

Tip Tanks for Dairy Flushing

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Several types of flush tanks are commonly used for flushing dairies in Missouri. This publication deals with tip tanks dedicated to flushing a single gutter. Such tanks are in contrast to the pipeline/valve systems, in which several gutters may be flushed from the same water storage tower or towers. See MU publication [WQ 317](#) for information on pipeline/valve systems.

Tipping tanks

The most common type of tank used to flush individual gutters is the tipping tank. These tanks may take one of several configurations, however, they all discharge flush water by tipping or rotating about an axle mounted in some type of bearing. These tanks are usually made of steel (10- to 12-gauge, depending on structural requirements) with an axle diameter and internal bracing appropriate to support the weight of the tank and contained water.

All mild steel tanks should be painted with a durable rust inhibitor and/or epoxy coating to reduce deterioration as much as possible. Recycled lagoon water accelerates rust and corrosion in mild steel. A “tank life” of 5 to 10 years is typical for mild steel flush tanks. Many producers have concluded that stainless steel may be a better choice for the tank material. Even though stainless steel is considerably more expensive, the tank will probably never have to be replaced because of deterioration.

The advantages of tipping tanks include simple construction and the resulting lower comparative cost. Tipping tanks may be obtained commercially, or in some cases, constructed locally or on-farm. Tipping tanks require relatively little on-site construction work for installation, but should be located on a concrete pad with sufficient stem walls, curbs, or splash boards to contain the water as the tank is dumped. Simple “set in place and flush” installation is an

attractive feature of tipping tanks. Although tipping tanks can be used in flushing any alley (return, freestall, etc.), they are perhaps used most effectively in flushing areas which may not have been designed originally to be flushed. Such areas may be wide or poorly defined gutters with flatter slopes than are optimum for flushing. Since tipping tanks can be discharged quickly (within 1 or 2 seconds, if needed) the resulting very high discharge rate can impart energy to the flush water to “make up” for inadequate slope. However, the effect of the high-energy discharge is reduced with increasing distance from the tank, and at distances of 50 to 70 feet or greater, this effect may not be adequate for good flushing, if slopes are too flat. The technique of providing another tipping tank at whatever distance interval is needed, has been used with some success. Tip tanks should be sized to hold the required volume of water for the width and length of the gutter being flushed. As a rule-of-thumb, tip tanks may be sized on the basis of 100 gallons per foot-width of gutter flushed, for gutters less than 150 feet long. See MU publication [WQ 314](#), *Basic Requirements for Flushing Dairies*, for more information on flush volumes.

Disadvantages of metal tipping tanks include reduced durability due to rusting or corrosion. Also, tipping tanks will usually block (partially or completely) the upper end of the associated flush gutter, if they are placed to discharge water directly down the gutter. This blockage may not be acceptable if human, cow or vehicular traffic into the gutter is necessary. Tipping tanks can be placed adjacent to the gutter, but this location is not as ideal because the water is not discharged directly down the gutter.

Manual tipping tanks

Most manually-dumped tipping tanks (sometimes called “rollover tanks”) are cylindrical with flat

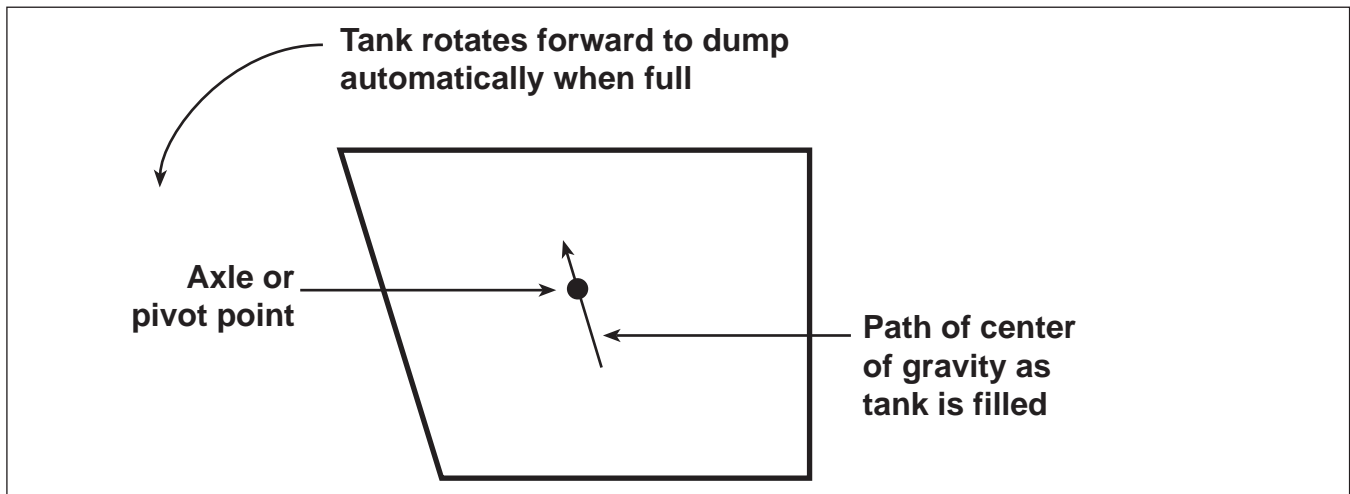


Figure 1. Cross-section of a trapezoidal-shaped automatic-dumping tip tank.

ends, and have an axle through the center of the cylinder, supported by pillow blocks at each end. Water is discharged through an opening in the top of the tank as the tank is rotated about the axle to dump. The width of the tank opening is usually one fourth to one-third of the tank diameter, and extends the full length of the tank. The tank is usually supported on an “A-frame” support structure made of angle or square steel tubing. Although manual tipping tanks are relatively simple, the contained water has considerable weight depending on the size of the tank. This weight requires adequate design and construction in terms of size of support members, bracing required, etc. For this reason, most producers prefer to leave the design and construction of tipping tanks to experienced builders. Table 1 lists typical tank sizes and weight of the contained water for flushing dairies.

Manually dumped tanks should be selected with the following basic criteria.

1. Volume. The tank should contain the volume required to flush the gutter. Additionally, the overall tank dimensions should fit within the gutter, or whatever space is anticipated for placing the tank.

Table 1. Typical tank volume, size and weight of water in cylindrical tipping tanks.

Tank Volume gallons	Tank Size dia. x length, in.	Weight of Water bs.
500	48 x 72	4700
1000	66 x 72	8800
1500	78 x 72	12400
2000	66 x 144	17700
3000	78 x 144	24700

2. Materials and construction. The tank should be made of suitable durable material (usually 12- or 10-gauge steel) with adequate bracing and structural components to support the weight of the water without undue deformation. The tank axle should be mounted in pillow blocks and precisely centered to minimize unbalanced rotational forces. Mild steel tanks should be coated with a durable rust inhibitor. Tank design should allow full 360-degree rotation of the tank.

3. Tanks should be equipped with a locking mechanism which will secure the tank in the “straight-up” position for filling, in the 90-degree position for inspection and cleaning, and in the 180-degree position for complete draining when the tank may not be used for periods of time.

4. Tanks are usually equipped with a handle mounted on the periphery of the tank. The operator dumps the tank by releasing the lock mechanism and rotating the tank using this handle. Tanks can also be equipped with a hand crank and chain/sprocket mechanism to allow dumping the tank by simply turning the crank. This configuration may make it easier to dump very large tanks.

Automatic tipping tanks

Some tip-type flush tanks are designed to dump automatically. These tanks are seldom used in dairy applications because the automatic dumping feature offers little or no advantage. These tanks are usually trapezoidal in cross-section, so that, as they are filled, the location of the center of gravity changes. If the axle, or pivot point, of such tanks is properly located, the tank will dump automatically when it gets full (when the center of gravity reaches an unstable position). Figure 1 is a typical cross section of an automatic tipping tank.

Dual-function tip tanks

Occasionally, tip tanks can serve more than one function. A typical multi-use application in dairies is to use such a tank as a watering station for cows, and as a means of washing manure from the area around the waterer. Waterers are typically located in areas not flushed by the alley flush devices. Therefore, an alternate means of cleaning these small areas is needed. Regular use of the watering tank as a flush tank also ensures that clean, fresh water is available to cows on a regular basis.



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