

FILTERS FOR GAS METERS



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General. Fundamentally, dry filters are used in gas pipelines to entrap small particles of dirt, rust, loose mill scale and other particulate matter for subsequent removal from the pipeline system.

Gas filters are used for any application which requires the exclusion of particulate matter from the flowing system. One area of particular interest to Apollo Engineering is the field of gas measurement. The inclusion of a filter in a meter station is often times essential in order to attain optimum performance of the measurement equipment.

Rotary Meters. For positive displacement rotary gas meters it is essential that the gas stream be adequately clean to prevent scoring and accelerated wear of the close running meter parts and to prevent parasitic drag or even complete rotor stall caused by dirt build-up. Without proper filtration the accuracy of the meter may be seriously impaired, thus resulting in lost product and increased maintenance due to the requirement for more frequent reconditioning.

Turbine Meters Clean gas is also necessary for the satisfactory operation of rotary turbine meters. There are primarily two reasons why particulate matter is detrimental to the performance of the turbine meters used in the gas measurement industry. First, the bearings and drive train gear are precision devices that operate in a pressurized 'clean chamber' and the introduction of particulate matter into the clean chamber can cause additional friction which will cause the meter to flow a greater volume than indicated. Secondly, solid particulate matter can cause additional problems by adhering to the trailing edge of the blades or possibly abrading the blades thus changing the exit angle of the gas relative to the blade and causing inaccurate measurement. AGA Report No. 7, "Measurement of Gas by Turbine Meters", suggests that "meter protection can be accomplished through the use of a dry type or separator filter installed upstream of the meter inlet piping."

The small integral breather filter in the clean chamber does provide some degree of protection for the clean chamber but is easily plugged because of its small size. When the breather gets plugged dirt is then ingested through the rotor shaft bearing as the line pressure fluctuates. The best way to eliminate all of the problems caused by unwanted particulate matter is to eliminate all of the particulate matter by using a gross filter upstream of the meter.

Filter Selection Factors that should be considered in selecting the proper filter:

1. Usually a nominal 10 to 20 micron filter is satisfactory for good meter performance. Looser filtration does not provide adequate protection. Tighter filtration generally results in a larger and more costly filter than required and/or higher maintenance costs due to the unnecessarily short element life.
2. To select the proper filter it is necessary to specify the maximum and minimum operating pressures, the operating temperature and specific gravity of the flowing gas. Given this information the pressure drop can then be determined by reference to capacity tables or charts.
3. The service life of the filter element is dependent on the flow rate and the amount of particulate in the flowing stream. Usually, the amount of particulate is not well defined but experience has shown that the Apollo GFS Series Gas Filter elements have a service life of about six plus months under typical pipeline operating conditions.
4. Typically, a filter will be placed in service and exhibit a 'clean' pressure drop as shown by the capacity charts, when flow is initiated. As time passes, the filter will gradually clog with dirt thus causing the pressure drop to increase correspondingly. The elements should be replaced when the pressure drop reaches the rated pressure drop. If the rated pressure drop is exceeded the elements may rupture. After the rupture, filtration effectively ceases and accumulated matter may be swept downstream.

These pressure drops should be considered in the design of the piping system.

Filter Service. After the filter has been placed in service a regular preventative maintenance schedule should be established so that the filter can be routinely and conveniently monitored and serviced to insure continued proper operation of the measurement system.

Conclusion. Rotary meters and turbine meters are high speed, precision devices that operate best when the flowing gas is properly cleaned and free of injurious dirt and other particulate matter. All dust sensitive equipment including meters, regulators, control valves, pilots and controllers should be protected by filters.