

Water metering and monitoring in 'Cleaner Production Management System'

The metering system:

A metering system must be viewed as an essential tool for resource management. Recording and analysing data on resource consumption allows organizations to monitor consumption patterns, identify anomalies, and highlight areas for improvement. Changes made will result in improved consumption patterns. Metering, therefore, is a critical factor for a successful cost-saving program.

The Cleaner Production Management System (CPMS):

For continuous improvement and attainment of the sustainability of Cleaner Production interventions, a factory must incorporate a management system that has a dedicated focus on Cleaner Production. Like any other management systems, CPMS will have dedicated executives or professionals to achieve specific goals integrated with the ultimate company goal. CP needs to be a part of a factory's management policy and ultimate business commitment. The team will be using necessary soft tools, knowledge, and information for making sustainable changes.

Water and its significance as a resource

On average, a textile mill (dye-house) uses around 100,000 m³ of water per month. About 150 litres of water is required to process (dyeing & finishing) 1 kilogram of fabric (cotton and cotton blends). High levels of water consumption have negative impacts on the hydrology and environment, especially in areas where water is over-extracted. In Dhaka for instance, **groundwater level is declining by 2-3 meters per year.**

Although it is free (for factories outside Dhaka city), the 'true' cost of water includes costs for pumping, distribution, softening, management and treatment. Hence, it is important that water, one of the most important resources for the textile wet processing sector, is consumed efficiently and smartly.

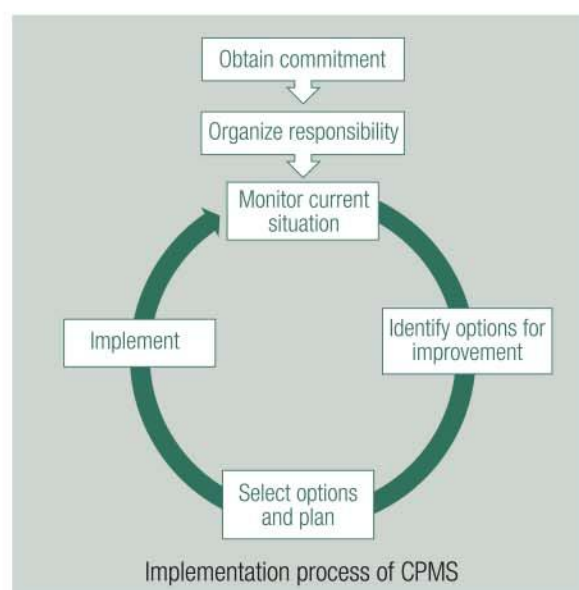
This info sheet contains necessary information on water meter selection, their installation, data monitoring and their integration in a management system, and how it contributes to increase company's profitability and sustainability.

The Cleaner Production (CP) approach:

Reducing the consumption at upstream, reusing them wherever possible and recycling from the downstream is the Cleaner Production approach. CP reduces the use of resources through improved management and housekeeping, substitution of toxic and hazardous materials, process optimizations, and reuse of waste products. CP approach ensures that companies gain financial benefits and simultaneously improve their business and environmental sustainability. Most of the CP interventions are financially feasible and easy to implement. Metering water consumption is one big step toward Cleaner Production. Metering helps achieve the 3R (reduce, reuse & recycle) approach by regular measuring and monitoring.

Water metering and CPMS

Metering is a pre-requisite for all textile factories, as we all know 'we cannot manage what we cannot measure'. Data generated by metering allow the factory management team to get an overall picture of how efficiently the factory operates and realize where the scopes for improvement lie. Thus, CPMS within the factory ensures best utilization of water flow meters.

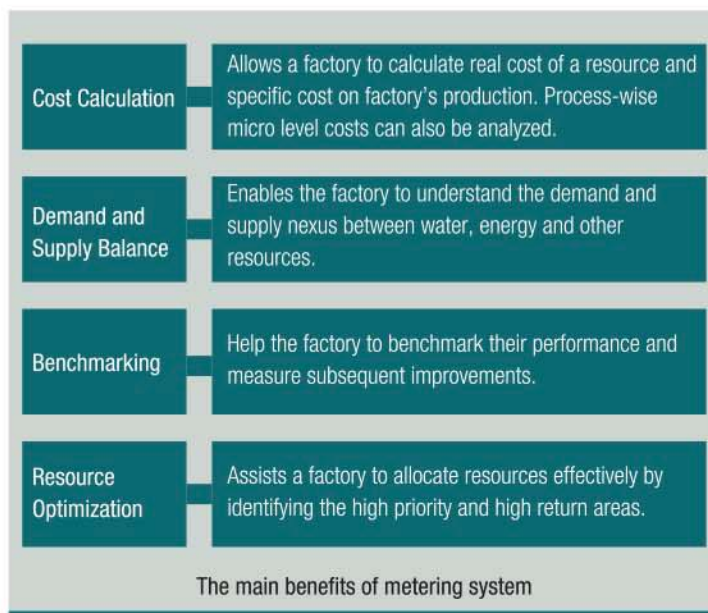


Purpose and optimum utilization of water metering

The actual purpose of a meter lies in how factory management uses the data generated. The data generated must be analyzed and processed to obtain general information like daily water consumption in production, to more sophisticated information such as which machines and production units are consuming more water, anomalies between data, etc.

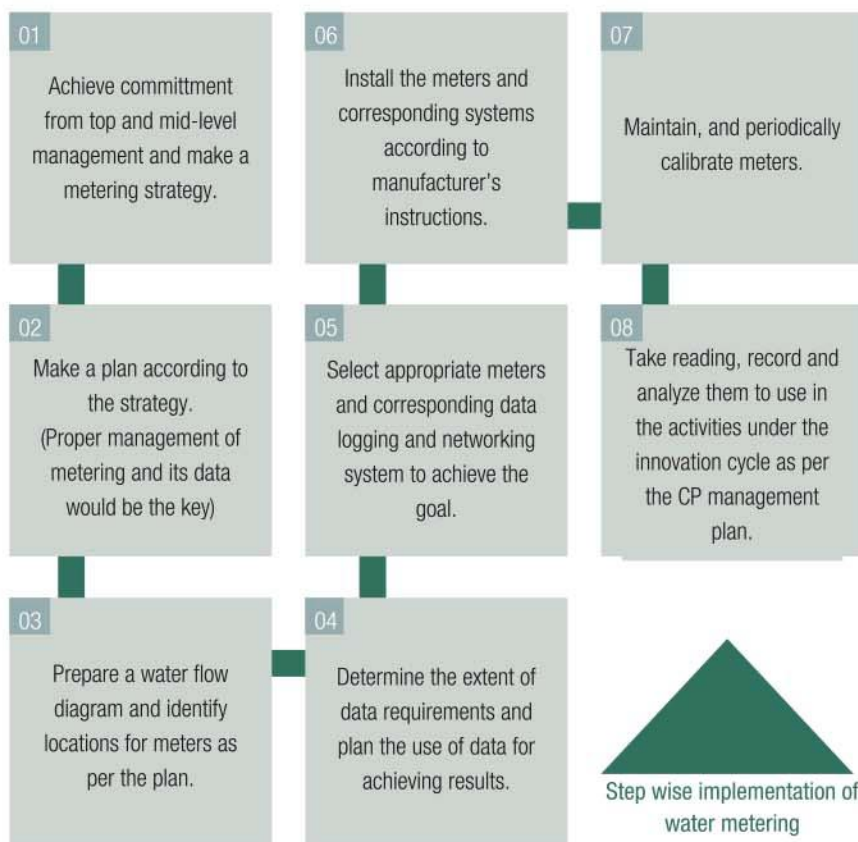
The business case

Savings and return of investment is positively associated with Cleaner Production. Installing metering system may not bring any direct benefits but it assists and leads the factory to achieve optimum savings from other Cleaner Production interventions. Metering is indeed a starting point of the journey towards savings, sustainability and profitability.



By installing water metering and monitoring system, 10 (deep dive) wet processing factories under the Bangladesh PaCT Program saved around **2.7 million m³ of water** which is **22.5% of their total annual consumption** and **their direct monetary savings was 32.5 million BDT.**

The case shows that **each factory could save an amount of water** which is equivalent to **160 times the regular size of an Olympic pool!**



Implementation of water metering

Implementing a comprehensive metering system is a straightforward and stepwise process, requiring careful consideration. Every meter needs to have a contribution in the central metering strategy. Tier wise approach helps factories build their own capacity in utilizing the meters through a step by step approach. Metering would start from bore pumps to Effluent Treatment Plant. Unit or workshop wise sub-meters can be considered at next stage while meters at each high consumption machine will help in performing process wise analysis and optimization. Metering of raw, soft and hot water as well as condensate, cooling water and wastewater, is important to fully understand water consumption. These measurements can also aid in understanding the performance of energy systems and specific processes.

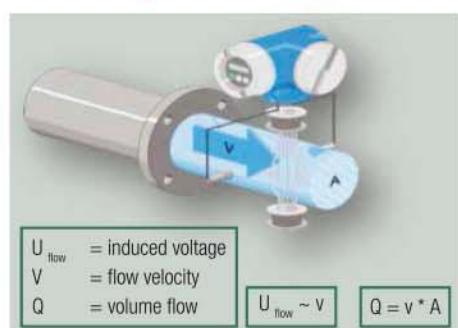
There are different types of water flow meters on the market which are applicable to the textile sector.

Mechanical flow meter

Mechanical water meters measure flow volume by multiplying the flow velocity and diameter of the pipe. These meters are commonly used for small volume water measurement such as office and dormitories. It will be economical to install this meter where management wants to know the water usage of each machine. Data accuracy of mechanical flow meters is not as reliable as other types of flow meters. These meters require more maintenance and performance of these devices deteriorate quickly as they have rotating parts. Mechanical flow meters without rotating parts could be interesting if their efficiency and accuracy is better. The type of fluid doesn't affect the performance to that extent. Sometimes mechanical flow meters impede the flow by reducing flow pressure.

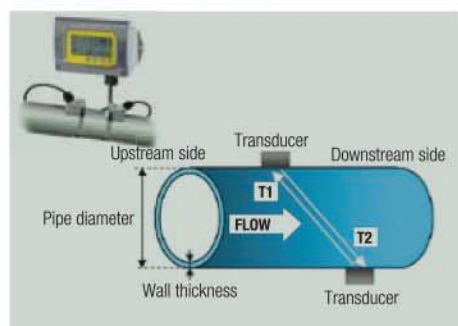


Electromagnetic flow meter



These meters use the principle of Faraday's Law of electromagnetic induction. Electromagnetic flow meters can be used to measure most electrically conductive liquids with or without solids, including water, wastewater, sludge, slurries and pastes. They are suitable for industrial purposes including effluent treatment plants. Level of accuracy of these flow meters is potentially high. Suitable locations for using electromagnetic flow meters are: main water pipe, branch fresh water pipe, branch hot water pipe, equipment fresh water, etc. These meters should not be used in nonconductive fluids. Fluids containing a lot of entrained air will not generate reliable results. However electromagnetic meters require less maintenance, produce no pressure drops, and are suitable for gravity and pumped flow.

Ultrasonic flow meter



An ultrasonic flow meter measures the velocity of a liquid by using ultrasound and doppler effects. These meters contain an ultrasonic transmitter and receiver. The travelling time of sound between the two transducers is converted to the velocity of the water in the pipe. Flow rate is calculated from velocity and inner diameter of the pipe and the travel time of sound between two sensors. Ultrasonic meters are typically suitable for noncritical flow in textile mills. These meters are effective for contaminated water. There are portable ultrasonic flow meters which can be used for baseline assessment and checking the functionality of inline meters. There are area velocity ultrasonic meters as well. Non-contacting or open channel ultrasonic flow meters are used to measure flow of water drains.

Vortex flow meters

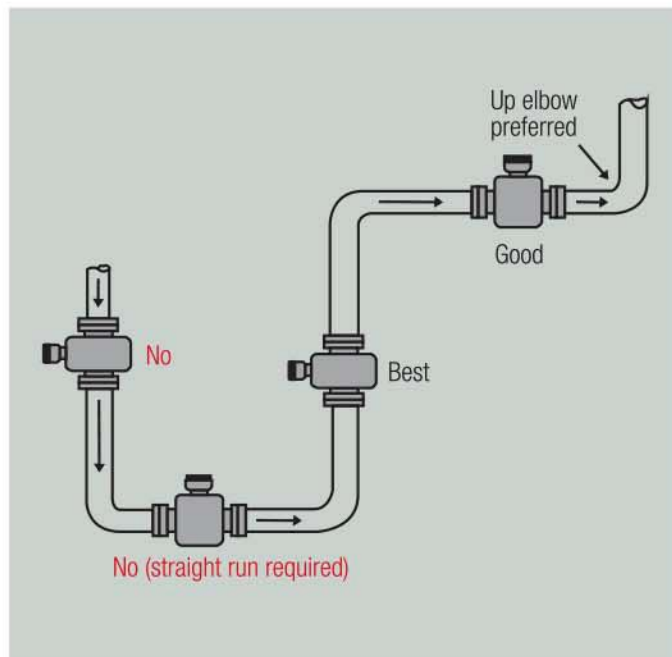
Vortex Flow Meters make use of a natural phenomenon that occurs when a Fluid flows around a bluff object. Eddies or Vortices are shed alternately downstream of the object. The frequency of the vortex shedding is directly proportional to the velocity of the liquid flowing through the meter. Vortex meters can be used to measure water flow also to measure gas and steam, water vapor etc. Flow of chemicals having low corrosiveness can be measured as well.

Comparison of water flow meters					
Type of the water meter	Price (USD/Unit)	Accuracy (pipe full) (+/- %)	Accuracy (pipe not full) (+/- %)	Installation and Maintenance	Life span (years)
Mechanical	\$164-\$2000*	5	5	Hard-Physical removal requires that flow to be halted	2-5
Electromagnetic	\$2623-\$4099*	0.2-.05	1-3	Hard-Physical removal requires that flow to be halted	15
Ultrasonic	\$983-\$1400*	1.0	10	Easy-Mounted externally	15

**Price of the meters varies widely depending on the size, functionality, origin, materials & services offered by the suppliers. This is only a broad range which may not be applicable for some cases.*

Installation guidelines

The guidelines for meter installation could vary depending on the type of meters, type of fluid etc. Flow meters should be installed in the lower part of the pipe work with enough head pressure to avoid cavitation. It is recommended that the flow meter is installed in a siphon, and if solids are carried along the fluid, it is recommended to plan a cleaning access. A simple U-tube or a rising pipe might be a simple solution too. For electromagnetic flow meters in particular, there are empty pipe detection electrodes which must be at the highest point of a horizontally installed meter to work properly. Meters should be kept at certain distances from closer valves or flanges. If data logger and corresponding networking system are not installed, accessibility of the meters is important to take readings. There are meters whose display units can be separated and can be installed remotely for ease of recording. It is recommended to follow meter manufacturer's instructions during installation of flow meters.



Networking, data analysis and smart meter

Data from individual meters must be collected in a centralized server for analysis. Frequent data collection and analysis is only possible with a system that networks meters into a central computer. Automatic read out, reliability and operating costs should be considered when designing the network infrastructure for a metering system. The networking should be performed on the basis of the metering coverage.

Smart meters combine a meter and a dynamic data logger. Data loggers have built-in clocks and micro-processors to time-stamp meter pulses counted over user-defined intervals. Using a converter and transmitter, data is sent digitally to a display in the operator room or even to the desk computer of the operations manager. This gives a good overview of water consumption in the different processes; displaying fluctuations in graphics. Water flow diagrams with input, different users and outlet can be constructed, and unexpected changes in water use, such as leakages and operational problems in dyeing machines, can be quickly identified.

For more information please contact Textile Technology Business Center

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