White Paper

L.J. STAR INCORPORATED

Guide to First-Indication Flow Rates of Sight Flow Indicators

Sight flow indicators provide a simple and failproof means of observing the presence or absence of flow within a process pipeline. Also, they allow operators to roughly estimate flow. What's more they do not need recalibration.

Some sight flow indicators have a calibrated scale that provides a rough measurement of flow to an observing operator. However, sight low indicators give no signal readout, so their value is in allowing operators to confirm at a glance that process fluid is or is not moving normally, rather than providing precise measurement of flow.

Unlike electronic instruments and sensors that require continuing recalibration and have the potential to give erroneous readings or to fail and give no reading, sight flow indicators will always work. The downside is that, as mechanical devices, they require a minimum flow and velocity to overcome inertia and begin to indicate flow.

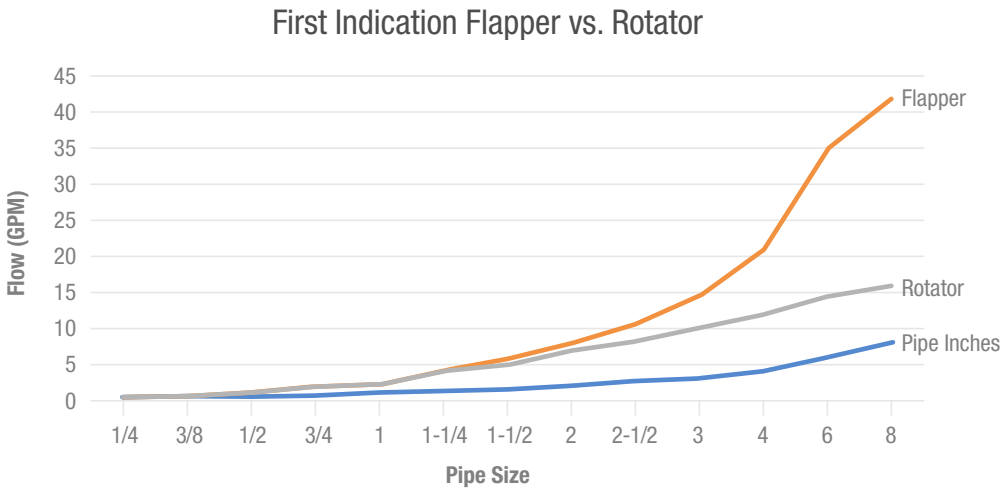
Size	Minimum **flow** for first indication			
	Flapper		Rotator	
	GPM	Lit./min.	GPM	Lit./min.
1/4″	0.50	1.89	0.50	1.89
3/8″	0.50	1.89	0.75	2.89
1/2″	1.00	3.79	1.00	3.79
3/4″	1.90	7.19	1.90	7.19
1″	2.30	8.71	2.20	8.33
1-1/4″	4.10	15.52	3.90	14.76
1-1/2″	5.80	21.96	5.00	18.93
2″	8.10	30.66	7.00	26.50
2-1/2″	10.70	40.50	8.30	31.42
3″	14.50	54.89	10.00	37.85
4″	21.00	79.49	12.00	45.43
6″	35.00	132.49	14.50	54.89
8″	42.00	158.99	15.80	59.81

Size	Minimum **velocity** for first indication			
	Flapper		Rotator	
	ft/sec	m/sec	ft/sec	m/sec
1/4″	1.30	0.40	1.30	0.40
3/8″	1.20	0.37	1.20	0.37
1/2″	1.20	0.37	1.20	0.37
3/4″	1.10	0.34	1.10	0.34
1″	1.00	0.31	0.97	0.30
1-1/4″	0.91	0.29	0.84	0.26
1-1/2″	0.85	0.26	0.76	0.23
2″	0.78	0.24	0.65	0.20
2-1/2″	0.71	0.22	0.56	0.17
3″	0.64	0.20	0.45	0.14
4″	0.53	0.16	0.30	0.09
6″	0.37	0.12	0.07	0.02
8″	0.24	0.07	0.04	0.01

The two tables above show the flow and velocity required for first indication of sight flow indicators available from L.J. Star (flapper and rotator style). The larger the pipe diameter, the more flow is required for first indication. First-indication velocity is the opposite. The larger the pipe diameter, the less velocity is required for first indication.

With flapper flow indicators, the relationship between pipe size and first-indication flow rate is not proportional. As pipe sizes get larger, comparatively more flow by volume is required for first indication. The same is true of rotary flow indicators, however to a far lesser extent.

Similarly, rotary indicators need less velocity as pipe sizes increase compared to flapper indicators.



The requirements of both tables must be satisfied; however this is simpler than it may at first appear. Given that flow is calculated by multiplying the cross-sectional area of the inside diameter of a given pipe by the velocity of the media, meeting either the flow or velocity parameter will guarantee that both parameters are met. For instance, if an application uses a 2-inch pipe that has a known media velocity of greater than 0.78 gallons per minute, then the flow will be sufficient to satisfy the requirement of a flapper type sight indicator. Conversely, if the same application has a known flow of greater than 8.1 gallons per minute, then the media velocity will be greater than 0.78 feet per second, which is the required velocity for the flapper indicator to register movement.

In an application, if the flow is too low to provide indication, then a smaller pipe may be installed, which may include a measurement line in parallel with the main pipe.

Types of Indication

Flapper flow indicator

Flow indicators may be fitted with a hinged flapper or flag visible through the sight glass. The flapper is deflected toward the flow direction. Because the position of the flapper changes in relationship to the force of flow, it provides operators with an approximate gauge of flow. This style is best applied on vertical pipelines, but it may also be employed in horizontal pipelines. It is ideal for use with transparent solutions and gases which cannot be observed directly, and for dark, nearly opaque fluids in which flow is difficult to observe.

Rotary flow indicator

Flow indicators may be fitted with rotors or impellers that are turned by the flow of liquid or gas. The rotors are mounted in the window view so operators can observe the direction and approximate speed of flow. This is particularly useful for clear gases and fluids, but the rotor is visible with dark fluids as well. This indicator operates

in any position and with any direction of flow. Rotor-style flow indicators should not be used if the flow rate is very low, because the rotating device or propeller may not turn.

Visual flow meters

Flapper-style sight flow indicators are available in which the flapper has a reset spring. The force of the spring is overcome by the relative flow of the process fluid. A graduated scale is marked on the glass so that the flow volume is indicated. In simple applications this may be used as an alternative to an expensive flow meter.

Some sight flow indicators use a weighted flapper or flag that indicates the volume of flow by its position on a calibrated scale marked on the sight glass. These flow meters are factory-set for a specific flow of water at 20°C for a given diameter of pipe. Therefore they are not useful for non-water applications.

Visual flow meters work with flow going in one direction only.

Drip indicator

Drip indicators may be models designed for drip observation or conventional flow indicators installed with a drip tube. Drips and low-volume intermittent flows may be observed in applications such as distillation. Because gravity is utilized, drip indicators are normally applied in vertical pipes with a downward flow.

Ball flow indicator

Flow moves a ball from the bottom of the indicator housing to a position at the top of the sight window. The ball is visible through the window so that flow may be observed easily at a glance. The suspension of the ball by the fluid indicates the presence of flow. Because gravity returns the ball to its rest position, this style of indicator must be applied in vertical pipes with upward flow. Generally this is used with slow moving fluids or gases, and not with high-rate or turbulent flows.

There is another style of ball flow indicator in which the flow of process fluid or gas causes a ball to oscillate in a glass dome. When the flow stops, the ball drops out of sight. This style must be installed in a horizontal position. It is especially useful for fast moving fluids and gases.

Plastic ball flow indicators are also available, some with calibrated scale markings that indicate relative flow, but plastic indicators are not recommended for use in process applications.

About L.J. Star

L.J. Star Incorporated provides an extensive line of process observation equipment – sight glasses, lights, sanitary fittings, and level gage instrumentation. Product lines include Metaglas® Safety Sight Windows, Lumiglas® Explosion Proof Lights and Cameras, Visual Flow Indicators, Sight Ports, Sanitary Clamps, Magnetic Level Gages and Gage Glass. Metaglas is the #1 selling fused sight glass, proven in thousands of installations around the world. Unlike some other sight glasses, it meets stringent DIN 7079 and DIN 7080 quality standards, and it is approved for USP Type I use. For additional information, or to request third-party documentation of standards compliance and product performance claims, contact L.J. Star Incorporated, P.O. Box 1116, Twinsburg, OH 44087. Phone: 330-405-3040. Fax: 330-405-3070. Email: view@ljstar.com. Website: www.ljstar.com.