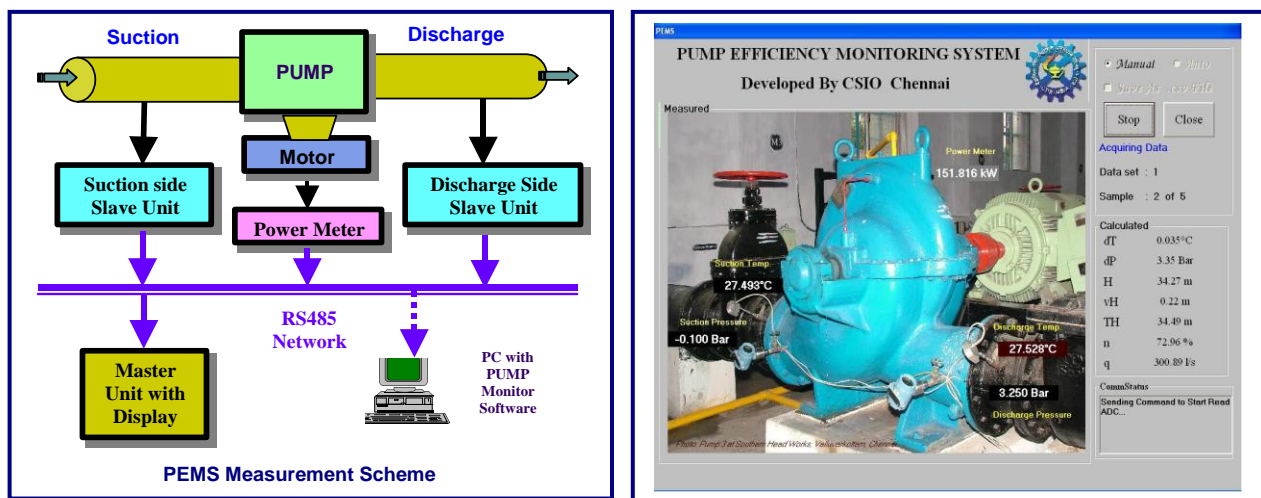


Pump Efficiency Monitoring System [PEMS]

Central Scientific Instruments Organisation (CSIO), Chandigarh is a premier national laboratory dedicated to research, design and development of scientific and industrial instruments. During the 1990s, CSIO Chennai Centre was identified for working in the area of Energy Management Instrumentation. CSIO Chennai Centre has successfully completed projects funded by the Ministry of Power, DST and the Indo German Energy Efficiency Program (IGEEP-GTZ). CSIO Chennai Centre also provides Energy Audit, Calibration Services etc. to the industries in the southern region. CSIO Chennai Centre has developed a low cost Pump Efficiency Monitoring System (PEMS) based on thermodynamic principle using the state of the art instrumentation.

Pumping systems account for nearly 20% of the world's electrical energy demand. Energy and maintenance costs are typically about 90% of a pump's Life Cycle Cost. Studies have shown that 30% to 50% of the energy consumed by pumping systems could be saved through monitoring the efficiency. As the energy costs are soaring high, any effort in energy conservation during pump operations, can reduce the overall demand for electrical supply as well as reduce the burden on the consumer.

The conventional method of calculating pump efficiency off-line is by taking measurements of flow, electrical power consumption, head and the pipe dimensions with different instruments.



PEMS is an on-line pump efficiency-monitoring tool. The PEMS developed by CSIO Chennai uses the principle of thermodynamics. The pump losses are calculated from *measurement of inlet and outlet fluid temperature and the dynamic head* developed by the pump. Pump Efficiency is then calculated. By monitoring electrical power input to the motor, the pump flow rate is calculated.

Application of PEMS:

- ❖ On-line Flow & Efficiency measurement with an accuracy of 1%
- ❖ Operation of pump with optimum energy consumption
- ❖ Proper Planning & Maintenance of the pump
- ❖ Refurbishment of the pump at the appropriate time periodically to increase the life of the pump
- ❖ Operation of pump at Best Operating Point (BOP)

Features:

- ❖ Single unit capable of on-line monitoring of suction temperature & pressure, discharge temperature & pressure, electrical power, head, efficiency & flow rate of the pump
- ❖ Temperature measurement with an accuracy of 0.001°C.
- ❖ Power measurement with an accuracy of 1%
- ❖ Capable of configuring the pump parameters
- ❖ Capable of displaying & logging data in *.CSV format for analysis

Specification of the system:

Suction Side Unit:

Temperature Range : 0 - 45° C
Temperature Accuracy : 0.001° C
Pressure Range : -1 to 5 Bar
Pressure Accuracy : 0.025% of full-scale
Output : RS485 with MODBUS RTU Protocol

Discharge Side Unit:

Temperature Range : 0 – 45° C
Temperature Accuracy : 0.001° C
Pressure Range : 0 to 15 Bar
Pressure Accuracy : 0.025% of full-scale
Output : RS485 with MODBUS RTU Protocol

Power Meter:

Accuracy : CLASS I ($\pm 1\%$)
Voltage Input : 0-270V rms
Current Input : 0-5A rms
Output : RS485 with MODBUS RTU Protocol

Master Unit: (Stand-alone Version)

Input:

- RS485 with MODBUS RTU Protocol
- Keypad

Output:

- 4 line LCD Display
- RS232 for PC interface

Master Unit: (Computer Version)

- P IV, 2.66 GHz and above
- RAM: 256 MB
- Hard Disk: 80 GB
- RS485 – USB Converter
- Operating System: Windows XP Pro.
- PEMS Application Software

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