2022 Hydraguip Tech Seminar

WELCOME!

Schroeder INDUSTRIES

Schroeder INDUSTRIES 2030

CLEAN ENERGY
Fueling The Future

Schroeder 2030 Provides Our Customers Solutions

Schroeder 2030 is an initiative to provide products and services to fluid system designers and operators to help achieve carbon neutrality *and* better profitability.

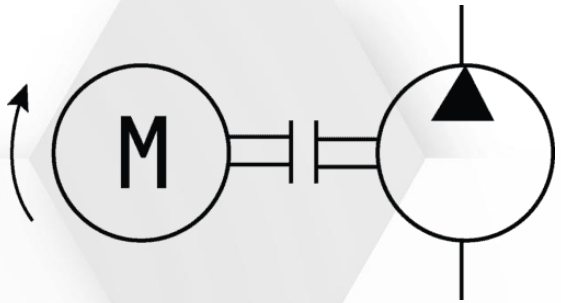
- **To Reduce Energy Consumption**
  - Through products designed for low pressure drop, to minimize horsepower requirements
  - Using light-weight materials
  - By optimizing the size of components to minimize weight and footprint

- **To Reduce Fluid Consumption**
  - By optimizing the fluid volume requirements for a given system
  - Through fluid conditioning to extend time between oil changes
  - By recycling waste oil
  - By managing fluid health to maximize its useful life

Electric Hydraulic Systems

The Future of Hydraulics

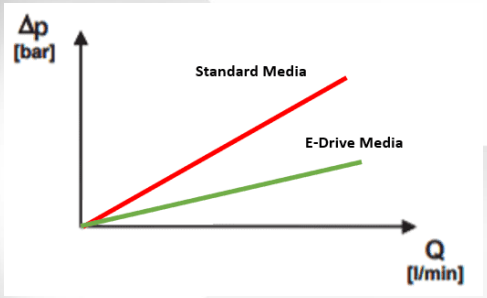
- Mobile hydraulics industry's major transformation – moving towards ***electric hydraulic systems***
- Electric hydraulic motor-pumps → zero-energy-mode
  - *Only operate when flow/pressure is required*
  - *Energy Efficient*
- Up to 70% more efficient than standard hydraulic counterparts
- **CO_2 reduction** → less fluid being used/less fluid being produced
- Quieter run times → reducing noise decibel readings
- Space and weight savings → much more compact and lighter
- Reliability – Electric drives will last longer, are our components ready.



New Electric Drive (E-Drive) Media

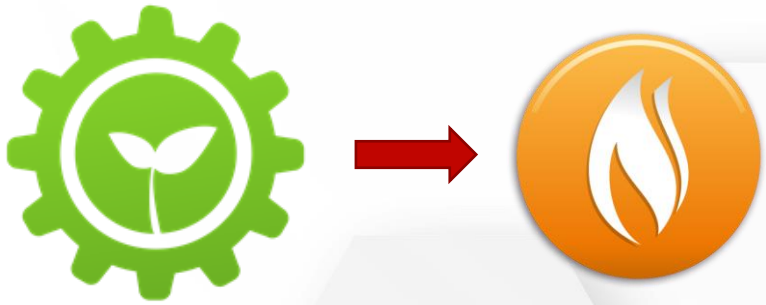
Electro-Hydraulic Drive Media for a Lower Pressure Drop

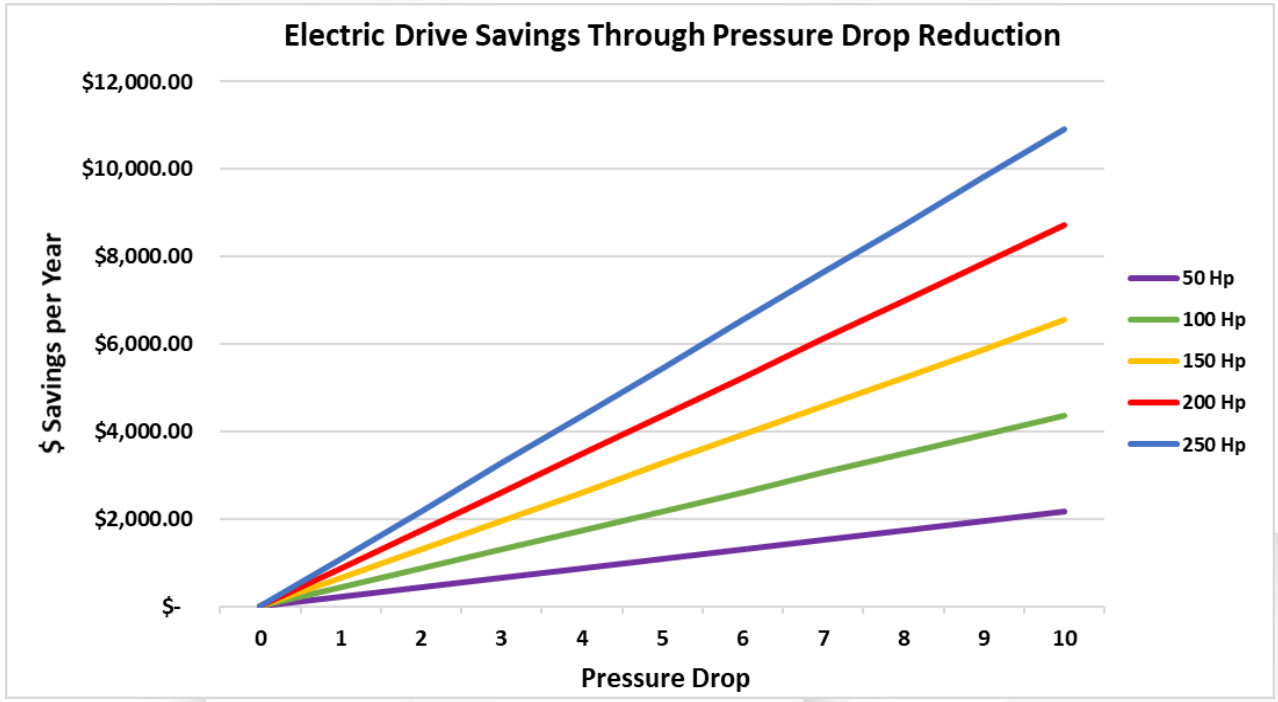
- E-Drive filter elements use multi-layered synthetic fiber filter media
- Excellent choice for use in electric hydraulic drive motor-pump units
- Schroeder's E-Drive Energy Saving Features:
  - Retains low resistance of flow → reduce ΔP across element
  - Energy savings with low DP
  - Great for cold start conditions
- Technical/ROI Specs:
  - Targeting 10 µm filtration rating to start
  - Current estimations at 30% less DP than typical synthetic media
    - Equivalent energy savings (30% less work required)
  - In progress with testing, targeting *2022 product launch*



Small Pressure Drop = Large Costs

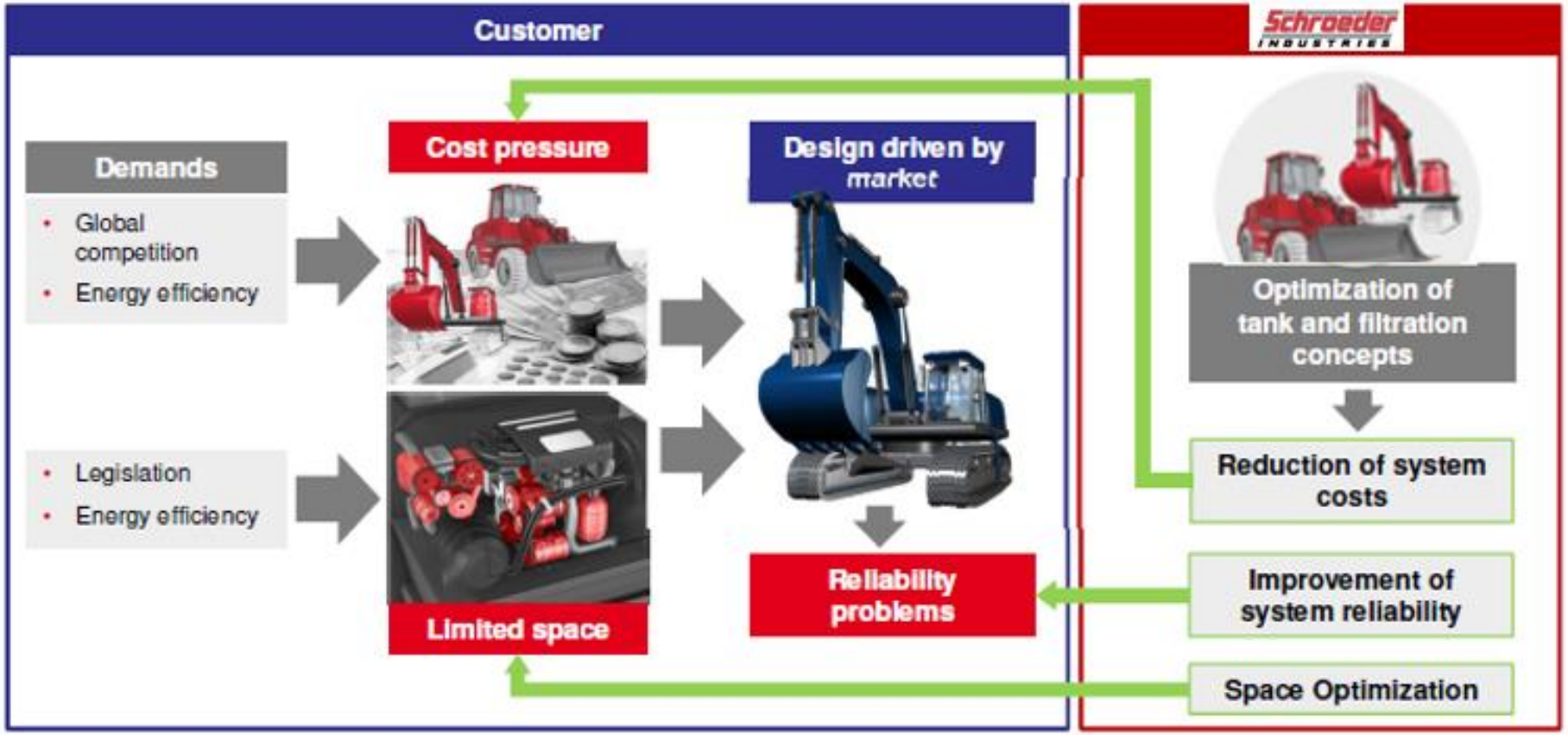
- All energy has a price and wasting it means wasting $$
- Conserve as much energy inputted into a system available to do *useful* work
- Differential Pressure → loss of energy available in a hydraulic system
- Energy isn't lost, rather converted into thermal energy

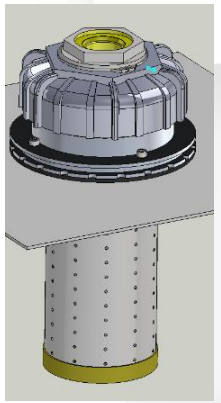




**Assuming electric driven operation at 65% efficiency and 100 psi inlet pressure. $ Savings based on energy cost of $0.15/kw-hr & ~6000 hours per year on an electric driven operation.*

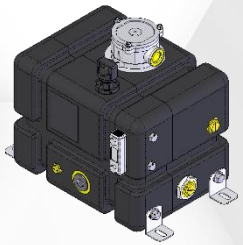
Market Demands and New System Design Approach



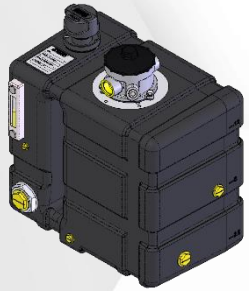


TNK – Flow Optimized Rotomolded Polymer Tank Solutions

- 40% Lighter than Steel
- Optimized Flow and de-aeration to do more with less oil.
- Ideal for small to medium OEM’s that do not have enough machine volume to justify the tooling cost on their own.
- Complete filter options with each tank package
- Certified Clean to SI Specifications.
- Available with Quality Protected Elements

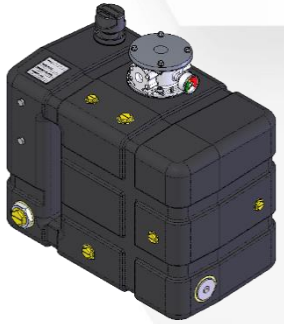


TNK7



TNK12

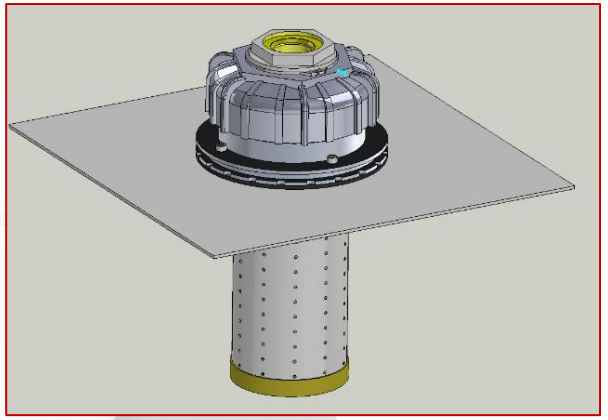
TNK18

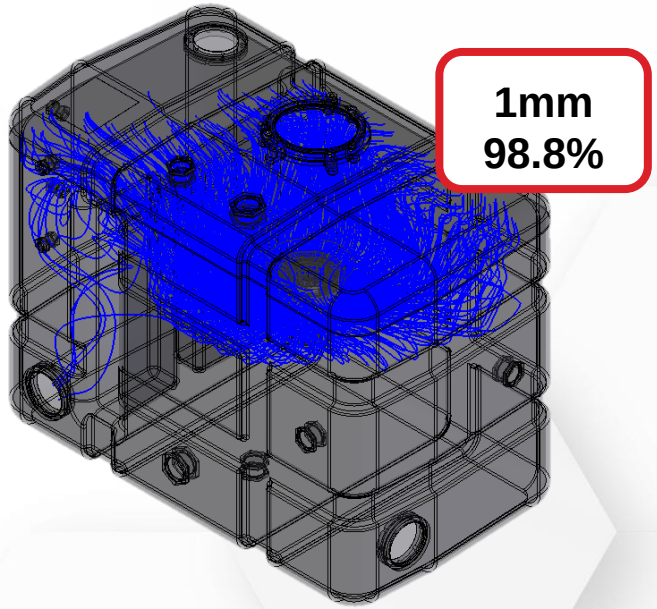


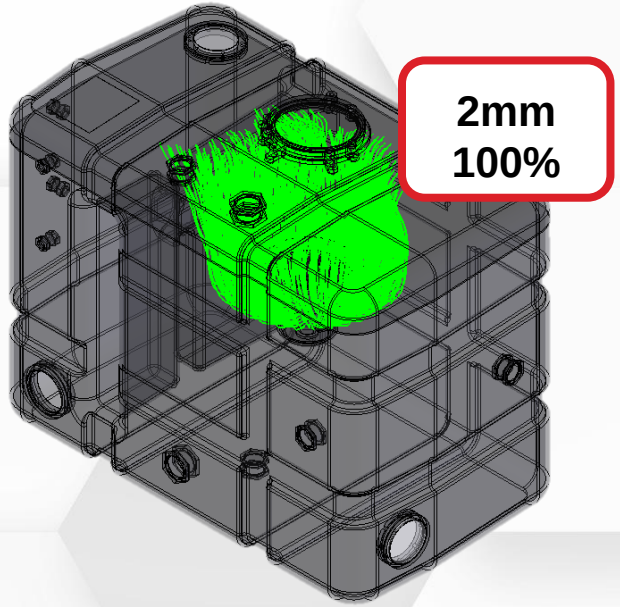
TNK25

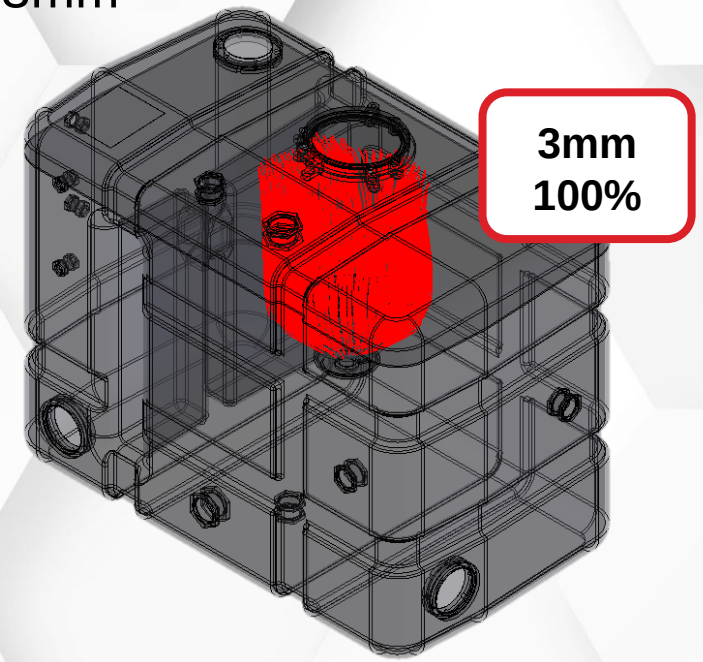
Deaeration Performance (TNK25) Standard

- Two hundred 1mm, 2mm, and 3mm air particles are injected into the system to determine de-aeration performance.
- 1mm air particles have shown in studies to not be a major concern in terms of cavitation or danger to the system
- Our main concern is de-aerating the 2mm and 3mm particles, however, we would like to remove the 1mm particles as well if possible
- The aim is for >75% for 1mm, >85% for 2mm, and >95% for 3mm

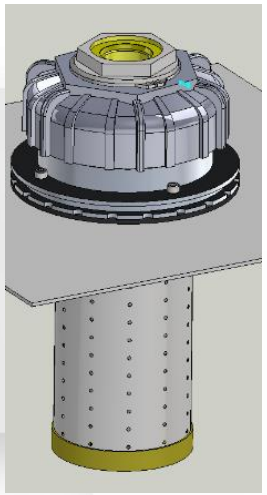




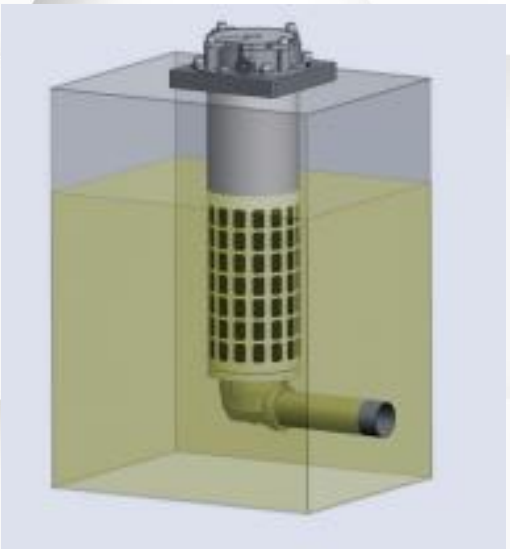




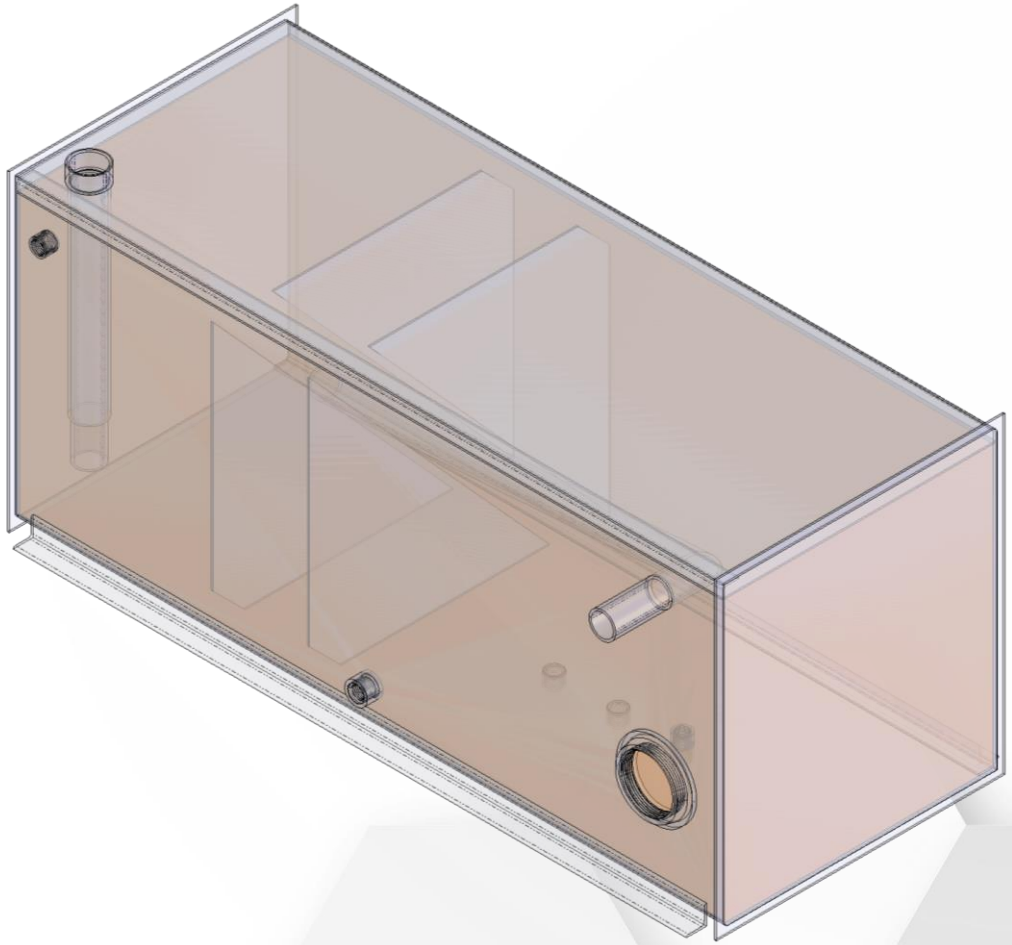
New BRT, TRT, & AFT Filters Features & Advantages



- **Integrated Deaeration Windows**
  - Directs flow above oil level
  - Air bubble coalescence
- **Advantages**
  - Improved deaeration – increased machine reliability
  - Oil volume reduction – cost savings, environmentally friendly
  - Tank size reduction – material cost savings, increases available area for other components
  - Simplifies tank fittings and connections – material and assembly cost savings



Ladder Truck Tank Optimized Simulation



Deaeration Performance

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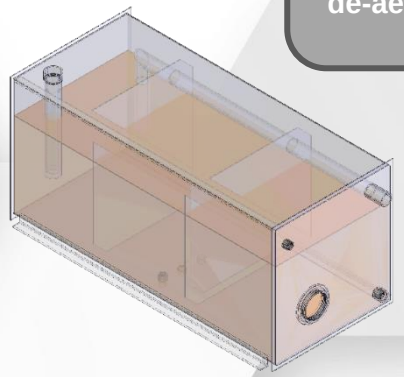
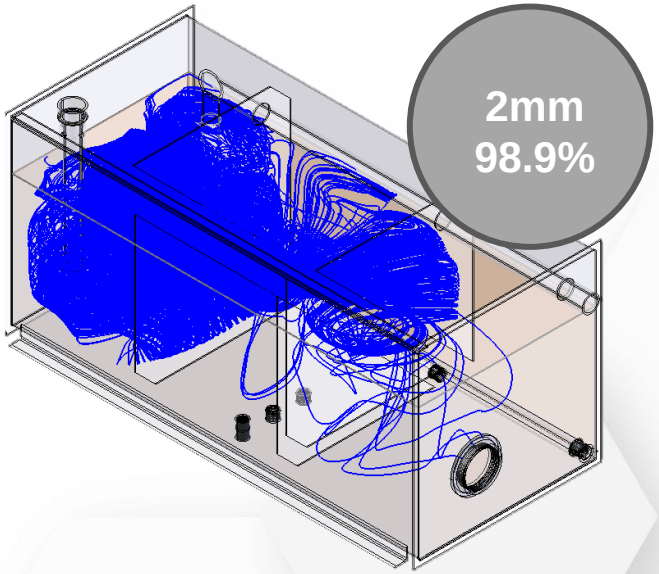
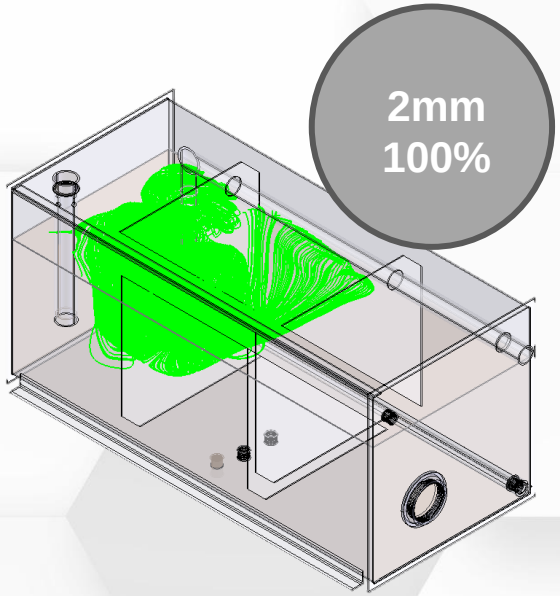
- The aim is for >75% for 1mm, >85% for 2mm, and >95% for 3mm

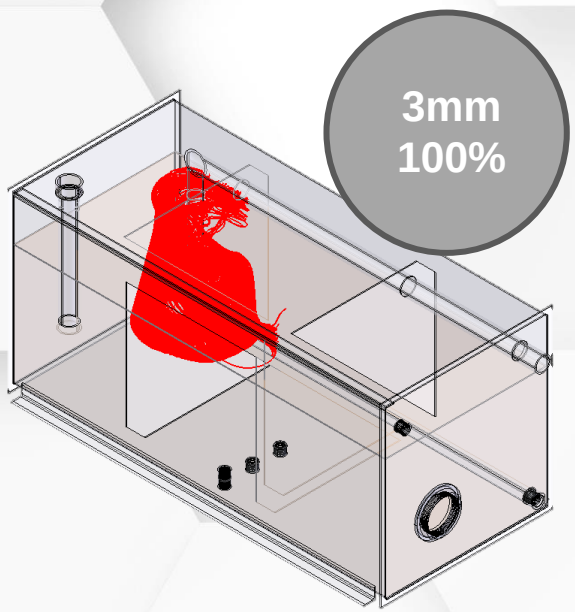
Values shown are the percent of air bubbles at that particular size successfully de-aerated from the system



1mm, 2mm, and 3mm air bubbles injected

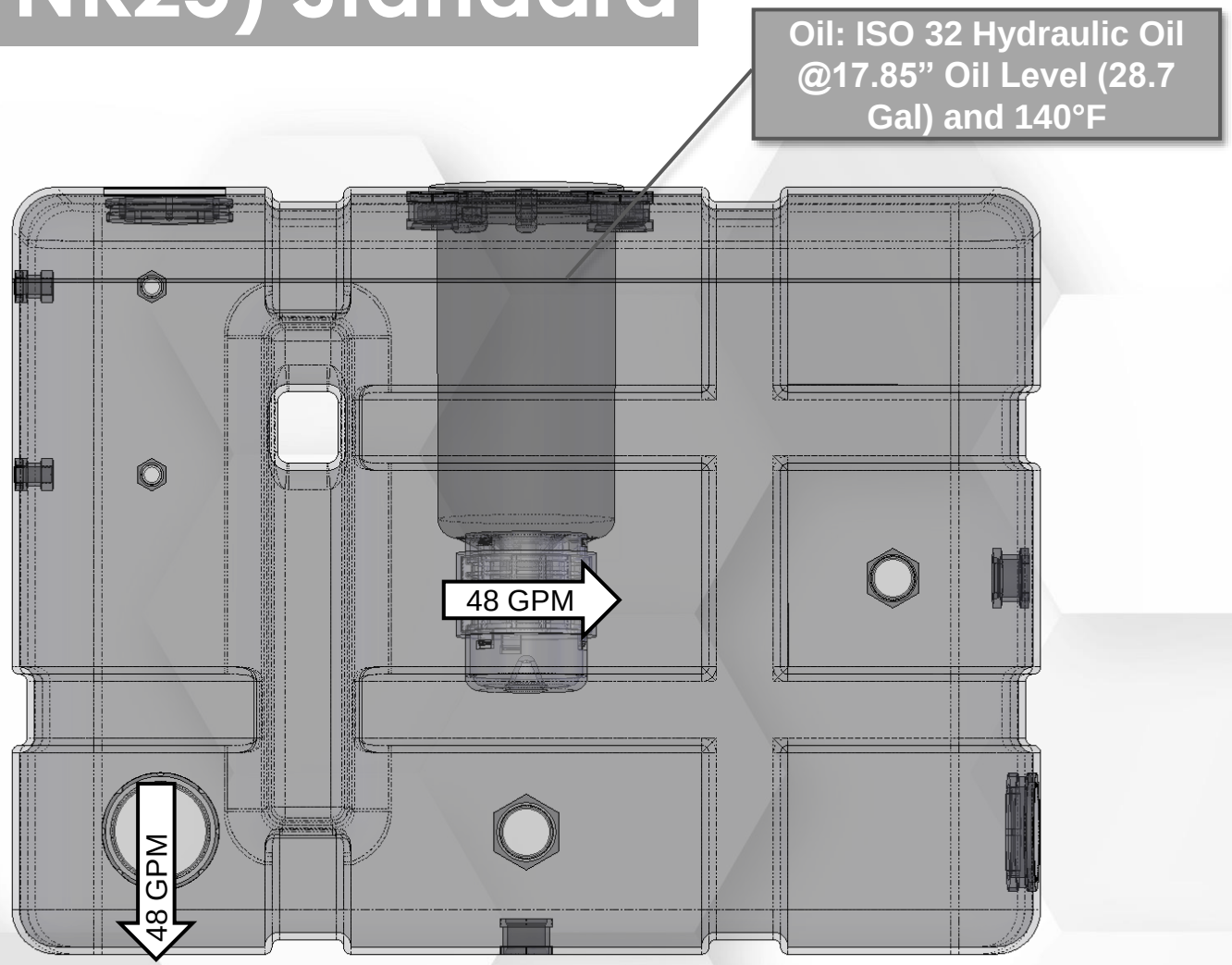






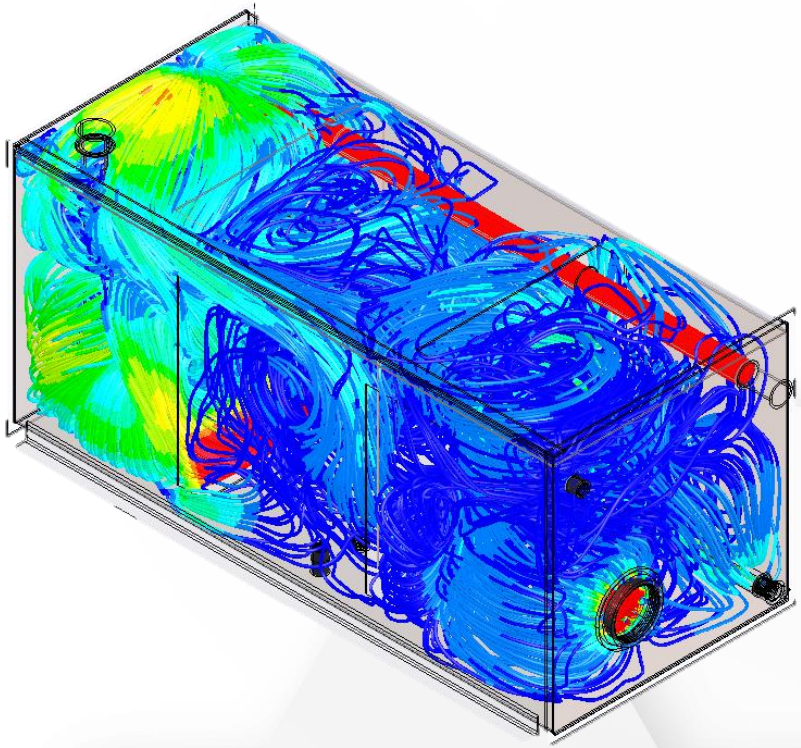
Boundary Conditions (TNK25) Standard

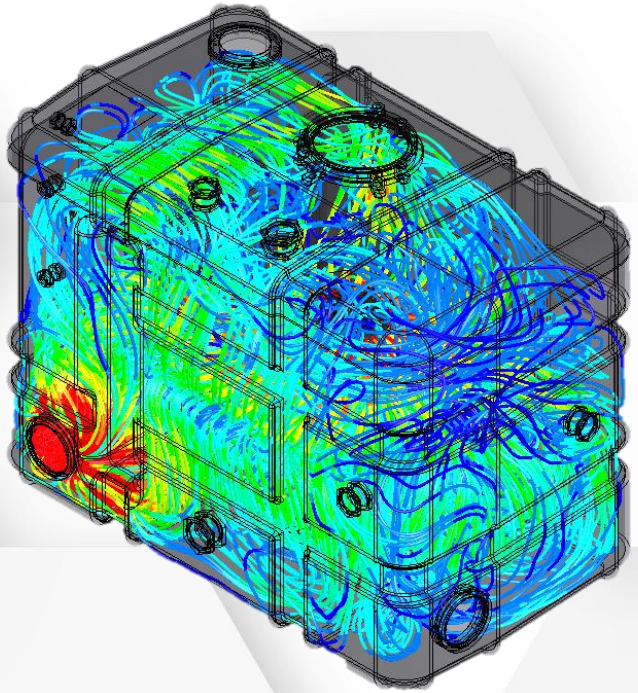
- Now, we will look at the same operating conditions in a Schroeder TNK25
- The TNK25 filled to the top of the fluid level gauge holds 28.7 gallons of fluid
- **This will save costs on oil as well as reduce overall weight of the tank**
  - This is approximately a 30-gallon savings from the previous two tanks
  - Assuming the gauge steel is 12ga based off of the step models sent: The tanks have a surface area of 4002 in^2 and 3703 in^2 respectively, which approximates out to 121lb and 112lb. The TNK25 weighs 45lb and will save 70lb – 80lb based on the tank it is replacing



Summary ROI by the #'s

- Oil & Steel Weight Saving per machine – 604 lbs
- Oil Cost savings per machine - $210.00
- **CO_2 Reduction from reduced Oil – 720 lbs CO2 / Machine****
- Total Machine Reservoir Cost Savings – $770.00





Independent Statistics & Analysis
U.S. Energy Information Administration

**https://www.eia.gov/environment/emissions/co2_vol_mass.php

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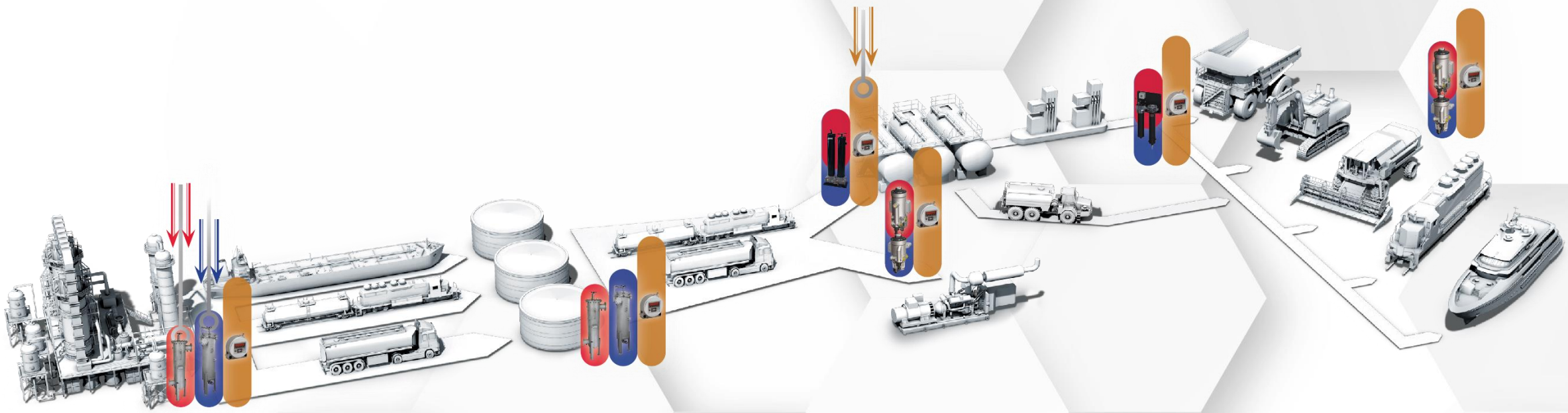
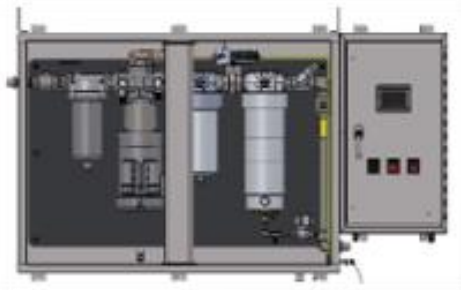
CLEAN FUEL

Why Is Fuel Filtration Important?



Fuel Filtration Flow

Fuel Delivery



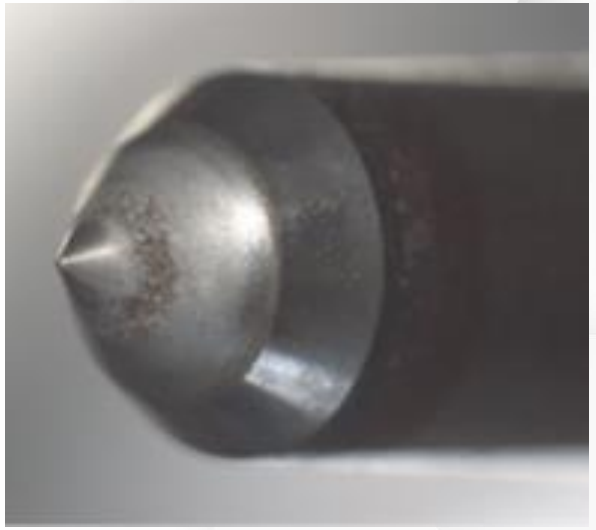
Bulk Diesel Storage

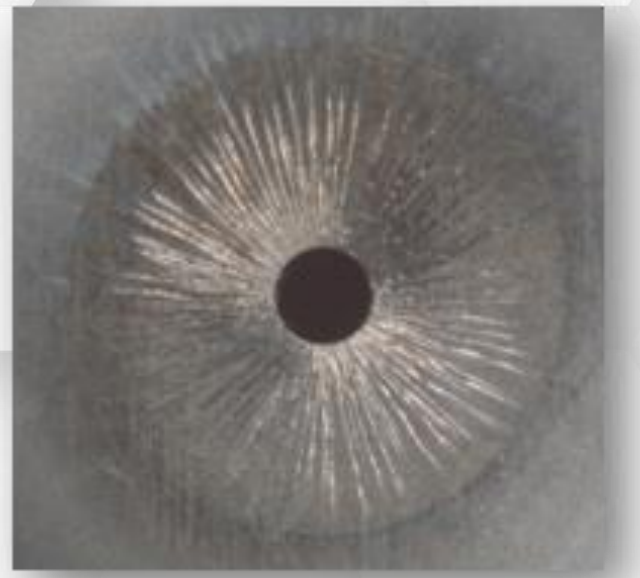
Fuel Dispensing

Point of Use

MAIN TECHNOLOGY DRIVER

- Extremely High Pressures
  - Excess of 30,000 psi
  - Moving to 70,000 psi
- Tight Tolerance Components
  - Injector tolerance as small as 2 µm
  - Moving to 0.5 µm
- 7.1 L Tier IV Engine Platform
  - >$3,400 cost of injector (6x)
  - >$2,100 cost of pump (1x)

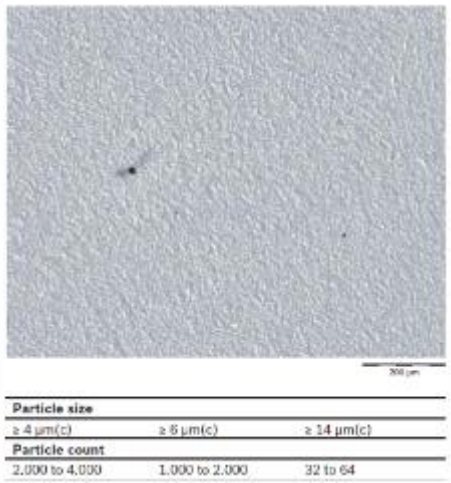




Injector Seat Scoring
Injector Poppet Erosion
Injector Tip Fracture
Mechanical Cylinder Wear
Accelerated Wear Metals

Cleanliness Levels of Diesel

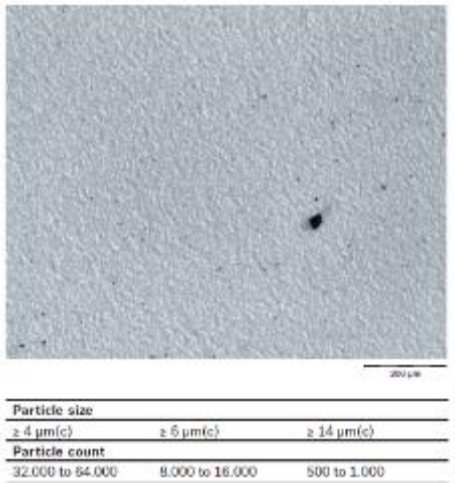
ISO 12/9/6



Particle size		
≥ 4 µm(c)	≥ 6 µm(c)	≥ 14 µm(c)
Particle count		
2,000 to 4,000	1,000 to 2,000	32 to 64

Fuel Injection Target

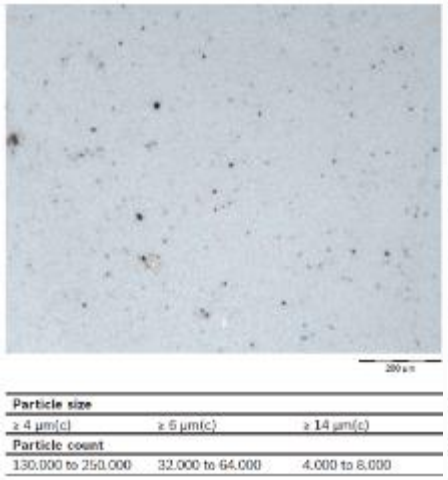
ISO 15/13/10



Particle size		
≥ 4 µm(c)	≥ 6 µm(c)	≥ 14 µm(c)
Particle count		
32,000 to 64,000	8,000 to 16,000	500 to 1,000

Dispensing Target

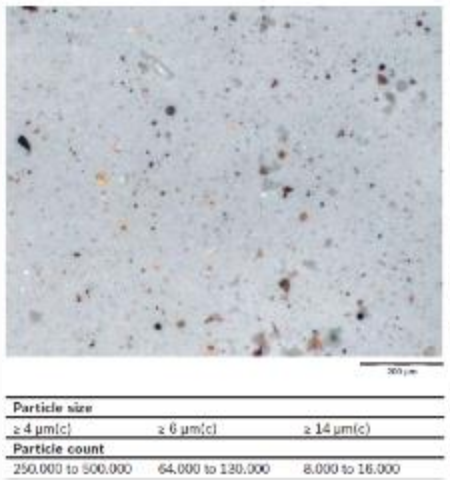
ISO 18/16/13



Particle size		
≥ 4 µm(c)	≥ 6 µm(c)	≥ 14 µm(c)
Particle count		
130,000 to 250,000	32,000 to 64,000	4,000 to 8,000

Worldwide Fuel Charter

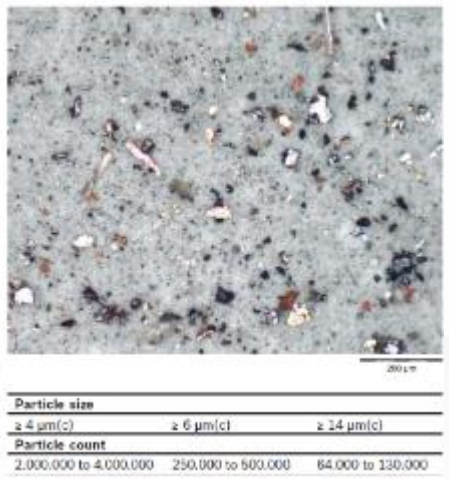
ISO 19/17/14



Particle size		
≥ 4 µm(c)	≥ 6 µm(c)	≥ 14 µm(c)
Particle count		
250,000 to 500,000	64,000 to 130,000	8,000 to 16,000

Cellulose Spin-on

ISO 22/21/18

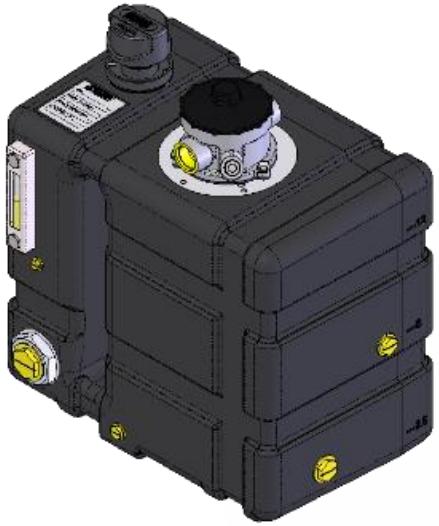


Particle size		
≥ 4 µm(c)	≥ 6 µm(c)	≥ 14 µm(c)
Particle count		
2,000,000 to 4,000,000	250,000 to 500,000	64,000 to 130,000

Common Bulk Tank

100 mL sample

Frac Unit Fan Drive



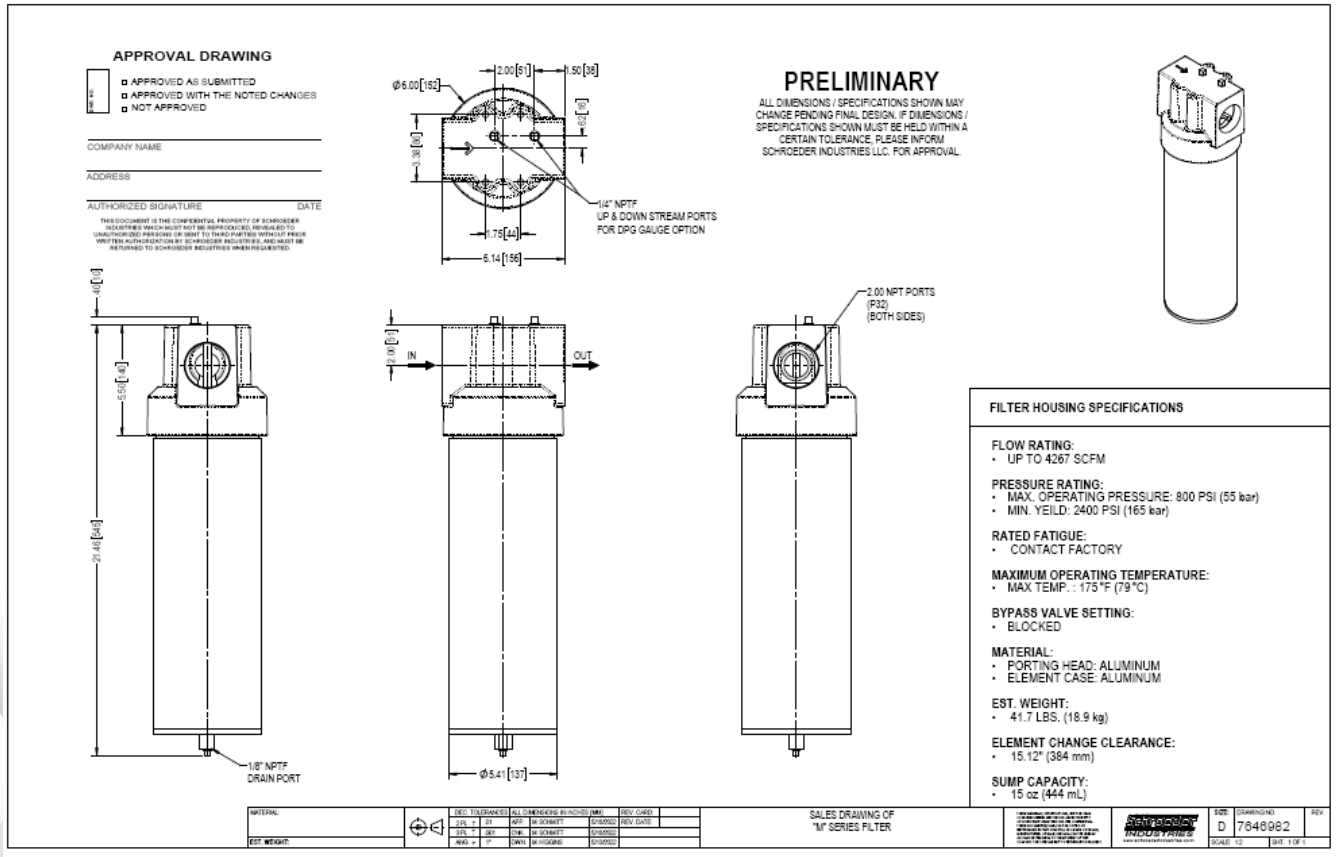
TNK12
Hydraulic Reservoir
for 60 HP Fan Drive for cooling system

Dual Fuel Opportunities

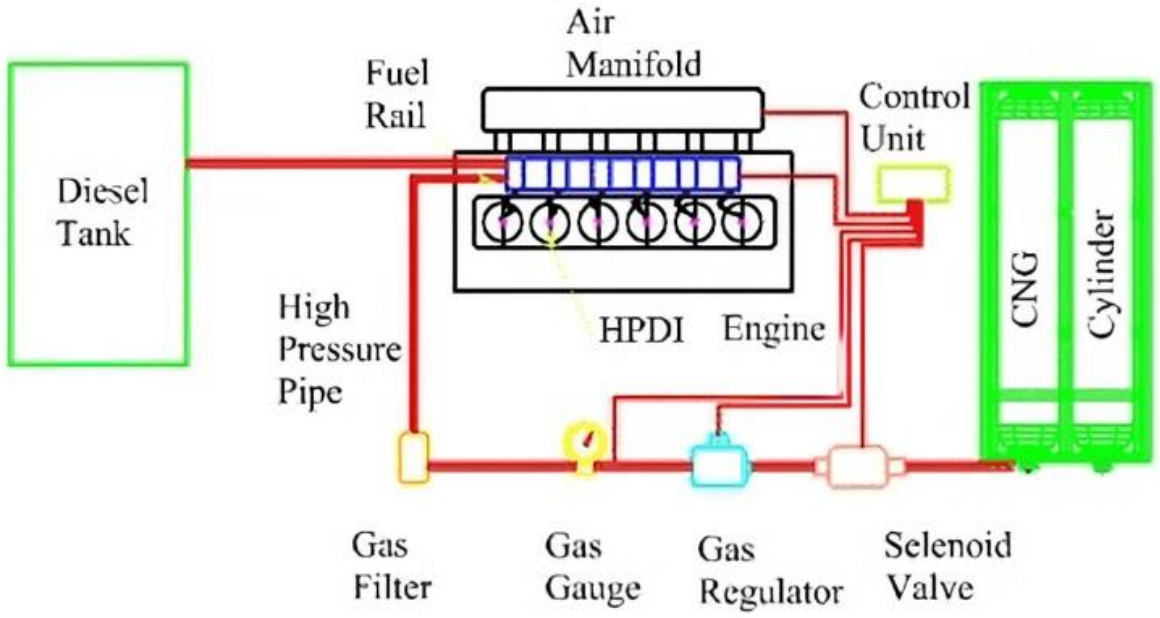
Natural Gas Coalescing & Particulate Filter

Dual Fuel Projects

Competitor:
Parker H and Parker M Series



Dual Fuel Application



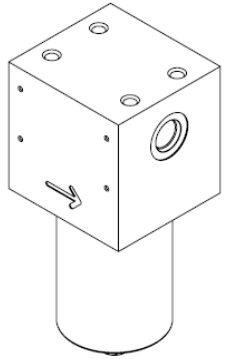
Parker H and Parker M Series

High Pressure Compressed Gas Filter | CGF50 Series

Features:

- 5000 PSI Rated Compressed Gas Housing
- SG Cast Iron Filter Housing, Nickel Plated Head and Bowl
- UV Stable Epoxy Paint Exterior Coating
- Durable Laser Etched Data Tag
- Optional Drain Kits and Gauge Kits Available
- Standard Tools For Element Service
- Bowls Slotted to Accept Filter Element Retaining Tabs
- Assembled in the USA

Size 05



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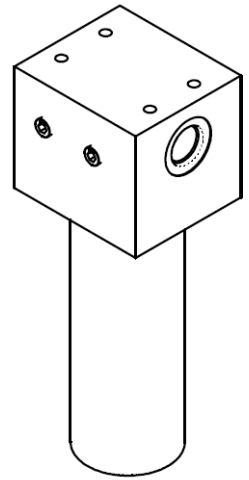
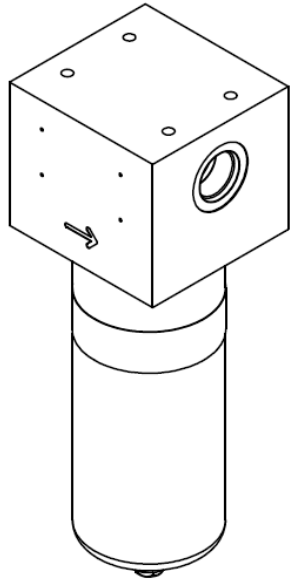
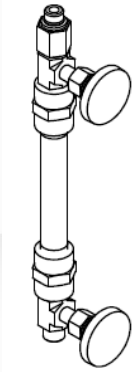
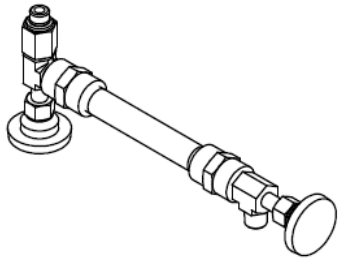


Size 09



Size 10





Vertical & Horizontal Drain Kit

High Pressure Compressed Gas Filter | CGF50 Series

Motivators for Pursuing the CGF50:

- Increasing Global Interest in Alternative Fuels
  - CNG Projected to Reach $36 Billion USD by 2023
  - Wide Heavy-Duty Commercial Vehicle Acceptance
- Manufacturer Pricing & Availability Challenges
  - Growing Competitor Lead Times & Pricing

Key Benefits of the CGF50:

- Competitive Pricing
  - Schedule B Discount
- Improved Lead Time / Availability
  - 6 Weeks ARO
- Potential for Private Labeling

Best Fit Fuel – FBO Replacement

Parker FBO 60357

14” (356 mm) – 10 µm Particulate

•Media Area: 1997 sq. in. (12,883 sq. cm.)

•Dirt Holding Capacity @ 15 gpm (57 Lpm)

- 72.95 grams @ 39.5 psid (2.72 bar)

•Beta 200 = 23.7 µm(c)

•Beta 1000 = >29.25 µm(c)

Schroeder SBFD-FBO-14Z10V

14” (356 mm) – 10 µm Particulate

- Media Area: 3363 sq. in. (21,694 sq. cm.)

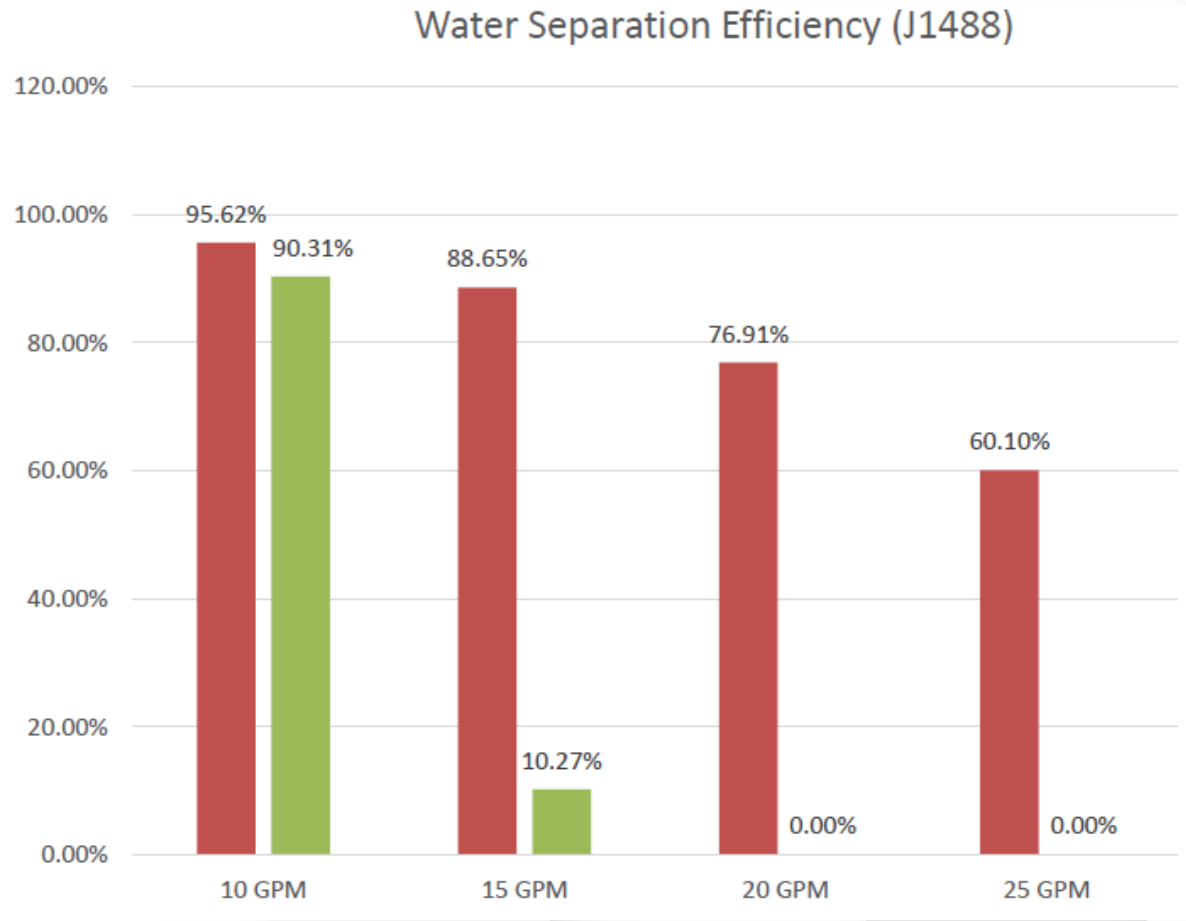
+68.4% Media Area

- Dirt Holding Capacity @ 25 gpm (95 Lpm)
  - 400 grams @ 39.5 psid (2.72 bar)

+448% Capacity

- Beta 200 = 11.7 µm(c)
- Beta 1000 = 14.9 µm(c)

BestFit Fuel – Parker FBO Water Separation



Schroeder SBFC-FBO-14Z5V

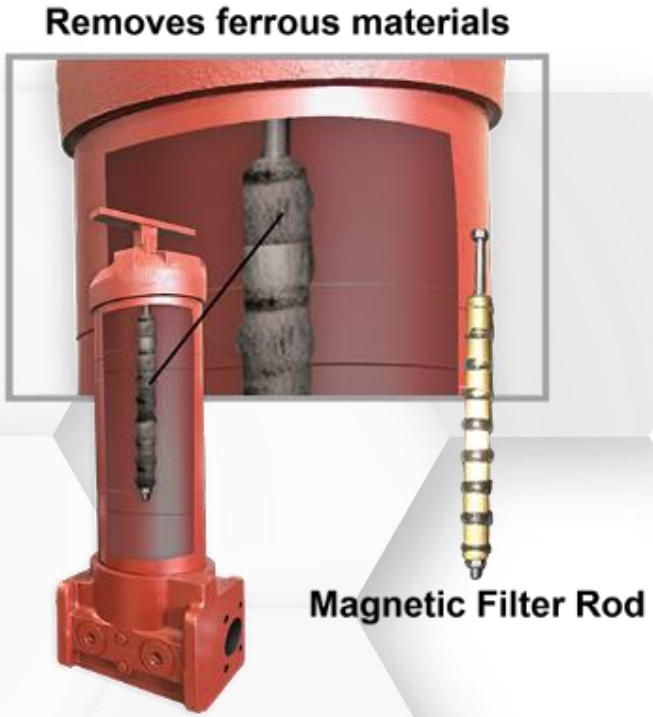
Parker FBO 60356

Schroeder QF5i vs. Parker IL8

- **Upgrade the system with our QF5i**
  - Size and flowrate are similar to Parker IL8
  - Providing OEMs with a new, innovative solution with extra protection and increased performance
  - Increased revenue with our housings and aftermarket elements

- **QF5i design utilizes inside-out flow filtration with extra ferromagnetic protection**
  - Magnetic filter rod is suspended through the coreless to catch extra ferrous materials during bypass
  - Continuous function whether on cold start or after max DHC is reached and filter enters bypass
  - Remove the rod and wipe ferrous material away with ease

- The QF5i's Magnetic Rod also extends the element life further by excluding ferrous contaminates for ever reaching the element.



Actual Photo with hundreds of grams of contaminates collected

Schroeder QF5i vs. Parker IL8

- **Parker IL8 versus QF5i:**
  - SI 40 micron is comparable in beta ratios; lower in pressure drop
  - SI 40 micron has **73%** more DHC than the Parker IL8 element
    - Plus, added advantage of ferrous material on magnetic rod

- **What if we upgraded to 25 micron?**
  - Same cost to make a 25 micron as a 40 micron, higher in pressure drop (minimal difference)
    - Upgrade where you can
  - SI 25 micron has better beta ratios than both Parker's and SI's 40-micron elements
  - SI 25 micron has **254%** more DHC than the Parker IL8 element
    - Plus, added advantage of ferrous material on magnetic rod

Parker IL8 - 40 micron	946945Q			
	Test #1	Test #2	Test #3	Avg
DHC (grams)	141.42	103.02	112.02	**118.82**
Beta 100	> 30.0	> 30.0	> 30.0	**> 30.0**
Beta 200	> 30.0	> 30.0	> 30.0	**> 30.0**
Beta 1000	> 30.0	> 30.0	> 30.0	**> 30.0**

Schroeder QF5i	16QCLIZ40V & 16QCLIZ25V	
	16QCLIZ40V	16QCLIZ25V
DHC (grams)	205.24	301.23
Beta 100	> 30.0	21.7
Beta 200	> 30.0	24.0
Beta 1000	> 30.0	27.5

Parker 40 micron → 0.46psi @238LPM
QF5I 40 micron → 0.30psi @238LPM
Q55I 25 micron → 1.09psi @238LPM

	gpm	l/min
Test Flow Rate:	62.9	238.0
	psid	bar
Terminal Pressure:	40.0	2.8

Schroeder QF5i vs. Parker IL8

- **ROI for OEMs:**
  - 40 µm → comparable costs, pressure drops, and efficiencies
  - 40 µm → comparing DHCs: use 3 SI elements for every 5 Parker elements
    - ***40% Savings just on elements alone!***
  - 25 µm → comparable costs, lower pressure drops; increased beta efficiencies
  - 25 µm → comparing DHCs: use 2 SI elements for every 5 Parker elements
    - ***60% Savings just on elements alone!***
  - Working on a new datasheet to help target against IL8 users with both drop-in direct replacements and upgrading to a better solution!

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Questions?

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