VOLUME DOSING WITH LEVIFLOW FLOWMETERS

Application Note PR-2400-11 Rev01

Introduction

Levitronix LeviFlow™ ultrasonic flowmeters offer a wide range of functionalities for different applications. Besides extremely accurate flow measurement from very low to high flow rates, a feature to measure a predefined volume is also included.

The desired dosing volume can be set by using the *LeviFlow™ Config Software* that belongs to the flowmeter products. A digital closed contact signal input starts the dosing operation and the flowmeter mathematically integrates the flow rate until the defined volume is reached. As soon as this happens, a digital output signals this state to the user.

The dosing volume can be set from a few milliliters up to many liters.

Note: It is also possible to change the required dosing volumes using the RS485 communications when an application may have a variable dosing requirement for each recipe rather than always the same volume.

Flow Rate Independent Dosage Volume

The volume [V] measurement is a mathematical integration of the flow rate [Q] over the time.

V: *Volume [mL or L]*
Q: *Flow rate [mL/min or L/min]*
t: *Period of time to reach the the desired volume [s]*

$$V = \int_0^t Q(t)dt$$

For constant flow rate the calculation can be simplified as follows:

$V = Q \times t$

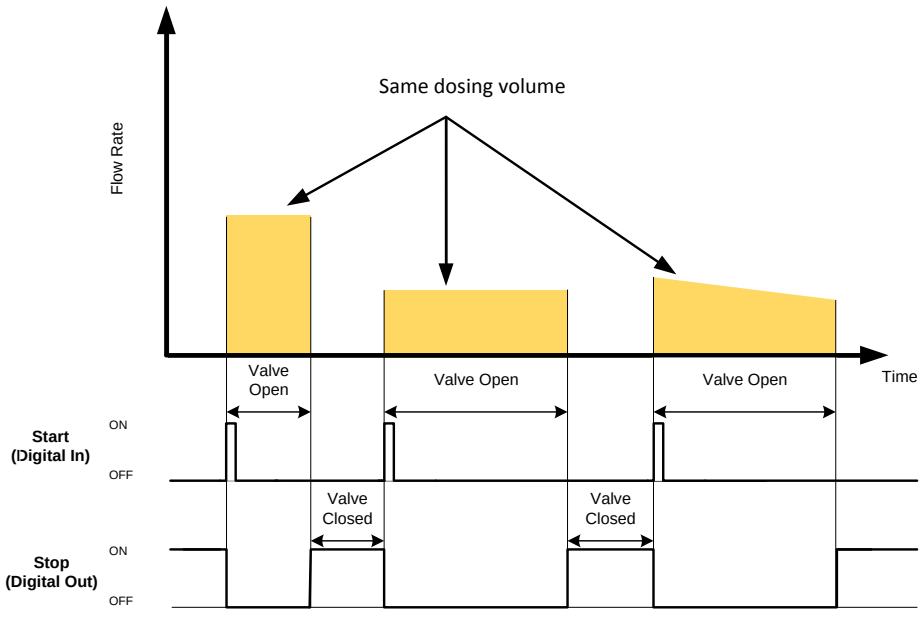

Figure 1: Flow rate independent dosing volume

Gravity Fed Dosage

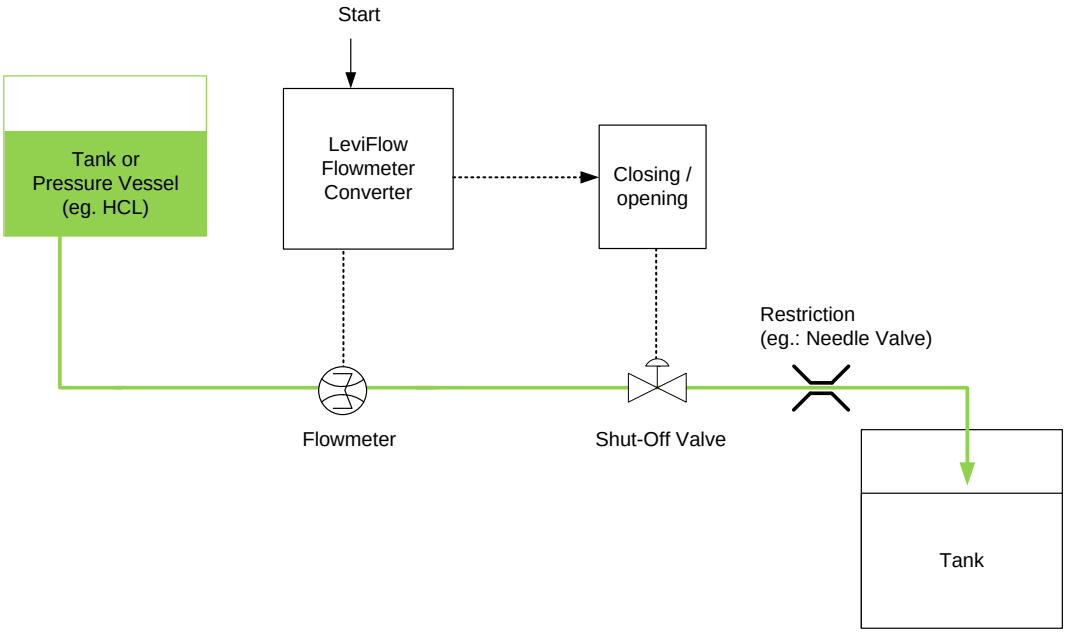

Figure 2: Gravity fed (or Pressure Vessel) dosing against open system (e.g. tank)

The pressure generated by gravity of the higher placed tank is used to feed the *LeviFlow* flowmeter, passing the shut-off valve and restriction to end up in a tank where a specified dosage volume is needed. The restriction defines a useful flowrange for the corresponding application. The shut-off valve enables and disables the liquid flow. This setup is useful when the period of time for the dosage of a specified volume is not predefined and just needs to be in a certain range. This range can be set by adjusting the hydraulic restriction to the flowrange. Depending on the level of the liquid of the source tank the flowrate will change, but the dosage volume stays constant.

Facility Fed Dosing

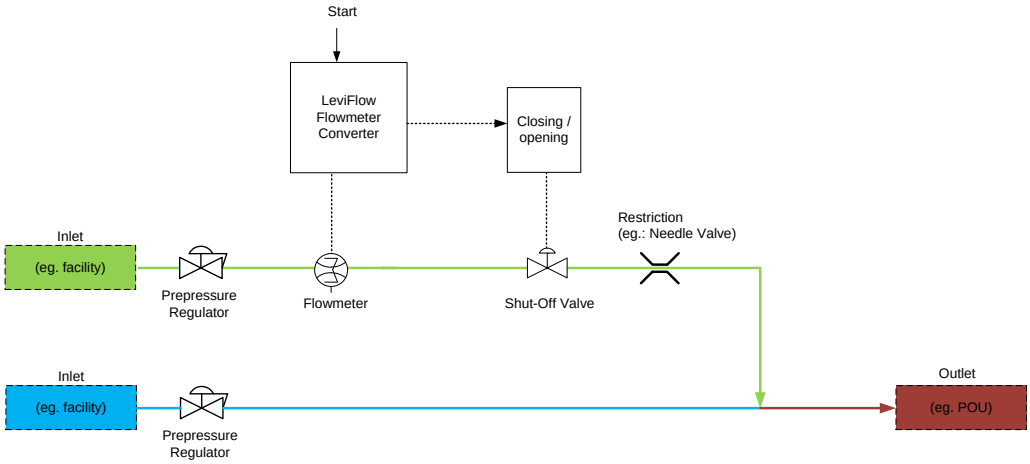

Figure 3: Facility fed or supplied dosing against open system (e.g. tank) or back pressure (e.g nozzle of POU or pressurized tube)

Figure 3 shows a typical situation when liquid from the facility needs to be dosed into a pressurized system like a tube or a POU nozzle. In both situations, the pressure of the dosage liquid needs to overcome the pressure that prevails in the tube upstream of the restriction. The dosing itself works as described above. The time for dosing a predefined volume depends on the pressure defined by the pressure regulator, the restriction and the back pressure.

Flow Controlled Dosage

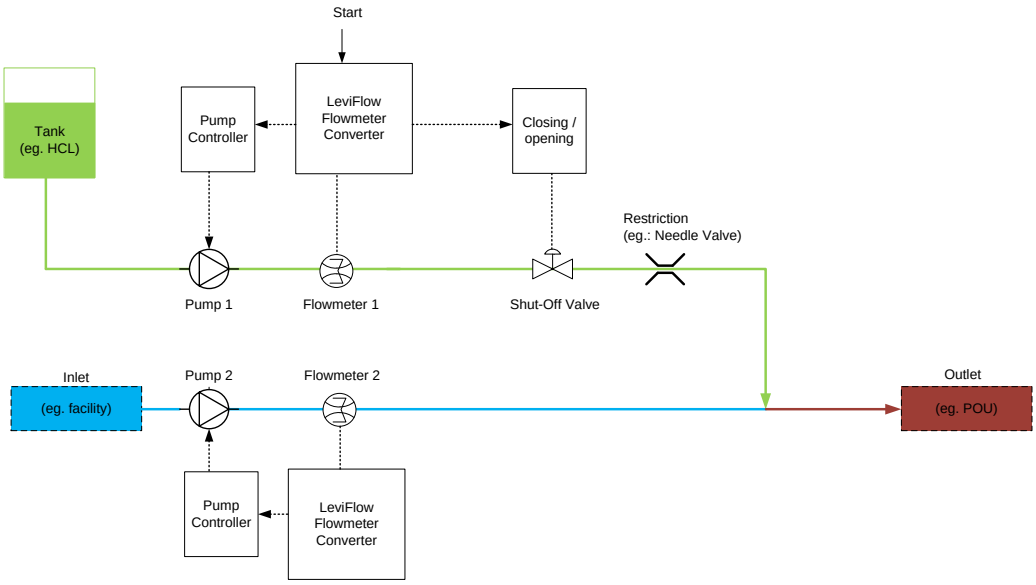

Figure 4: Flow controlled dosing into a defined flow stream

The Levitronix *LeviFlow* Flowmeter 1 in combination with a *Levitronix* Pump 1 offers the additional benefit of a controlled flow system. The dosing itself works identically to the systems above. A defined flowrate is useful when the time for the dosing sequence is important and needs to be accurate for the down-stream module (e.g. POU nozzle). The proposed setup is facility independent, drift free and an absolutely accurate system.

A system with a defined main stream flow rate (Pump 2 and Flowmeter 2 in flow control mode) allows an inline blending of two or more flow streams to a defined mixing ratio and defined total flowrate.

Benefits

- Precise volume dosage with high purity ultrasonic flow sensor
- High repeatability (0.5%)
- No drift of dosing volume (no wear out of diaphragm)
- Simple setup and hook up
- All wet components are PFA
- No moving parts – no particle generation
- Very competitive pricing at extreme high performance

Technical Support

For troubleshooting, support and detailed technical information contact *Levitronix®* *Technical Service Department*:

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