An Introduction to

MANIFOLD FLUSH SYSTEMS

on

Multiple Compartment FUEL DELIVERY TRUCKS

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Total Control Systems Metering products

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Here is a 4-compartment Fuel Delivery Truck.
These often have a Fill Manifold at ground level.

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Ideally, each compartment has a dedicated meter and hose reel so there is no shared plumbing, thus:

- No need for flushing when delivering a different fuel.
- Minimal chance for contamination.

It’s more common to see fuel delivery trucks like this used truck for sale:

- 5 Compartment Tank Truck.
- **Two Delivery Pumps.**
- **Two Delivery Meters & Digital Registers.**
- **Two Delivery Hose Reels with Nozzles.**

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Typically, there is:

- Meter/hose reel for gasoline type fuels.
- Meter/hose reel for diesel type fuels.

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Gasoline type fuels could be:

- Low Octane gasoline (87 Octane)
- High Octane gasoline (93 Octane)
- E85 Alcohol + Gasoline Blend.

Diesel type fuels could be:

- Dyed off-road diesel
- undyed on-road diesel
- Kerosene
- Heating oil.

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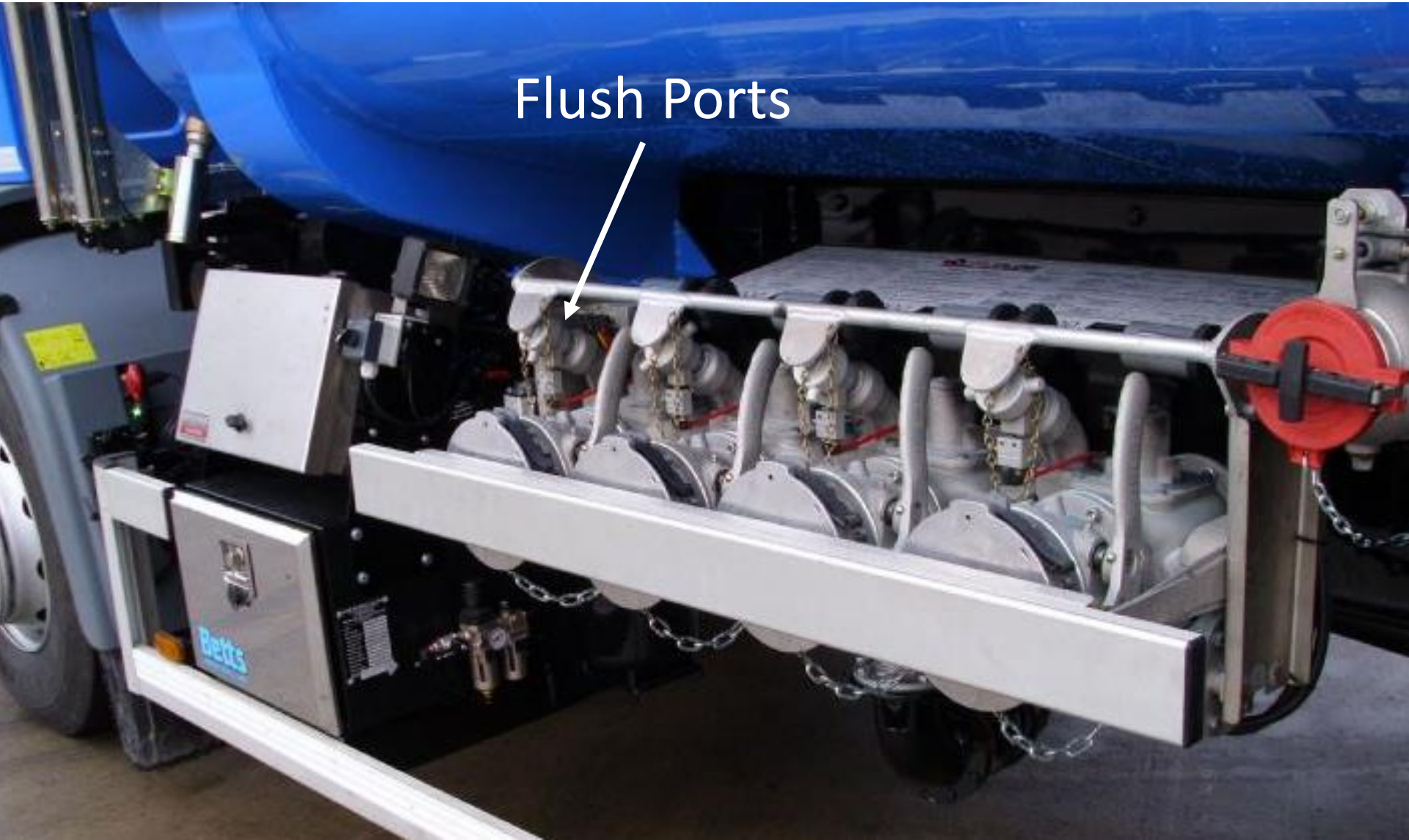
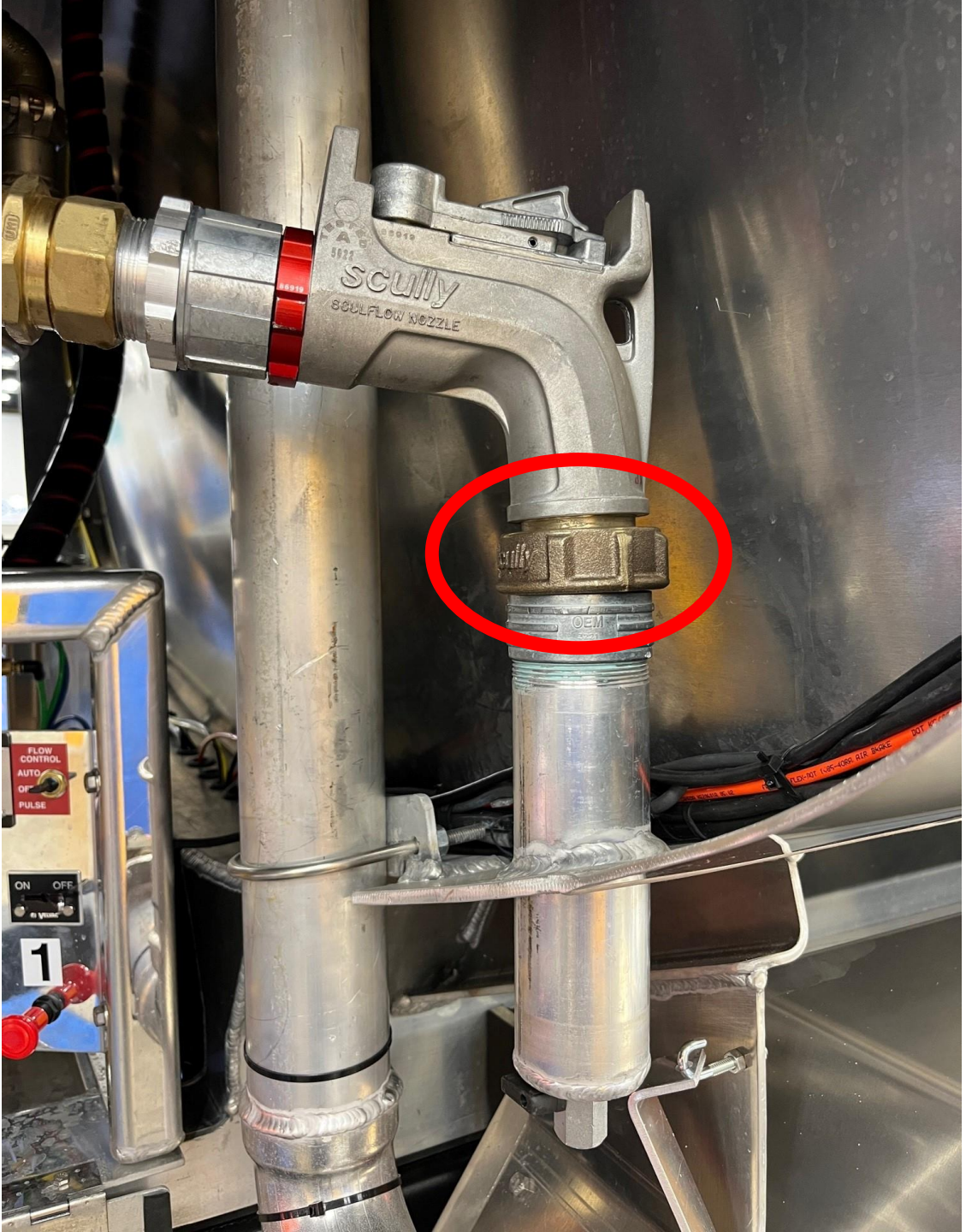
Here is a Manifold Flush System on a Fuel Delivery Truck





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A Special Nozzle used with manifold flush systems prevent drips and allows the pump pressure to push the flush-fluid back up into the correct compartment.

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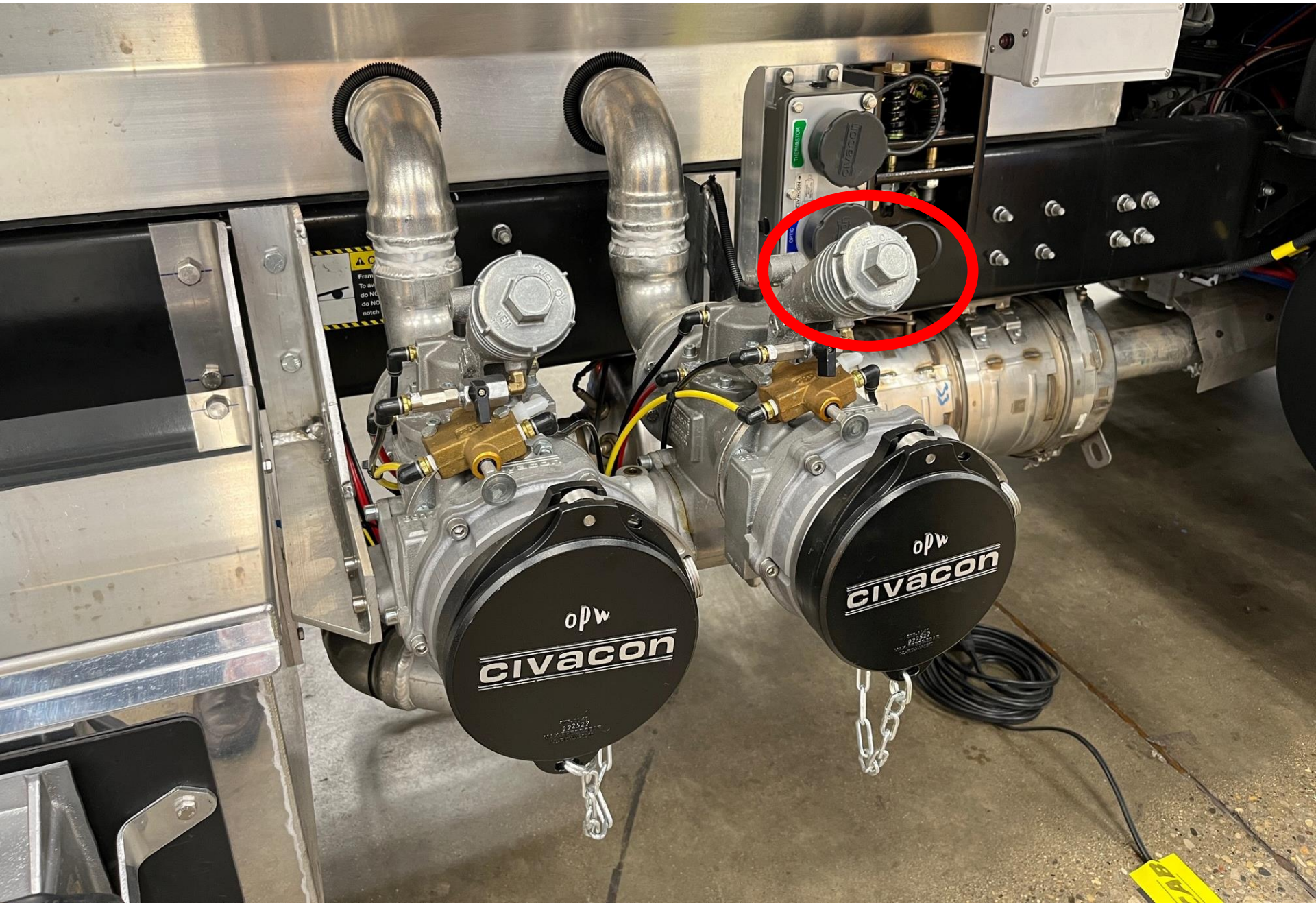
Nozzle Flush Port



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Without a manifold flush system, Fuel Truck Drivers try to minimize the need for flushing the delivery lines. They plan their routes so they can make multiple deliveries before switching fuels.

When they need to flush, they often flush into the customer's tank. They know the volume needed to flush the plumbing, meter, and hose on their truck (20-gal is typical). The last 20 gallons delivered is the flush.

Example= Desire a 500-gallon delivery of dyed diesel.

- Preset for 480 gallons of dyed diesel
- Then preset for 20 gallons of un-dyed diesel to flush the dyed diesel left in the meter & hose into the customer tank.
- System is now primed for the next delivery of un-dyed diesel!

Sometimes, the driver must flush back into their delivery truck. Without a manifold flush system, they must climb up on top of the truck and flush back into the correct compartment.

Manufacturers advertise the convenience and **safety** as a reason to purchase Manifold Flush Systems:

One manufacturer says in their ad…

…Optional ground-level flush fittings provide for safe and secure product change… without the operator ever having to climb on top of the cargo tank.

Fuel delivery truck owners have made their own manifold flush systems to improve safety for their drivers. While the intention was good in this example, the 3-way valve shown makes it unclear if the flush system is on or off. Situations like this raised the original need for regulations to prevent both intentional and unintentional fraud during flushing.

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For 5 years HB-44 has had code to regulate Manifold Flush Systems in the VTM section (HB44-2022).

S.3. Design of Discharge Lines and Discharge Line Valves.

… This paragraph does not apply to the following:
(1) Equipment used exclusively for fueling aircraft.
(2) Multiple-product, single-discharge hose metering systems that are equipped with systems designed to flush the discharge hose, provided the flushing system complies with the provisions of paragraph S.3.1.1. Means for Clearing the Discharge Hose.

(Amended 2018)

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S.3.1.1. Means for Clearing the Discharge Hose. – Metering systems may be equipped with systems specifically designed to facilitate clearing of the discharge hose prior to delivery to avoid product contamination. In such systems, a valve to temporarily divert product from the measuring chamber of the meter to a storage tank shall be installed only if all the following are met:
(a) the discharge hose remains of the wet hose type;
(b) the valve and associated piping are approved by the weights and measures authority having jurisdiction over the system prior to commercial use;
(c) the valve is permanently marked with its purpose (e.g., flush valve);
(d) the valve is installed in a conspicuous manner and as far from the hose reel as practical;
(e) the system clearly and automatically indicates the direction of product flow during operation of the flush system;
(f) clear means, such as an indicator light or audible alarm, is used to identify when the valve is in use; and
(g) no hoses or piping are connected to the inlet when it is not in use.

(Added 2018)

There is also a User Requirement in HB-44 (also in the VTM section):

UR.2.6. Clearing the Discharge Hose.

UR.2.6.1. Records. – Whenever, prior to delivery, a different product is pumped through the discharge hose to avoid contamination, a record including the date, time, original product, new product, and gallons pumped shall be maintained. These records shall be kept for a period of 12 months and available for inspection by the weights and measures authority having jurisdiction over the system.

(Added 2018)

VTM 18.1 is written to improve the existing code:

S.3.1. Diversion of Measured Liquid.
…provisions of paragraph S.3.1.1. Means for Clearing the Discharge Hose**, Multiple-Product, Single-Discharge Hose Metering Systems.**
(Amended 2018 **and 20XX**)
…

(f) clear means, such as an indicator light or audible alarm, is used to identify when the valve is in *use* ***on both quantity indications and any associated recorded representations (e.g., using such terms as "flushing mode" or "not for commercial use");*** and
[Nonretroactive as of January 1, 2024]

(g) effective, automatic means shall be provided to prevent passage of liquid through any such flush system during normal operation of the measuring system; and no hoses or piping are connected to the inlet when it is not in use.
[Nonretroactive as of January 1, 2024]

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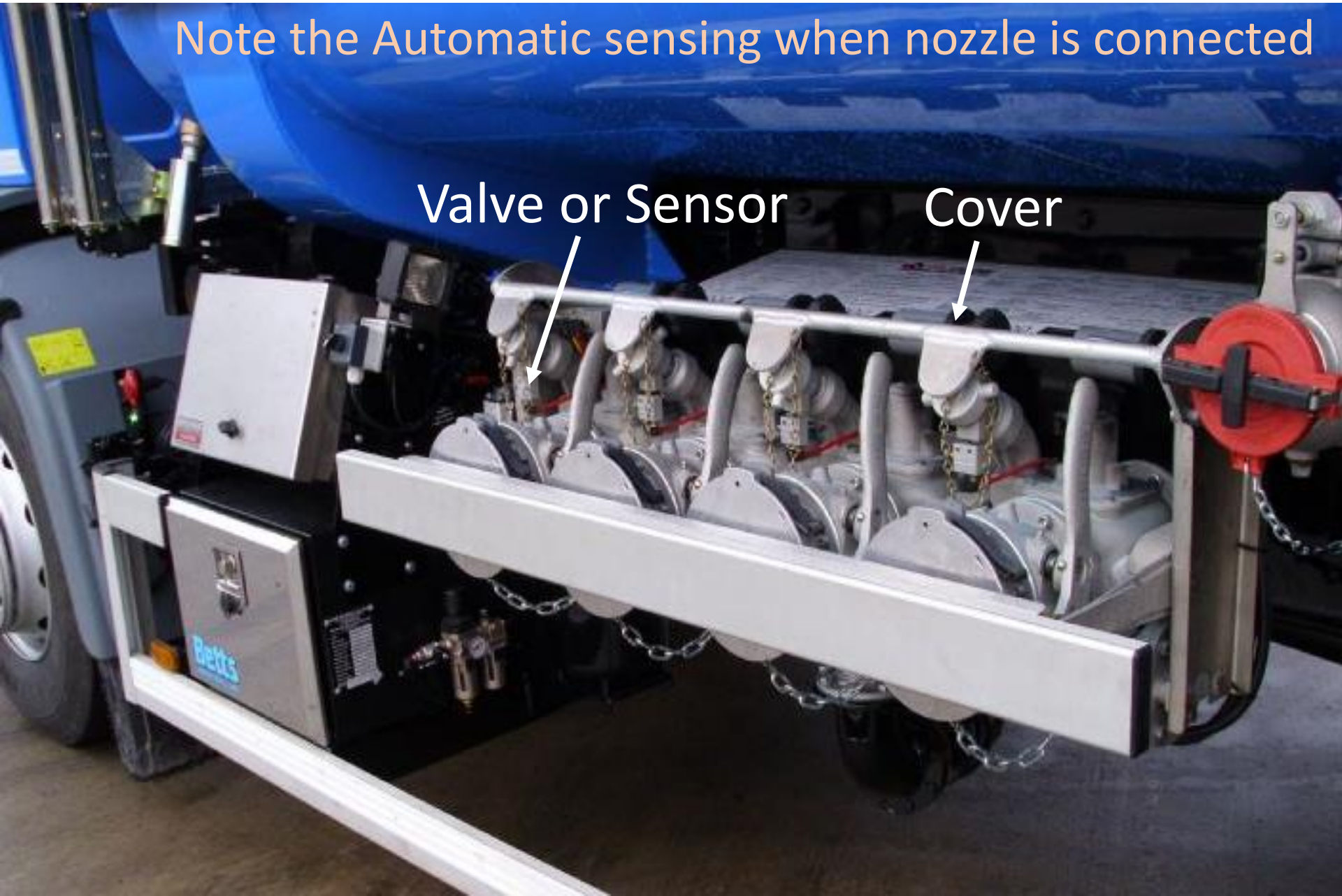
Note the Automatic sensing when nozzle is connected



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VTM 18.1 also improves the User Requirement:

UR.2.6. Clearing the Discharge Hose.

UR.2.6.1. Clearing the Discharge Hose, General. – A manifold flush or similar system designed to accommodate the flushing of product on single-hose, multiple-product systems is not to be used during a commercial transaction. The following restrictions apply:

(a) The inlet valves for the system are not to be connected to any hose or piping (dust covers are permitted) when not in use.

(b) When the flushing system is in operation, the discharge hose is only to be connected to the port for the product type being flushed from the discharge line.

(c) Following the flushing process, indications and recording elements must be reset to zero prior to beginning a commercial delivery.

(Added 20XX)

VTM 18.1 User Requirement, continued:

UR.2.6.2. Minimizing Cross Contamination. – When dissimilar products are dispensed through a single meter, the user shall take steps to ensure the system is properly flushed to minimize the potential for cross contamination of product in receiving tanks on subsequent deliveries. Dispensing products having radically different characteristics (e.g., gasoline and diesel fuel) through a single meter delivery system is not recommended. (Added 20XX).

Adding this statement to Handbook 44 to help preserve fuel quality meets what Murray Equipment requested in VTM 20.1 that was combined into VTM 18.1.

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We've come a long way with Fuel Delivery and regulating Vehicle Tank Meters.

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Lets keep making progress! Thank you!