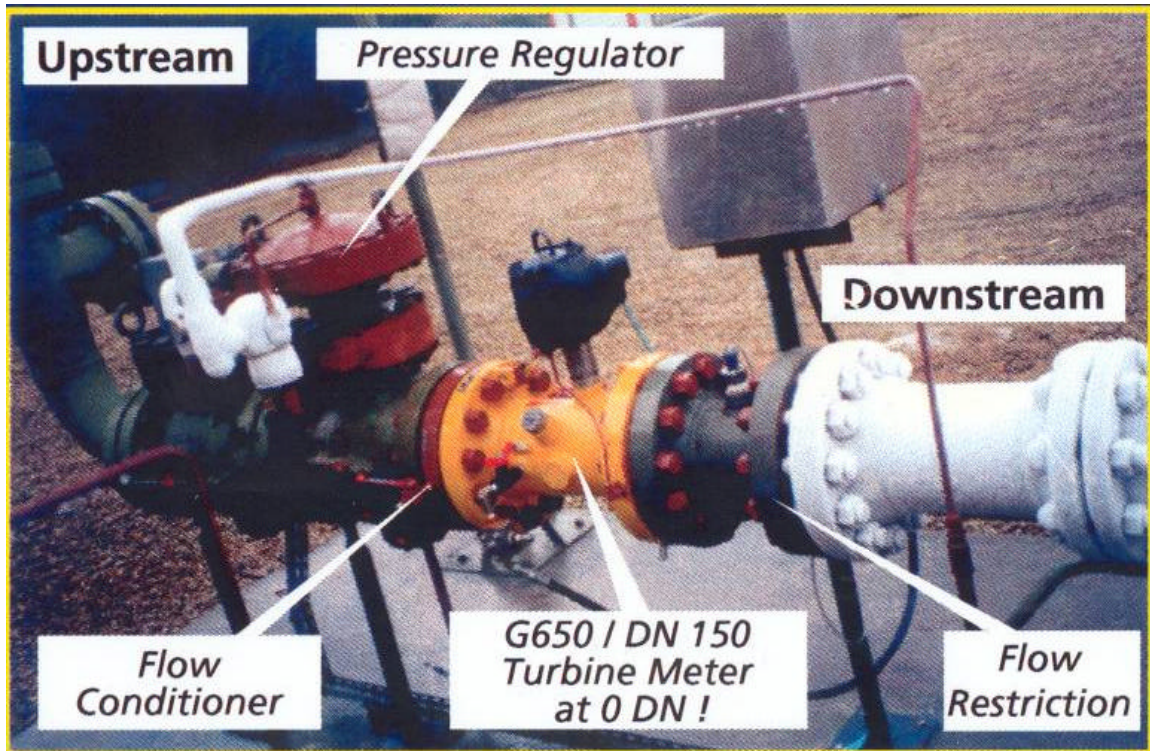


# VARIABLE PRESSURE METERING AND FLOW CONDITIONER



**A COST-EFFECTIVE SOLUTION FOR YOUR REGULATING/METERING STATIONS**

- **IMPROVED IN-THE-FIELD PERFORMANCES**
- **LOW COST IMPLEMENTATION**
- **MINOR MODIFICATION TO THE EXISTING LINE**
- **LESS UNACCOUNTED GAS**

## GENERAL

The association of Variable Pressure Metering and the flow conditioner allows, by a novel combination of the pressure regulator and the meter:

⇒ to increase the overall rangeability of metering

⇒ to downsize regulating / metering stations.

Indeed, the standard metering ranges with constant pressure are sometimes insufficient (7 for orifice plate meters, 20 for turbine meters and 30 to 50 for rotary displacement meters). Moreover, the combination of pressure regulators and meters may cause installation condition problems, from a metrological point of view.

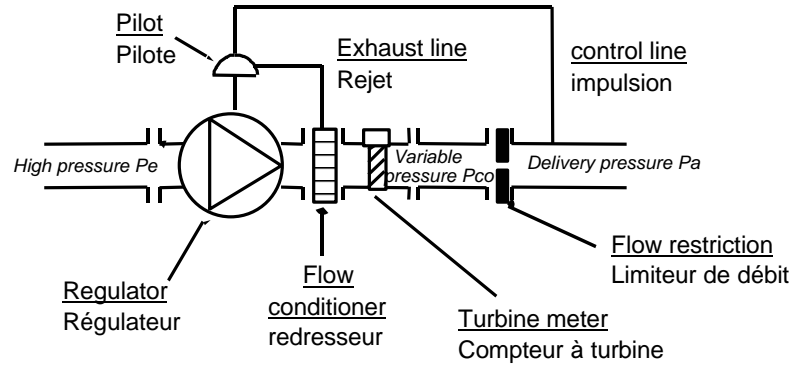
## PRINCIPLE

- **a flow restriction device is mounted downstream of the meter and the pressure regulator controls the pressure downstream of this flow restrictor.**

The flow restriction ensures that the volume flow rate does not exceed the maximum flow rate of the meter. The metering pressure increases with the normal flow rate in the station. Beyond the critical point ( $P_{co} \sim 2 \times P_a$ ), the volume flow rate remains constant and the metering pressure increases linearly with the normal flow rate. The flow restriction is calculated so that the metering pressure reaches a value as close as possible to the inlet pressure at the maximum normal flow rate.

- **a flow conditioner is placed upstream of the meter in order to damp the flow disturbances generated by the pressure regulator.**

Here is a drawing of the VPM approach :



These two innovations (Flow Restriction + Flow Conditioner and Flow Conditioner) are protected by two patents.

## ADVANTAGES

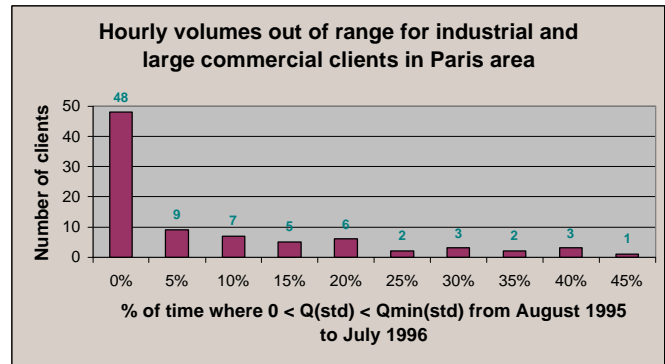
⇒ **Gain in the overall metering range and reduction of the meter size**

Through an increase of the operating pressure it is possible to reduce the speed in the meter run and thus to use a smaller meter without limiting the station capacity ( $Q_{nmax}$ ). The minimum flow rate ( $Q_{nmin}$ , minimum flow rate for which maximum error specifications apply  $\pm 2\%$ ), which is obtained with downstream pressure decreases consequently:

The rangeability  $D$  of the meter is thus multiplied (in variable pressure metering) by a factor dependent on the rate of pressure reduction ratio. Rangeability of several hundreds can be reached.

⇒ **less unaccounted gas**

As a consequence of the increase in metering rangeability, non metering at low flow rates is highly reduced (a recent one year survey of french large customers showed that for 10 % of them, 30% of delivered gas were not metered by the turbine and rotary meters and was not counted by the LDC!).



⇒ **Size reduction**

The flow conditioner makes it possible to remove the straight lengths of pipe upstream of the meter without affecting the metering quality.



⇒ **Very low installation costs**

An experiment conducted in Paris in a double-line station showed that the cost of this station was 40% more important than for a single-line metering one whereas the cost of the VPM metering would have the same with that for single line metering.

⇒ **Protection of the meter**

The flow restriction practically eliminates the risk of overloading the meter.

## TECHNICAL FEATURES

### - PRESSURE REGULATOR

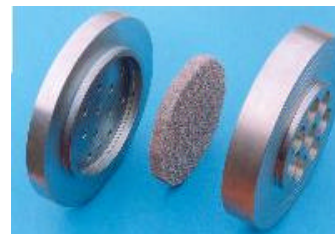
The pressure class of the upstream and downstream flanges must be equal. In the case of a pilot controlled regulator, it is necessary, moreover, that all the elements which are connected to Pco can withstand the upstream pressure.

Pco should not have any influence on the balancing of the valve.

In the case of pilot controlled regulator, some minor modifications of the pilot are necessary in order to meter the gas flowing through the pilot exhaust line.

### - FLOW RESTRICTION DEVICE

It is made up of an upstream perforated plate with gauged holes acting as a flow restriction device, of a porous material acting as a silencer (noise level < 70 dB<sub>A</sub>) and of a downstream support plate.



### - FLOW CONDITIONER

It is made up of the combination of a perforated plate and a porous material assembled on a support placed between flanges.

The conditioner is directly placed against the upstream flange of the meter.

The design of the holes is specially studied to optimize the conditioner efficiency.



The total length Flow conditioner + Meter + Flow restriction is less than  $4 \times DN$ .

### - METER

All types of meter are adapted to this configuration. They have to withstand the station upstream pressure.

The gas volume conversion device must be adapted to the metering pressure range.