in civil engineering term earthwork is used which include backfilling with new or Original materials to voids, spreading and leveling over an area. British Standard CP6031 gives standards and recommendation to earthworks covering embankment and cuttings, leveling and compacting, and the use of earthmoving plants etc.
Laying of Pipeline:
Types of Pipes:

1. MDPE-
Medium-density polyethylene (MDPE) is a type of polyethylene defined by a density range of 0.926–0.940 g/cm3. It is less dense than HDPE, which is more common.
MDPE can be produced by chromium/silica catalysts, Ziegler-Natta catalysts or metallocene catalysts. MDPE has good shock and drop resistance properties. It also is less notch sensitive than HDPE. Stress cracking resistance is better than that of HDPE. MDPE is typically used in gas pipes and fittings, sacks, shrink film, packaging film, carrier bags, and screw closures.
Features:

- High Impact Resistant Body and Nut which enables it to absorb thermal and mechanical stress.
- The fittings have a co-polymer polypropylene Body, Body Nut and Guide Ring, Acetal Grab Ring and Nitrile Seal.
- Simple and quick to connect: To fit the pipe you don't need to dismantle the connector, you don't need to chamfer the pipe, you won't lose any pieces on the job site, no time wasted; just cut the pipe, insert, pipe line, lubricate the seal, undo the nut a few turns, push the pipe in as far as it will go, tighten the nut and it's done.

2. HDPE-
High-density polyethylene (HDPE) or polyethylene high-density (PEHD) is a polyethylenethermoplastic made from petroleum. It is sometimes called "alkathene" or "polythene" when used for pipes.With a high strength-to-density ratio, HDPE is used in the production of plastic bottles, corrosion-resistant piping, geo membranes, and plastic lumber. HDPE is commonly recycled, and has the number "2" as its resin identification code. In 2007, the global HDPE market reached a volume of more than 30 million tons.
Characteristics:

- HDPE is known for its large strength-to-density ratio.
- The density of HDPE can range from 0.93 to 0.97 g/cm3 or 970 kg/m3. Although the density of HDPE is only marginally higher than that of low-density polyethylene,
- HDPE has little branching, giving it stronger intermolecular forces and tensile strength than LDPE. The difference in strength exceeds the difference in density, giving HDPE a higher specific strength.

3. Ductile Iron Pipe-
Ductile iron pipe is a pipe made of ductile cast iron commonly used for potable water transmission and distribution. This type of pipe is a direct development of earlier cast iron pipe, which it has superseded. The ductile iron used to manufacture the pipe is characterized by the spheroidal or nodular nature of the graphite within the iron. Typically, the pipe is manufactured using centrifugal casting in metal or resin lined moulds. Protective internal linings and external coatings are often applied to ductile iron pipes to inhibit corrosion: the standard internal lining is cement mortar and standard external coatings include bonded zinc, asphalt or water-based paint. In highly corrosive environments loose polyethylenesleeving (LPS) to encase the pipe may also be used. Life expectancy of unprotected ductile iron pipes depends on the corrosiveness of soil present and tends to be shorter where soil is highly corrosive.

4. Cast Iron Pipe-
Cast iron pipe is a pipe which has had historic use as a pressure pipe for transmission of water, gas and sewage, and as a water drainage pipe during the 19th and 20th centuries. It comprises predominantly a gray cast iron tube and was frequently used uncoated, although later coatings and linings reduced corrosion and improve hydraulics.Cast iron pipe was superseded by ductile iron pipe, which is a direct development, with most existing manufacturing plants transitioning to the new material during the 1970s and 1980s. Little cast iron pipe is currently manufactured.Cast iron proved to be a beneficial material for the manufacture of water pipes and was used as a replacement for the original elm pipelines laid in the ground earlier. These water pipelines were composed of individually cast pipe sections, often termed sticks, jointed together by a bell and spigot joint.

Pressure test:
There are two methods for pressure tests:
Hydrostatic test-
A hydrostatic test is performed by using water as the test medium, whereas a pneumatic test uses air, nitrogen, or any non-flammable and non- toxic gas.
A hydrostatic test is a way in which pressure vessels such as pipelines, plumbing, gas cylinders, boilers and fuel tanks can be tested for strength and leaks. Hydrostatic testing is the most common method employed for testing pipes and pressure vessels.

Pneumatic test-
Standard Pneumatic Test means a leak test of a pressure piping system using air or nitrogen, conducted by an organization that holds an Alberta certificate of authorization permit to construct pressure piping, using a procedure referenced in their QMS manual, and within the stored energy, temperature and material limitations established in this document.

Pressure Regulator:
A pressure regulator is a control valve that reduces the input pressure of a fluid to a desired value at its output. Regulators are used for gases and liquids, and can be an integral device with an output pressure setting, a restrictor and a sensor all in the one body, or consist of a separate pressure sensor, controller and flow valve.

Types-
1. Single stage regulator-
High pressure gas from the supply enters into the regulator through the inlet valve. The gas then enters the body of the

regulator, which is controlled by the needle valve. The pressure rises, which pushes the diaphragm closing the inlet valve to which it is attached, and preventing any more gas from entering the regulator.

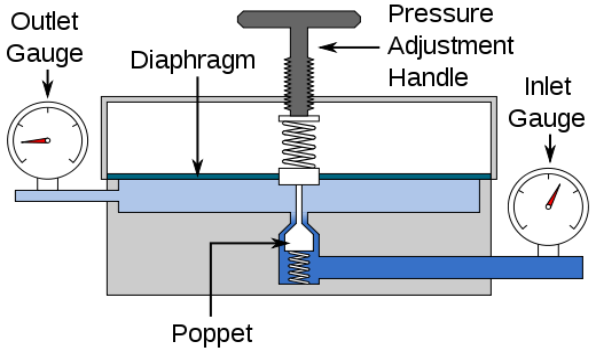



Image: Single stage regulator

2. Double stage regulator-

Two stage regulators are two single stage regulators in one that operate to reduce the pressure progressively in two stages instead of one. The first stage, which is preset, reduces the pressure of the supply gas to an intermediate stage; gas at that pressure passes into the second stage. The gas now emerges at a pressure (working pressure) set by the pressure adjusting control knob attached to the diaphragm. Two stage regulators have two safety valves, so that if there is any excess pressure there will be no explosion. A major objection to the single stage regulator is the need for frequent torque adjustment. If the supply pressure falls, the outlet pressure increases, necessitating torque adjustment. In the two-stage regulator, there is automatic compensation for any drop in the supply pressure. Single stage regulators may be used with pipe lines and cylinders. Two stage regulators are used with cylinders and manifolds.

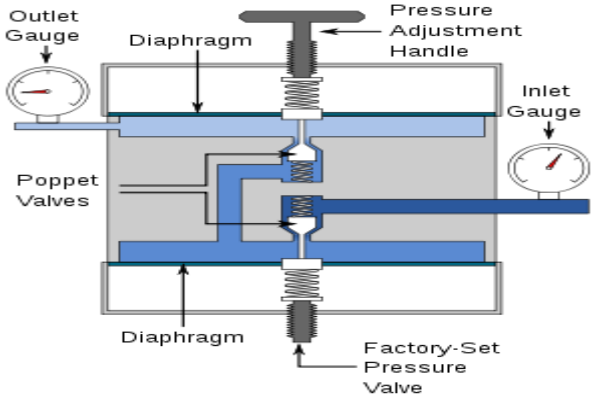



Image: Double stage regulator

Valve Actuator:

A valve actuator is the mechanism for opening and closing a valve. Manually operated valves require someone in attendance to adjust them using a direct or geared mechanism attached to the valve stem. Power-operated actuators, using gas pressure, hydraulic pressure or electricity, allow a valve to be adjusted remotely, or allow rapid operation of large valves.

Power-operated valve actuators may be the final elements of an automatic control loop which automatically regulates some flow, level or other process. Actuators may be only to open and close the valve, or may allow intermediate positioning; some valve actuators include switches or other ways to remotely indicate the position of the valve.

Types:

1. Manual-

A manual actuator employs levers, gears, or wheels to move the valve stem. Manual actuators are powered by hand. Manual actuators are inexpensive, typically self-contained and easy to operate. However, some large valves are impossible to operate manually and some valves may be located in remote, toxic or hostile environments that prevent manual operations. As a safety feature, certain types of situations may require quicker operation than manual actuators can provide to close the valve.

2. Pneumatic-

Air (or other gas) pressure is the power source for pneumatic valve actuators. They are used on linear or quarter-turn valves. Air pressure acts on a piston or bellows diaphragm creating linear force on a valve stem. Alternatively, a quarter-turn vane-type actuator produces torque to provide rotary motion to operate a quarter-turn valve.

A pneumatic actuator may be arranged to be spring-closed or spring-opened, with air pressure overcoming the spring to provide movement. A "double acting" actuator use air applied to different inlets to move the valve in the opening or closing direction. A central compressed air system can provide the clean, dry, compressed air needed for pneumatic actuators. In some types, for example, regulators for compressed gas, the supply pressure is provided from the process gas stream and waste gas either vented to air or dumped into lower-pressure process piping.

3. Hydraulic-

Hydraulic actuators convert fluid pressure into motion. Similar to pneumatic actuators, they are used on linear or quarter-turn valves. Fluid pressure acting on a piston provides linear thrust for gate or globe valves. A quarter-turn actuator produces torque to provide rotary motion to operate a quarter-turn valve.

4. Electric-

The electric actuator uses an electric motor to provide torque to operate a valve. They are quiet, non-toxic and energy efficient. However, electricity must be available, which is not always the case.

Leak Detection and Control:

Causes:

i) Type of mains-

This is a very important factor as the leakages normally leakages occur at faulty joints and fittings, if the material is not chosen according to the ground condition we may have to face leakage problems.

ii) Soil conditions-

Clearly soils influence corrosion and leakage rates, some soils are very aggressive which will increase the leakage rate significantly.

iii) Climate and ground movement-
Seasonal variations have a marked effect on leakage. Monsoon areas, which vary from long dry periods to intensely wet periods, cause ground movement, which can cause severe strain on pipe joints and service lines.
Flow Meters:
Flow measurement is the quantification of bulk fluid movement. Flow can be measured in a variety of ways. Positive-displacement flow meters accumulate a fixed volume of fluid and then count the number of times the volume is filled to measure flow. Other flow measurement methods rely on forces produced by the flowing stream as it overcomes a known constriction, to indirectly calculate flow. Flow may be measured by measuring the velocity of fluid over a known area.
Types-
1. Piston Meter/Rotary Piston-
Because they are used for domestic water measurement, piston meters, also known as rotary piston or semi-positive displacement meters, are the most common flow measurement devices in the UK and are used for almost all meter sizes up to and including 40 mm (1 ½ in). The piston meter operates on the principle of a piston rotating within a chamber of known volume. For each rotation, an amount of water passes through the piston chamber. Through a gear mechanism and, sometimes, a magnetic drive, a needle dial and odometer type display are advanced.

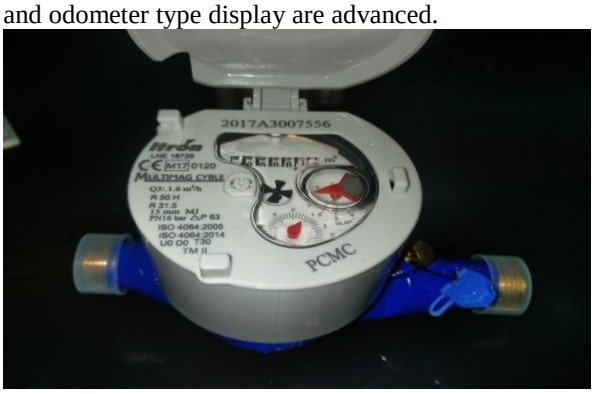



Image: Piston meter
2. Gear meter-
Gear meters differ from Oval Gear meters in that the measurement chambers are made up of the gaps between the teeth of the gears. These openings divide up the fluid stream and as the gears rotate away from the inlet port, the meter's inner wall closes off the chamber to hold the fixed amount of fluid. The outlet port is located in the area where the gears are coming back together. The fluid is forced out of the meter as the gear teeth mesh and reduce the available pockets to nearly zero volume.
Monitoring of System:
SCADA:
The definition of SCADA is 'Supervisory Control and Data Acquisition'. The major function of SCADA is for acquiring data from remote devices such as valves, pumps, transmitters etc. and providing overall control remotely from a SCADA Host software platform. This provides process control locally so that these devices turn on and off at the right time, supporting your control strategy and a remote method of capturing data and events (alarms) for monitoring these processes. SCADA Host platforms also provide functions for graphical displays, alarming, trending and historical storage of data.
Looking at the overall structure of a SCADA system, there are four distinct levels within SCADA, these being;
i. Field instrumentation,
ii. PLCs and / or RTUs,
iii. Communications networks and
iv. SCADA host software.
Leak Detection Methods:
Passive Leak Detection Method-
This is when water loss is only tackled when leakage is visible or when problems are reported. Adoption of this strategy minimizes day to day costs of leak detection, but substantially increases the risk of water being wasted. It results in an ever increasing upward trend in the annual supply of water being pumped from treatment works since many leaks can go undetected for years until they reach a level that needs quick action.
Active Leak Detection Method-
An active leak detection policy requires a commitment to spend funds on meter installations and associated costs for leak detection equipment's or for private leak detection companies operating under contract to the authority. The following benefits should be achieved.
i) Leakage is minimized and monetary losses are reduced.
ii) It results in an overall reduction in water demand.
iii) Limited water resources are conserved for legitimate use and are not wasted.
Public Awareness:
Increasing population, lead to increase in water pollution which cause shortage of water this have generated pressure on environment. This cannot be prevented by laws alone .public participation is also important with regard to environmental pollution. Therefore public awareness is very important which help to aware people about the problems which cause environmental problem which led to water shortage issues. Public awareness can be done in many ways. Example with the help of street plays, by making posters, by newspapers, by personally visiting to the people and telling them, or more. Once the people is aware about the problems it's very easy to solve it.
Advantages-

- To educatethe public about their local government's operations and the contributions that skilled city, town and countries managers make to those operations.
- To aware people about the problems which cause environmental problems.
- Public awareness help in convincing people about the work which is done by government or any organization.

## III. CONCLUSION

The intermittent water supply system is adopted by almost all towns and cities that comprises severe deficiencies which lead to poor water quality and pressures, inadequate quantity, discomfort and inconveniences, contamination etc. The water

provided by PCMC to all people of sector 4 and 6 is of standard quality and passes the safe permissible. This overcomes existing systems in terms of cost and manpower required. Minimized cost of the whole system will support to use as economical and logical metering system. Monthly billing cycle can be maintained to limit the use of precious natural resource water.

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