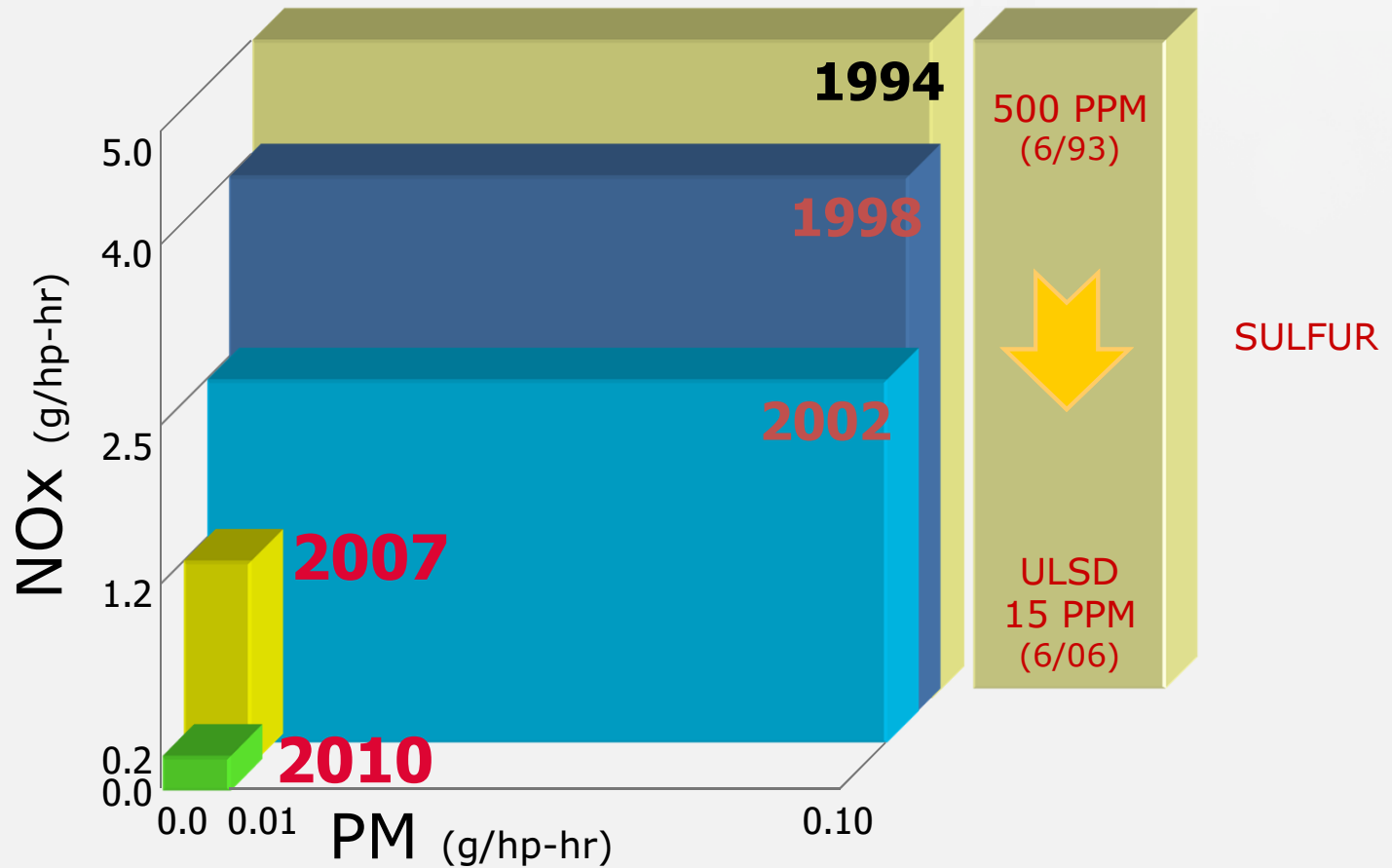


# ***Diesel Exhaust Fluid Educational Seminar***

*Mike Ladd  
General Sales Manager - DEF  
RelaDyne, LLC*

## Why Are We Here Today?



Courtesy: Cummins

## *Why Are We Here Today Cont.....?*

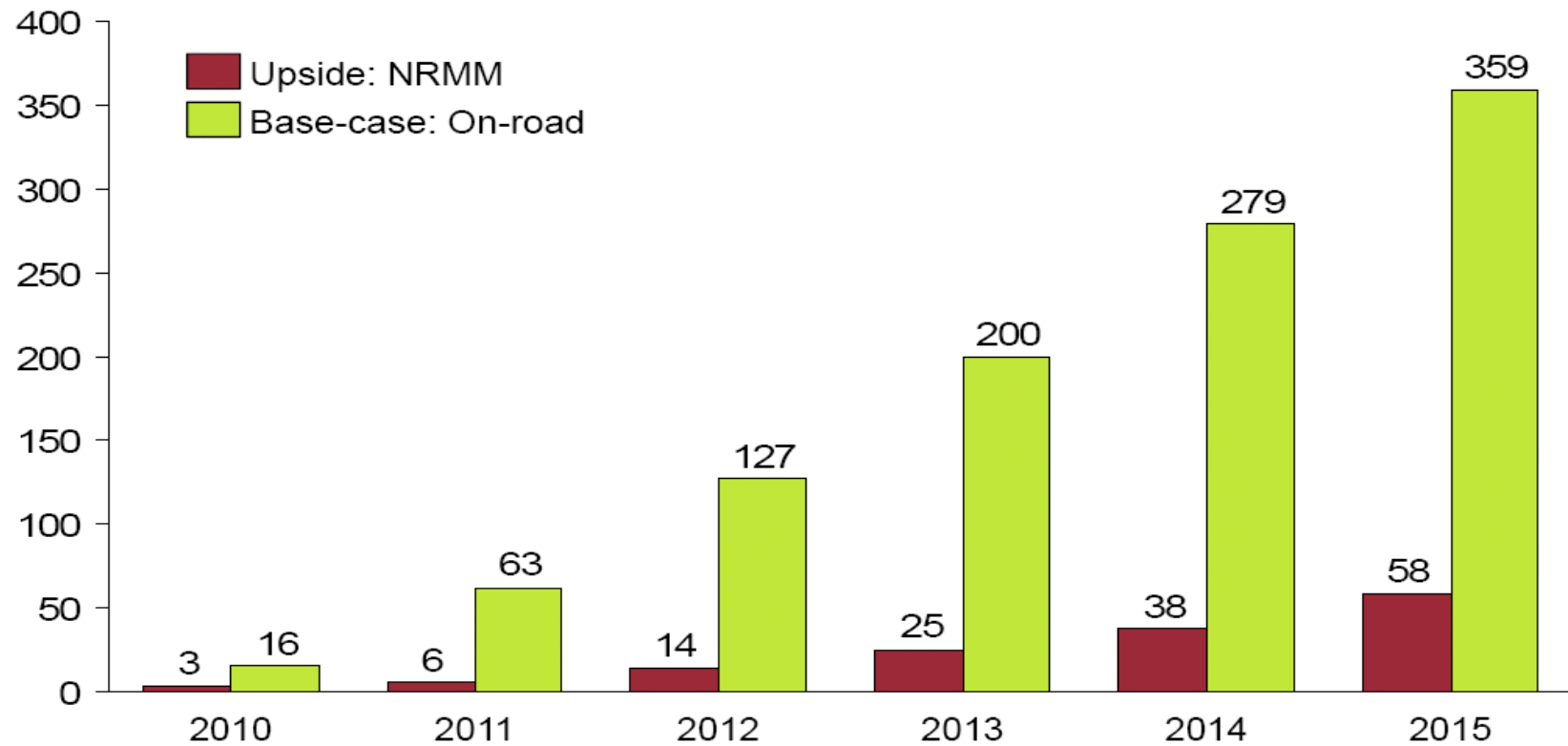
- **How do we achieve the latest emission's requirement for NOX?**
  - **Selective Catalytic Reduction (SCR) & Diesel Exhaust Fluid (DEF)**
- **All OEMs globally, with the exception of Navistar are using SCR technology as the method of hitting 2010 emission requirements.**

## *EPA Timeline Overview*

- **2010 – On-Road**
- **2011 – Off-Road Interim Tier 4 (Greater than 174HP)**
- **2012 – Off-Road Interim Tier 4 (Less than 174 HP)**
- **2014 – Off-Road Tier 4 Final**
- **2014 – Largest C2 Marine**
- **2015 – Locomotives**
- **2016 – C3 Ocean Going Vessels (Over 130kW )**  
*Example: container ships, tankers, bulk carriers & cruise ships.*
- **2017 C1 Marine**

## DEF Industry Projections

- Estimated DEF usage (million gallons)



Source: Integer/Knibb, Gormezano and Partners Non-Road Mobile Machinery DEFF Study

## *Diesel Exhaust Fluid 101*

- *DEF is an after treatment, not an additive*
- *A solution comprised of 32.5 % Urea & 67.5 % de-ionized water*
- *Usage will be approx 2-3% of diesel consumption*
  - *Real world fleet results show **3-10%** fuel efficiency return*
- *Engine will de-rate without DEF*
  - *After a series of indicator and warning messages on the cluster*
- *Must meet API Certification*
  - *OEM's will not honor warranty if your DEF is not API approved*

## *Contamination is a major concern.*

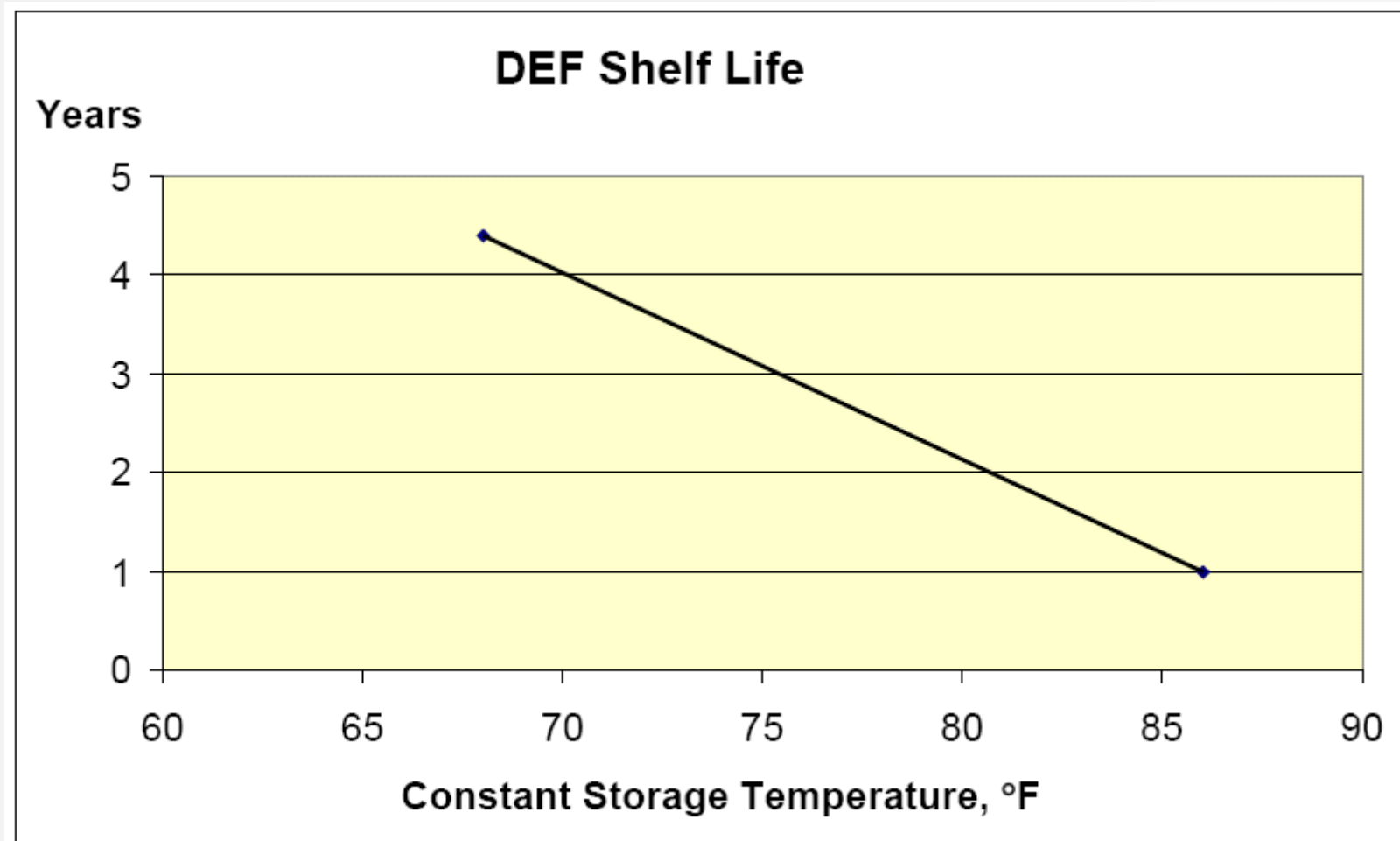
**To make a 5000 gallon tanker of DEF non compliant it takes.....**

<i>Copper</i>	<i>0.1 Teaspoons</i>
<i>Zinc</i>	<i>0.1 Teaspoons</i>
<i>Chromium</i>	<i>0.1 Teaspoons</i>
<i>Nickel</i>	<i>0.1 Teaspoons</i>
<i>Phosphorous</i>	<i>1.1 Teaspoons</i>
<i>Calcium</i>	<i>1.3 Teaspoons</i>
<i>Iron</i>	<i>0.3 Teaspoons</i>
<i>Aluminum</i>	<i>0.7 Teaspoons</i>
<i>Magnesium</i>	<i>1.2 Teaspoons</i>
<i>Sodium</i>	<i>2.1 Teaspoons</i>
<i>Potassium</i>	<i>2.3 Teaspoons</i>

## *Weather Conditions & DEF*

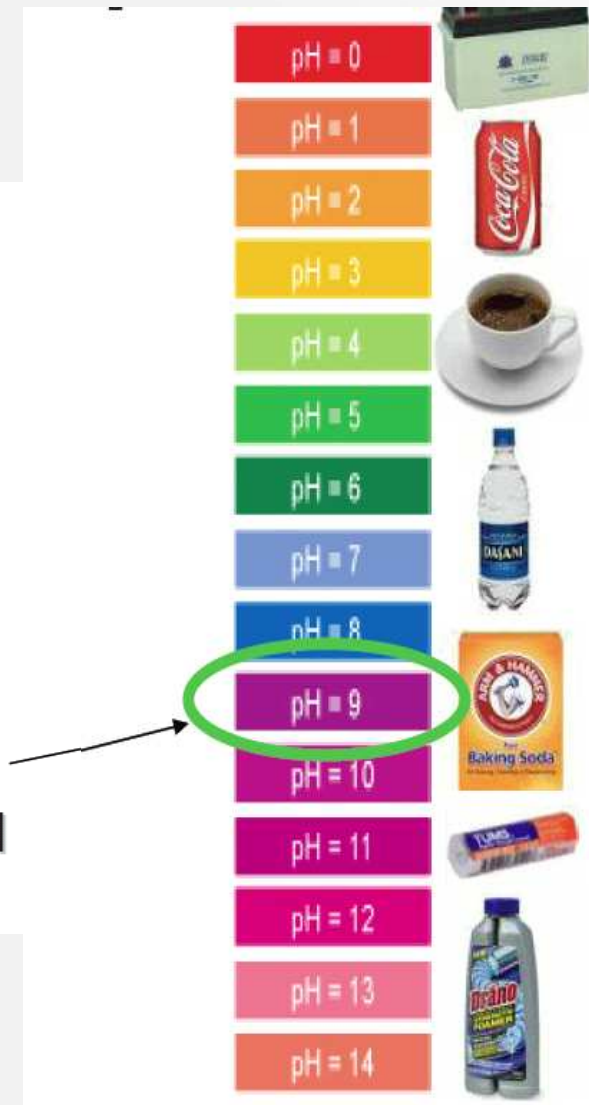
- *Cold Weather*
  - *DEF Will Freeze at 12 Degrees*
  - *Freezing does not affect the solution*
  - *OEM's have designed heating units around the tank and lines*
- *The Sunlight*
  - *Direct UV rays are the most damaging to the product*
- *Warm Weather*
  - *Constant temperatures of 85+ degrees will degrade product over time*

## High Temperature Degradation



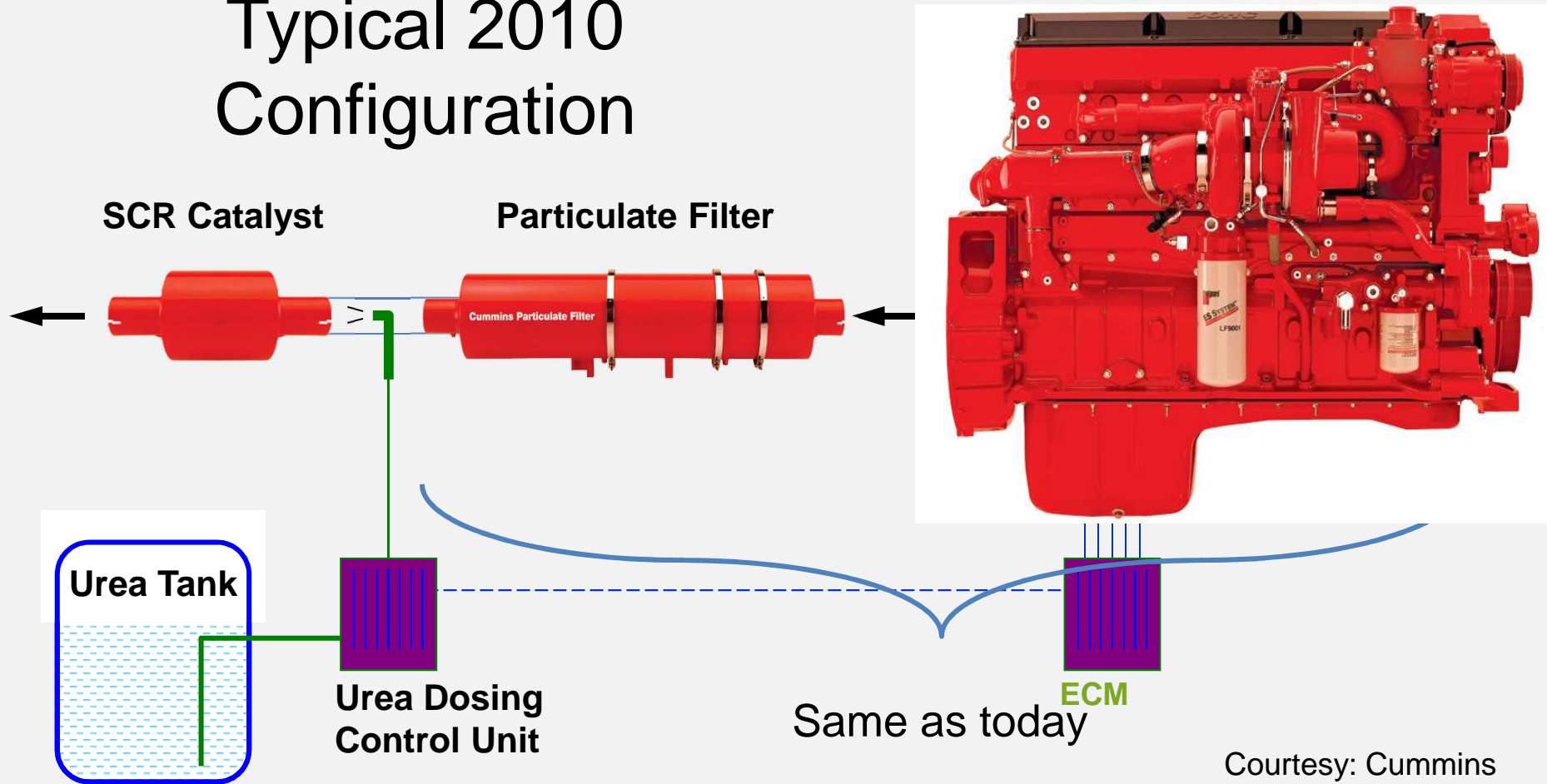
## pH Scale & DEF

- DEF is safe to handle and store
  - Non-toxic and non-polluting
  - Non-flammable
  - Stable and colorless
  - Non-hazardous
  - Does not require special handling
- When stored at extreme temperatures, neither DEF nor Urea become toxic
- DEF is slightly alkaline with a pH of approximately 9



## SCR engine set-up

### Typical 2010 Configuration



## *SCR Summary*

### *Advantages*

- *Infrequent Re-Generations “ReGen’s”*
- *Improved Fuel Economy (3-5%)*
- *Pre-1994 power and performance*
- *Reduced Maintenance*

### *Disadvantages*

- *\$10K Sticker Increase from 2009 Models*
- *Storage and Handling of DEF*



# Closed, Sealed & Secure

## DEF Dispense Systems



Delivering **DEF Purity From Manufacturer to End-User**

# Container Systems

## Open vs. Closed

### Technical Differences

Stinger / Drum Pump



**OPEN**

**ОБЕИ**

Probe / Dip Tube



**OPEN**

**ОБЕИ**

Valve



**CLOSED**

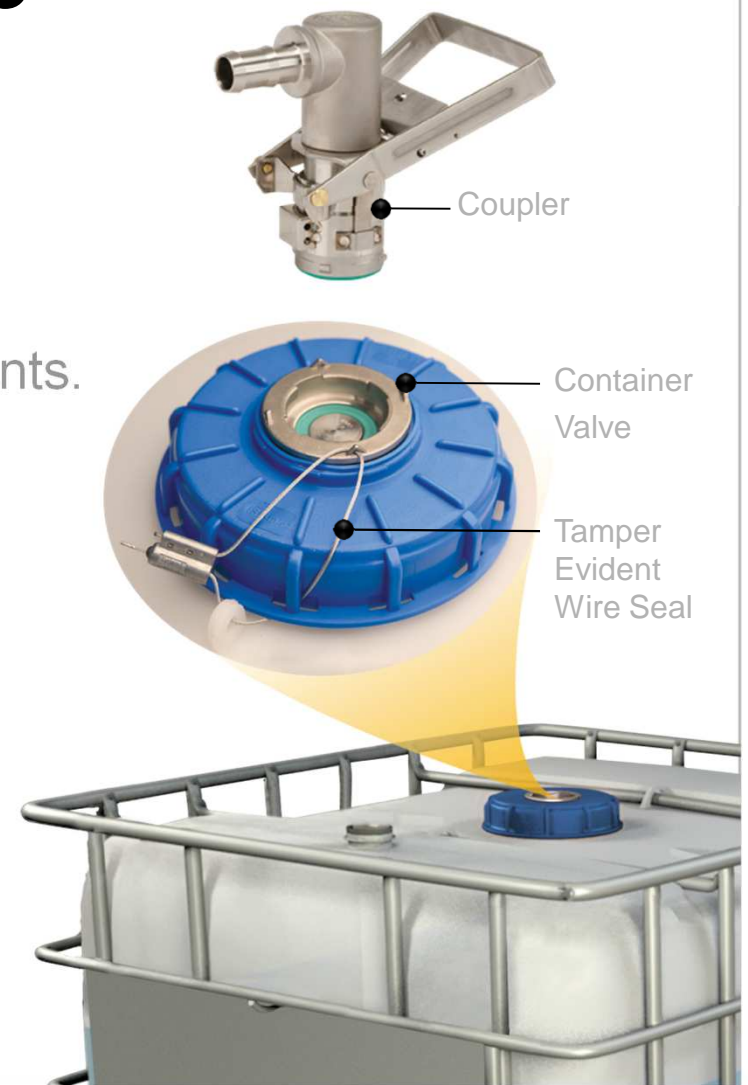
**СГОЗЕД**

# The Micro Matic Difference

## CLOSED, SEALED & SECURE

From Fill thru Dispense

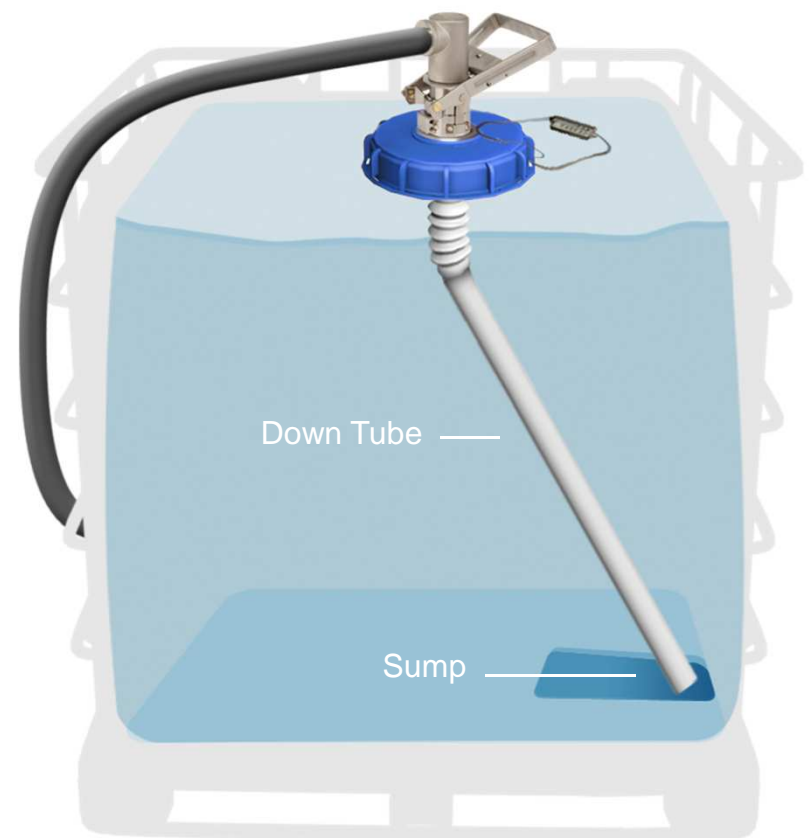
- **Closed** to unauthorized users, product adulteration and environmental contaminants.
- **Sealed** spring actuated valve systems ensure automatic closure of coupler and container valve when disconnected.
- **Secure** tamper evidence protects container valve from removal and clearly identifies if container package has been tampered with.



# The Micro Matic Difference

## Maximize Yield & Minimize Waste

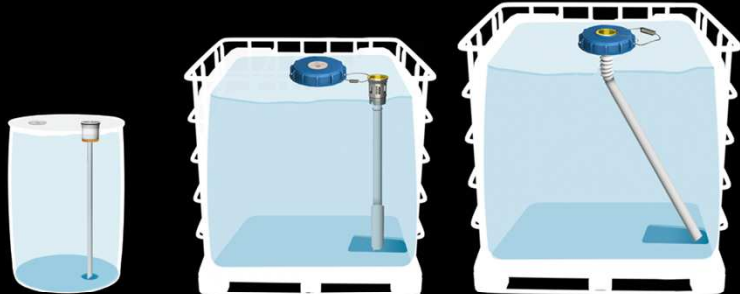
- Dry disconnect dispense & fill couplers.  
(less than 2 milliliters)
- Down tube resides in container sump  
maximizing product extraction  
and minimizing waste.  
(100 milliliters or less)



# 3 Container Size Options

## 55 Gallon Drums, 275 & 330 Gallon Totes

All Micro Matic DEF parts are **compliant with ISO 22241** requirements for materials of construction.



**55-Gal**

Drum

**275-Gal**

IBC (Tote)

**330-Gal**

IBC (Tote)

**CLOSED System options shown. In cold climates, containers should be stored indoors to prevent freezing.**

### Container Size Options

**55-GALLON DRUM** supplies up to 11,000 miles\*. Ideal for one or two trucks operations and can last several months.

**275-GALLON IBC** supplies up to 55,000 miles\*. IBC (Tote) is delivered by truck and requires unloading by forklift.

**330-GALLON IBC** supplies up to 66,000 miles\*. IBC (Tote) is delivered by truck and requires unloading by forklift.

NOTE: \* Above calculations based at 3% usage at average fuel economy of 6 miles per gallon. Container volume/mileage usage may vary depending on vehicle dosage rate.

Sizes

# 3 Ways to Go

## Economic Distribution Options

We understand the dynamics associated with distribution and logistic networks. **Our Closed System Solutions are designed to maximize operational efficiencies and minimize cost.**



**One-Way**



**Returnable**



**On-Site Refilling**

### Distribution Options

**ONE-WAY** Fill – Transport – Dispense – Dispose / Recycle.

**RETURNABLE** Fill – Transport – Dispense – Return – Refill  
Transport...

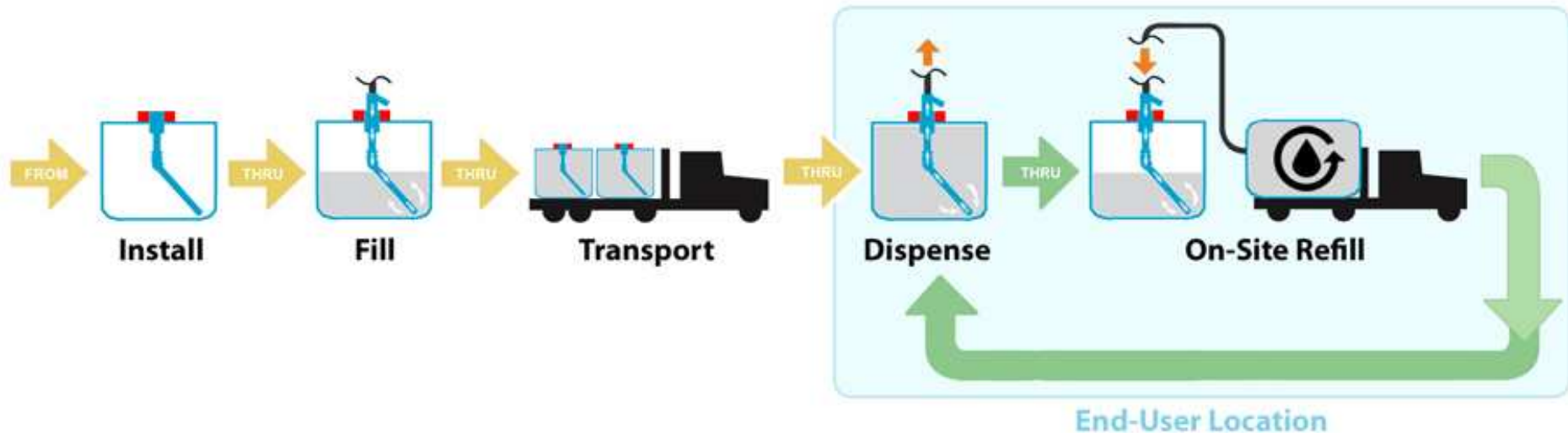
**ON-SITE REFILLING** Fill - Transport - Dispense - On-site Refill  
Dispense - On-Site Refill...

Ways to Go

# On-Site Refilling

## Multiple Use

When your operations require quick & easy **on-site refilling via bulk delivery truck.**



# Multiple Use

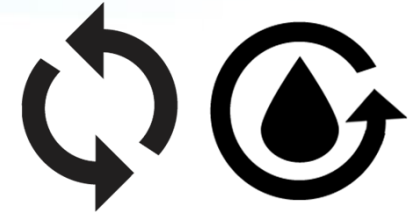
## RSV Closed System

### Off-Site Filling & On-Site Refilling

- **Reduces cost**, refill without cleaning or reconditioning.
- **Spring actuated dry break seal**, keeps the product contained in the fill coupler and hose upon disconnect.
- **Proprietary DEF 4Pin/4Cam Keyed System** controls container access.
- **ISO 22241 compliant**  
Seal Materials Viton<sup>®</sup> (or) EPDM



Fill Coupler



# Questions