Filter Systems
Matt Brown

2020 DISTRIBUTOR TRAINING

FILTER SYSTEMS Products:

Contamination Monitors > Condition Monitoring

- Measure Solid Contamination
- Measure Water Saturation Levels
- In-line and Portable Options

Off-line Filtration Systems > Fluid Conditioning

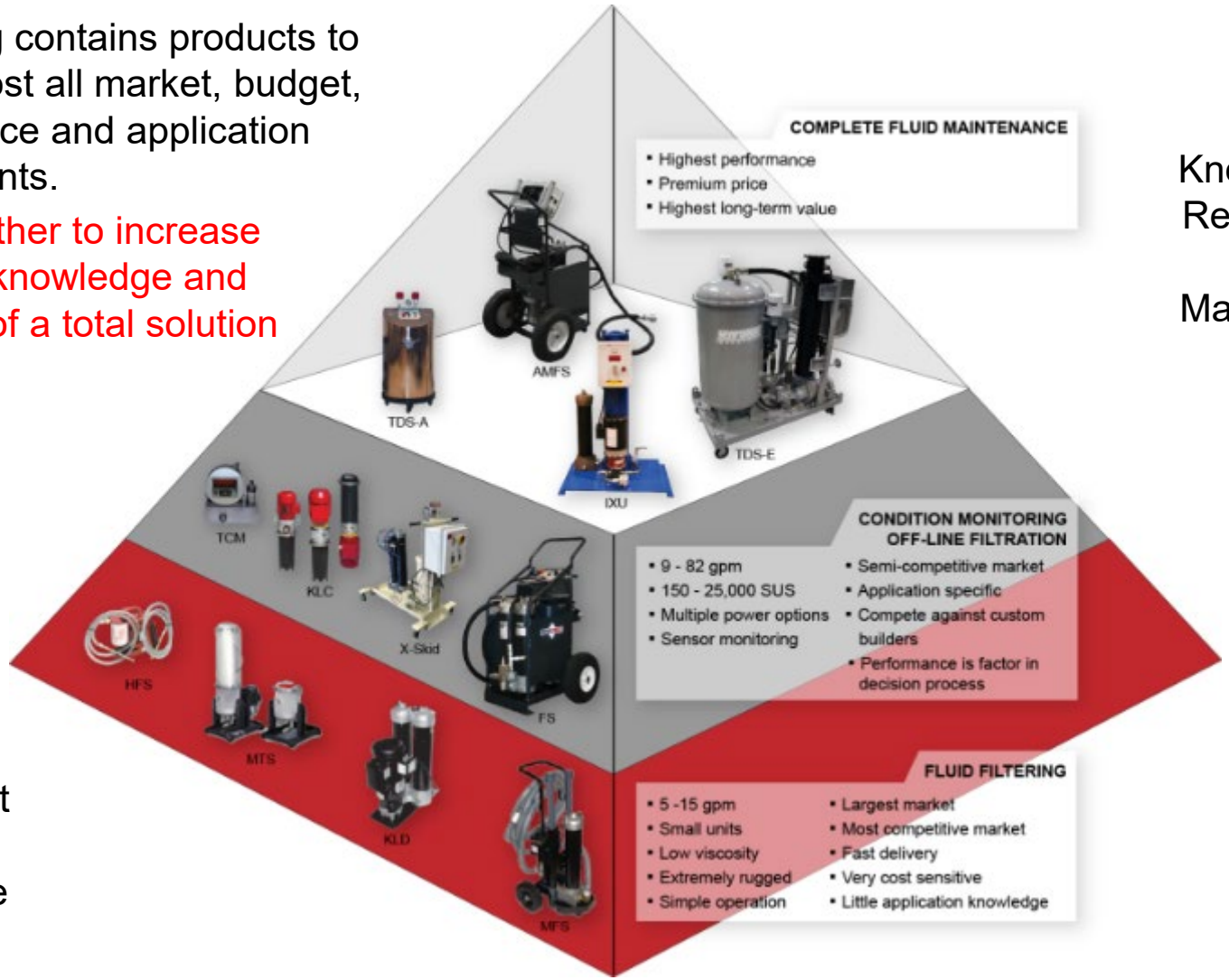
- Portable Filter Systems
- Kidney Loop Systems
- Dehydrators

Filter System Systems

SI Catalog contains products to meet almost all market, budget, performance and application requirements.

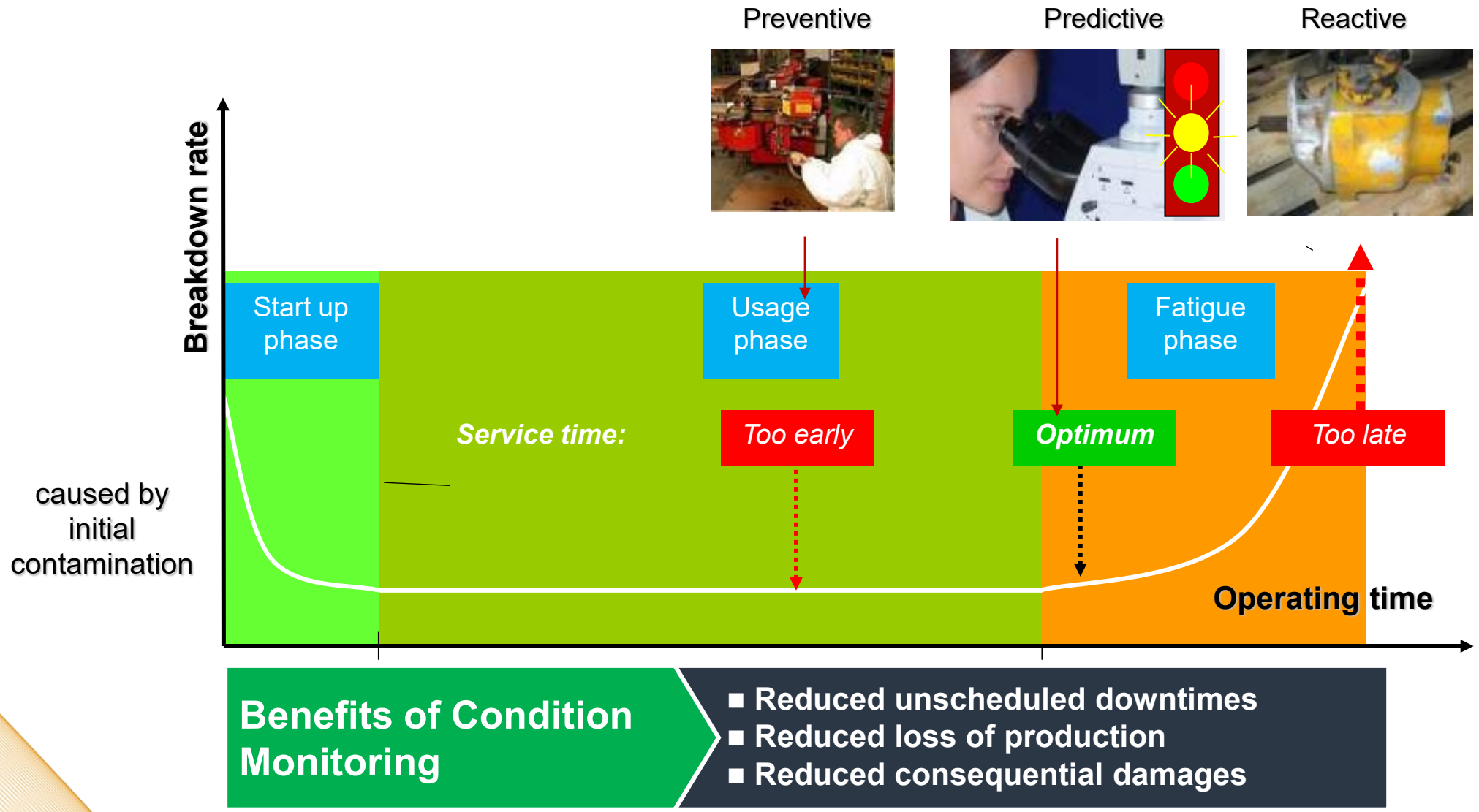
Work together to increase customer knowledge and the value of a total solution

Product Cost + Product Performance



User Knowledge + Reduction of Overall Maintenance Budget

Predictive Maintenance Program by Condition Monitoring



Benefits of Condition Monitoring

- Reduced unscheduled downtimes
- Reduced loss of production
- Reduced consequential damages

Effects of Contamination

- Cylinder Drift
- Jerky Steering
- Slower Performance
- Erratic Operation
- Shorter Service Intervals
- Higher Operating Costs
- Lost Productivity

System efficiency can drop by up to 20% before an operator even detects a problem!

Condition Monitoring

Core Products

- Contamination Monitoring
  - Contamination Sensors (in-line & portable):

    CS, FCU, Schroeder Pro HY-TRAX®

  - Water Sensors: AS1000 & AS 3000.
  - Debris Sensor (particles larger than 70 Microns): MCS
  - Technical Cleanliness (Parts Cleanliness): CTU & CTM

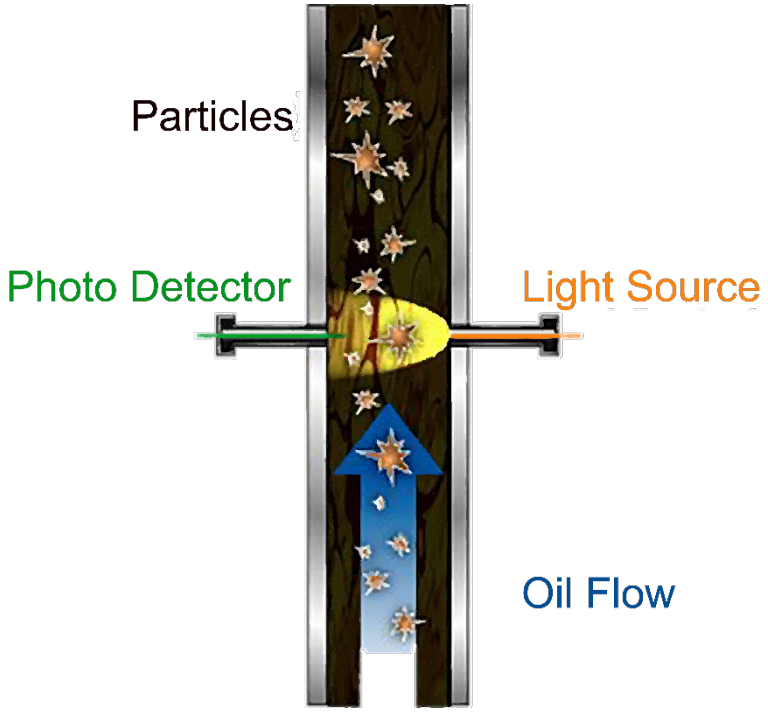
Particle Sensors

Basic principle of an optical particle counter:

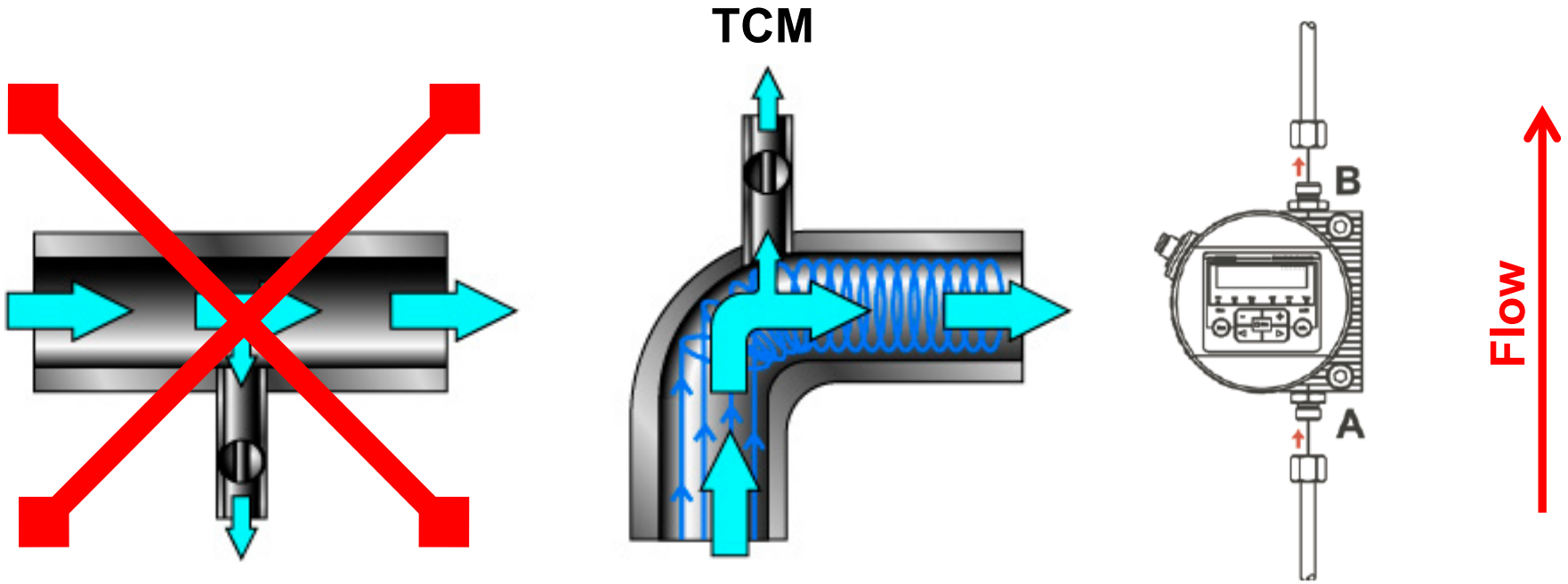
LIGHT OBSCURATION

A light beam is transmitted through the fluid

Particles dampen the intensity of the light beam



CS-12XX Proper Installation



- Install TCM in a <u>vertical position</u>
- Direction of flow:

  From IN (bottom) to OUT (top)
- <u>Keep short distances</u>, place TCM close to measuring point

CS-12XX Contamination Sensor

Offers continuous On-line, real-time condition monitoring

Features:

- **Measure Solid Contamination** in Hydraulic & Lubricating Fluids in-line in your system
- Viscosity range up to **4,635 SUS (1000 cSt)**
- Pressure up to **4,350 psi (300 bar)**
- **Optional Display** with 6-digit ISO Code (ISO4406:1999)
- Display with Pivot Function (face rotates 270 degrees)
- Compact & Rugged design
- Permanently mount in mobile or industrial equipment

- **Optional Manifold**: CS w/optional aqua sensor combined in one plug and play unit with adjustable relief valve to regulate and maintain constant flow. Available in our **Quick Delivery** program

CS Drill Rig Piston Pump

Problem:

Several **pump failures** out in the field **because of fluid contamination**.

Customer was aware that 80% of the failures are caused by contamination, but never had the equipment to measure. Each blender has 15 pressure compensated piston pumps, along with several servo valves.

Solution:

Monitoring of each pump with in-line CS 1210 **on a Manifold** from one location with signal sent to the cab when contamination level is becoming a problem or could cause damage.

Cost for pump repair: Approximately $40,000 each

Shown with optional Water Sensor

HY-TRAX®

FACT: Continuous duty particle counters require constant pressure and flow for accurate readings

What happens if customer's systems don't meet the minimum conditions?

Our HY-TRAX® Systems are designed for monitoring fluid conditions in reservoirs or low-pressure lines.

- Real-time ISO fluid condition for oils up to 700cSt
- Manually controlled version easily tied into customer PLC
- Pari With CSI-C11 to tenasmit data from contaminations sensors via Bluetooth or ethernet connection

Offline Contamination Monitoring
Reactive to Predictive Maintenance

FCU1310 Fluid Contamination Unit

Portable Fluid Condition Monitoring unit

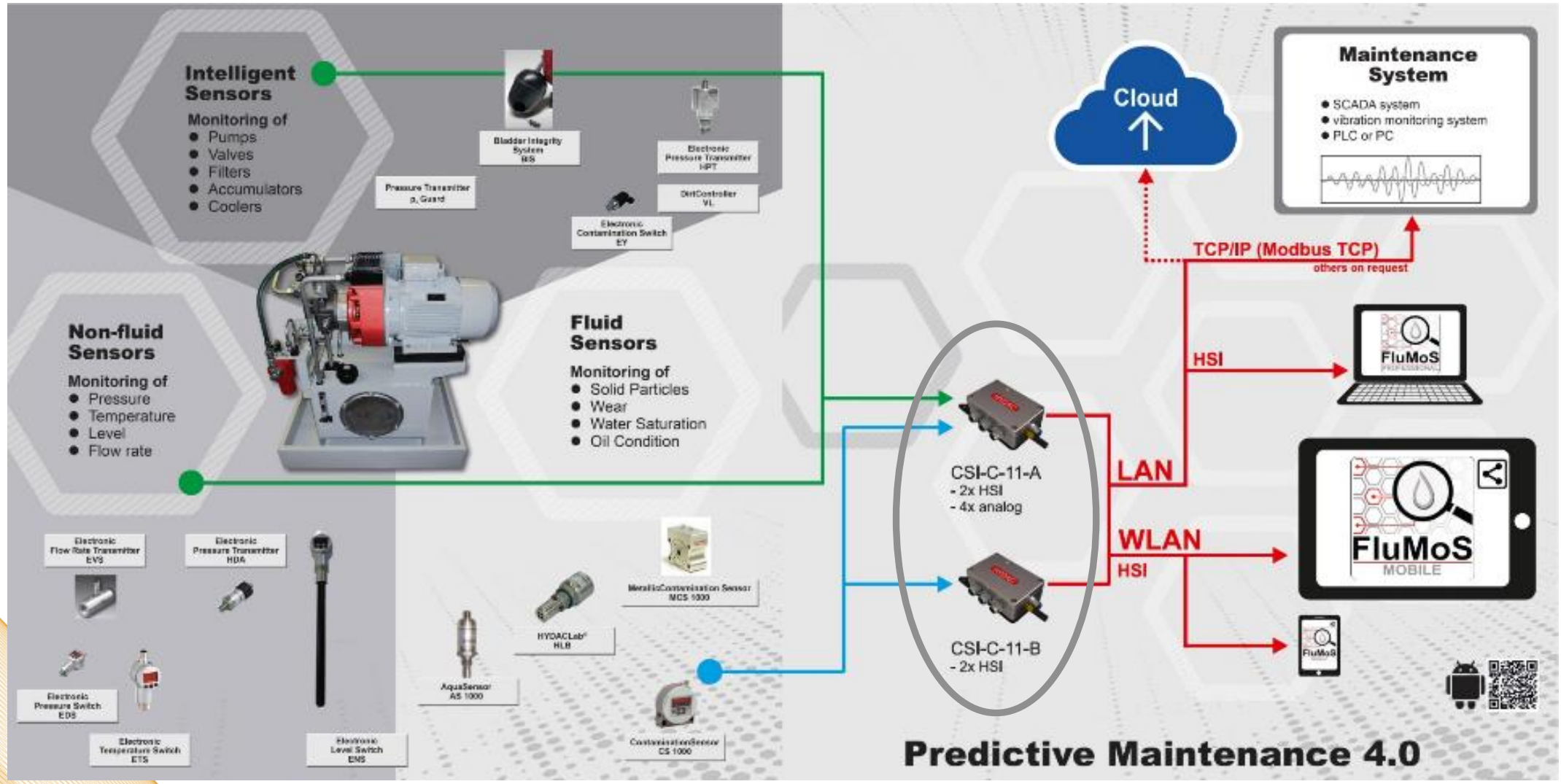
- Particulate Contamination
  - ISO, NAS & SAE
- Relative Water Content
  - % Saturation

Schroeder PRO: Total Fluid Life & Total Fluid Health

Advanced portable fluid condition monitoring unit

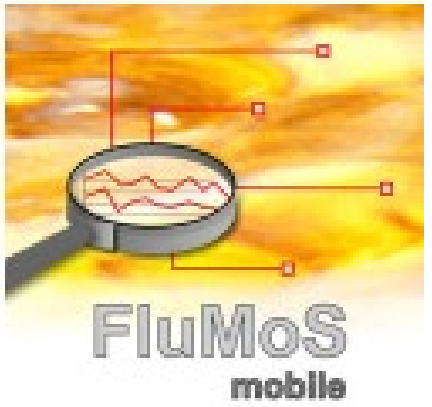
- Particulate Contamination
  - ISO, NAS & SAE
- Relative Water Content
  - % Saturation
- Oil Life Indication
  - Electrochemical composition
  - Relative to new fluid condition
- Particulate Categorization – with Total Fluid Health

CSI-C-11 Contamination Sensor Interface



FluMoS Android App

- FluMoS Mobile is a tool for displaying and downloading measurement data from the FCU, Sensor Monitoring Unit SMU, and CSI-11 to your Android device. FluMoS Mobile Features (Version 1.10)
- Displays current measurement values (solid particle contamination, water saturation and temperature) of your device in table format
- Displays measurement value progress (solid particle contamination, water saturation and temperature) in graphic format (one graphic per measurement channel)
- Selective download of log files in .dat format from the internal memory of the FCU and/or SMU to your Android device
- Provide Online storage of measurement data on your Android device
- You can easily forward the .DAT files per e-mail to other devices such as a PC. The files can then be processed in FluMoS.



Fluid Contamination – Water in Oil

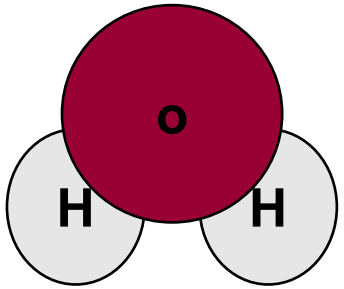
Related Problems of Oil Ageing:

- Short service life of oil
- Filter plugging
- Corrosion
- Higher Viscosity
- Sludge and sediment formation
- More disposable charges & new oil charges
- Component sticking (valve, …)
- Deterioration in the lubrication characteristics (increased wear and tear)
- Cavitations (vaporous cavitations causing erosive wear)

Classification of Oil/Water Mixtures

Dissolved Water:

Homogenous mixture of oil and water. The water molecules are discrete and thoroughly mixed with the oil molecules.



Emulsified Water:

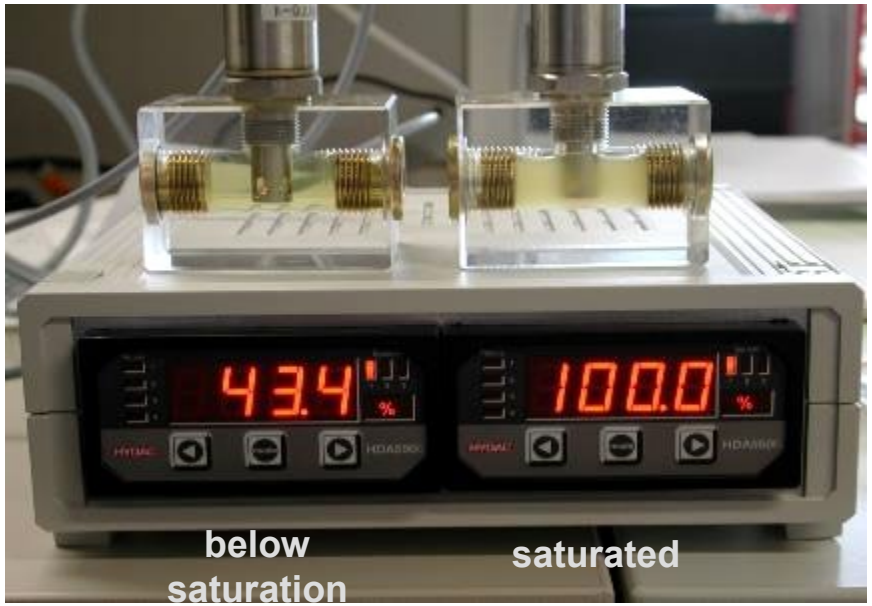
Is a special form of free water. Tiny droplets of water stay suspended in the oil and form a cloudy mixture with the oil

Free Water:

Above the saturation point water molecules are aggregated into separate drops. The mixture is no longer homogenous.

AS -1000 Aqua Sensor

- **Measures fluid temperature and water content** relative to the saturation concentration
- 0% reading indicates fluid free of water while 100% indicates fluid is saturated with water
- Extremely reliable on account of its compact, rugged design
- Cost effective means to Monitoring and automation

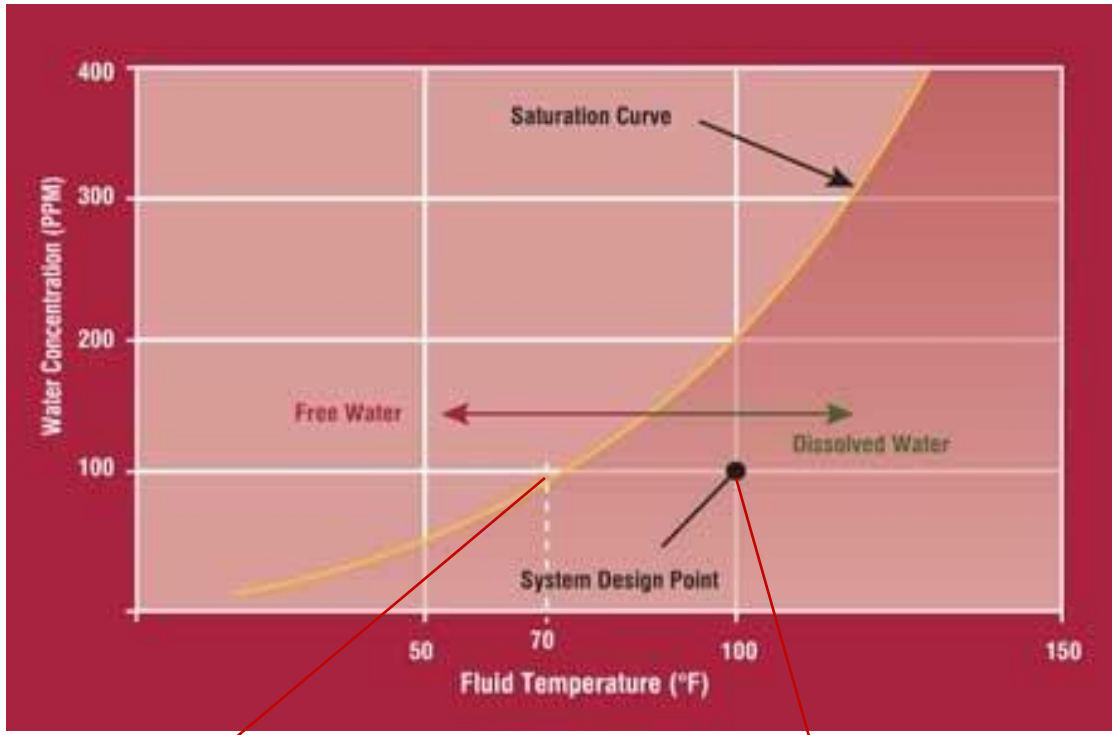


AS - 3000 Aqua Sensor

- Provides **percent water saturation**
  - Integral 4-digit display
- TWS-D provides **temperature in Celsius or Fahrenheit**
- Two switching outputs
  - SP1 is for the alarm level
  - SP2 is set for the warning level

AS Aqua Sensor % Saturation

- TWS Saturation sensors measures dissolved water to the right of saturation
- Once moisture levels (ppm) reach the saturation curve water will exist in a free state.
- Free water will read as 100% saturated.
- Oil can absorb more water at higher temperatures
- *Same ppm can exist as free or dissolved water depending upon fluid temperature*



100% Saturated

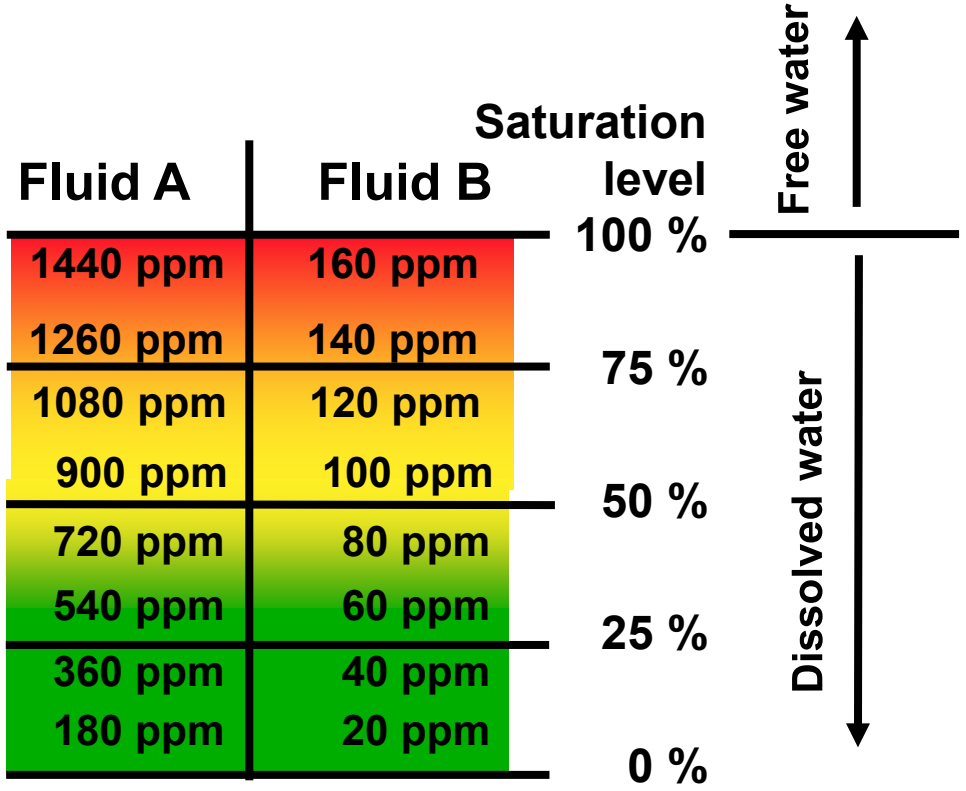
50% Saturation

Why Measure Saturation %?

Relation between Saturation level and water content (ppm)

The saturation level is a fluid independent indicator of the safety distance from free water.

A PPM value does NOT give you that information if you do NOT know the Saturation Curve of the specific fluid.



Fluid Conditioning

Sizing a Kidney Loop System

- Determine the reservoir size
- Determine the required number of turns:
- # turns based on several items
  - Ingression rate
  - Starting ISO code
  - Desired ISO code
  - Fluid Viscosity

    4-6 turns drop 1 ISO code

  Calculate the pump flow rate

Example:

- 500-gal reservoir
- 6 turns / shift (8 hrs.)

500-gal x 6 (# of turns) = 3000 gal

8 x 60 min = 480 min

3000 gal / 480 min = 6.25GPM

Therefore, a standard 7 GPM pump will be sufficient

FLUID CONDITIONING UNITS

Mobile Offline Kidney Loop Filtration

- Primary purpose is to provide and maintain very clean fluid often done with staged filtration
- Robust filtration with built-in condition monitoring and sensor communication interface to document the fluid cleanliness
- Know your oil is clean and can prove that it is!

WHY DO YOU NEED THEM?

Particulate contamination in fluid systems is a fact of life and needs to be addressed

- Oil coming into a plant in drums, totes or bulk fluid delivery needs to be filtered before introducing into any fluid reservoir
- NEW OIL IS NOT CLEAN OIL – unless the customer is paying for ISO Certified Clean Oil
- Oil should be filtered to the cleanliness of the most critical component in the system

Filtration Carts for every Application

Standard Carts
Up to 2,500 SUS

HFS-BC

HFS-15

MFD-BC

MFS & MFD
7 & 14gpm at 1000SUS
3 & 10gpm at 2500SUS

3 → 14

Viscosities
Up to 15,000 SUS

MFD-HV
3gpm

MFD-MV
6 or 10gpm

Smart Carts
With Condition Monitoring

AMFS

FS

MFD-HYTRAX

HANDHELD OFF-LINE FLUID CONDITIONING UNITS

HFS-BC – Economy

- 4 gpm for oils up to 1,600SUS
- 120VAC, 230VAC and 12VDC power options
- All petroleum-based hydraulic fluid
- Quick Disconnects to easily remove the included hoses and wands for ease of handling

HFS-15

- 4 gpm for oils up to 1,600SUS
- All petroleum-based hydraulic fluid
- Quick Disconnects to easily remove the included hoses and wands for ease of handling

PORTABLE OFF-LINE FLUID CONDITIONING UNITS

MFD-BC Filter Carts

- Low cost solution
- Light duty Filtration system for hydraulic fluids
- For oils up to 1000 SUS
- 10 GPM flow rate
- Elements for particulate and/or free water removal

MFS & MFD Filter Carts

- Filtration system for hydraulic fluids
- Options available for Water Glycols and Phosphate Esters
- Options for oils up to 2500SUS and Condition Monitoring
- High efficiency, high-capacity elements for particulate and/or free water removal

HY-TRAX® MOBILE FILTRATION SYSTEM

- HY-TRAX® pump supplies contamination sensor with optimal flow for accurate readings
- Real-time Hydraulic Oil cleanliness shown on the CS1220 contamination sensor
- Addition of the CSI-C-11 Sensor Communication Interface allow viewing of data real-time with FluMoS Mobile App or easily connect sensors into LAN network
- With CSI-C-11 option, give the ability to add AS1008 and view water saturation in addition to particulate contamination
- Retro-fit Kit is also available to add the HY-TRAX® Condition Monitoring System to an existing MFD filter cart

CONDITION MONITORING CARTS vs PARKER PORTABLE FILTER CART

Appearance	Compact with modular base to minimize leakage	Compact, all components contained in tubular frame	Components exposed; hand truck frame
Viscosity	Up to 2500SUS	Up to 1000SUS	With iCount - up to 250 SUS
Element change-out	Easy to change with screw on filter caps	Easy to change with screw on filter caps	Requires removal of multiple bolt on caps
Automatic control	No	Auto shut-off when programmed ISO code is met	None
Data Retrieval	Via CSI-C-11	USB port	RS232
Drip Tray	Yes	Removable for easy clean-up	Permanent, difficult clean-up
Filtration	2 filters after pump	2 filters after pump	One strainer filter before pump, one filter after pump
Use as Bulk Transfer Cart	Yes	Yes	No
Durability	Rugged construction with metal components; 8” wheels	Rugged construction with metal components; 15” wheels	Weak construction utilizing many plastic components
Particle Monitor	Enclosed in shroud, metal construction (IP67 rated)	Enclosed in shroud, metal construction (IP67 rated)	Open, plastic construction
Water Sensor	Optional	Standard	Optional

Application Success - FS

- Project Value: 15 units ~ $120K
- Market: Home Appliances
- Application:
  - Filtering of hydraulic reservoirs on machine presses. Customer having issues meeting target ISO code with inadequate bag filtration on systems
- Additional value-added features:
  - Onboard contamination and water saturation sensors along with auto-shutdown feature allows user to service other parts of equipment while oil is being filtered to target ISO code
  - Reduces amount of bottle sampling with real-time cleanliness data
  - Customer liked rugged design of our cart verses the Competitor

AMFS Asset Management Filtration

- Predictive maintenance is using measurements and monitoring tools with your equipment or assets to “predict” when maintenance needs to be performed.
  - ➢ The true purpose of trending

- The Asset Management Filtration Station provides visibility and traceability of data previously unavailable or unmanaged making true predictive maintenance a reality

The Downtime caused by Hydraulic or Lubrication failures can costs thousands of $$ per minute / hour / week in lost operating revenue.

AMFS Asset Management Filtration Station®

- **5 gpm** flow rate for oil up to 1000SUS
- Software turns on and off the pump/motor for filtering
- ISO Codes and Water Saturation Data Recorded
- All the data is pre-configured into Excel
  - Files are automatically named by machine number

- Operation and Fleet Managers can:
  - Condition, measure and track each asset individually (Trend)
  - Track and manage maintenance routines (Control)
  - View the data generated in detail or summary (Analyze)
- Organized by machine ID# and the operator performing the PM routine

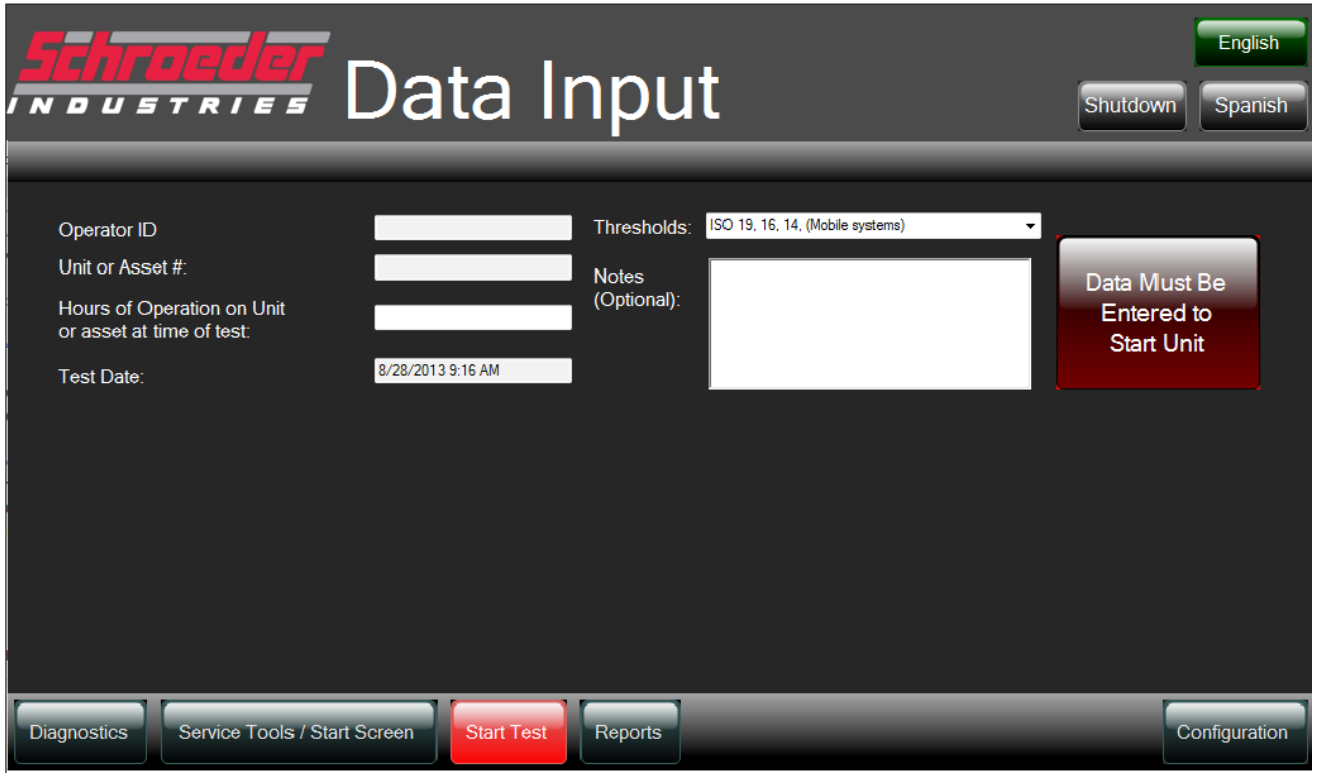
AMFS Asset Management Filtration Station®

Operation and Fleet Managers can:

- Condition, measure and track each asset individually (Trend)
- Track and manage maintenance routines (Control)
- View the data generated in detail or summary (Analyze)

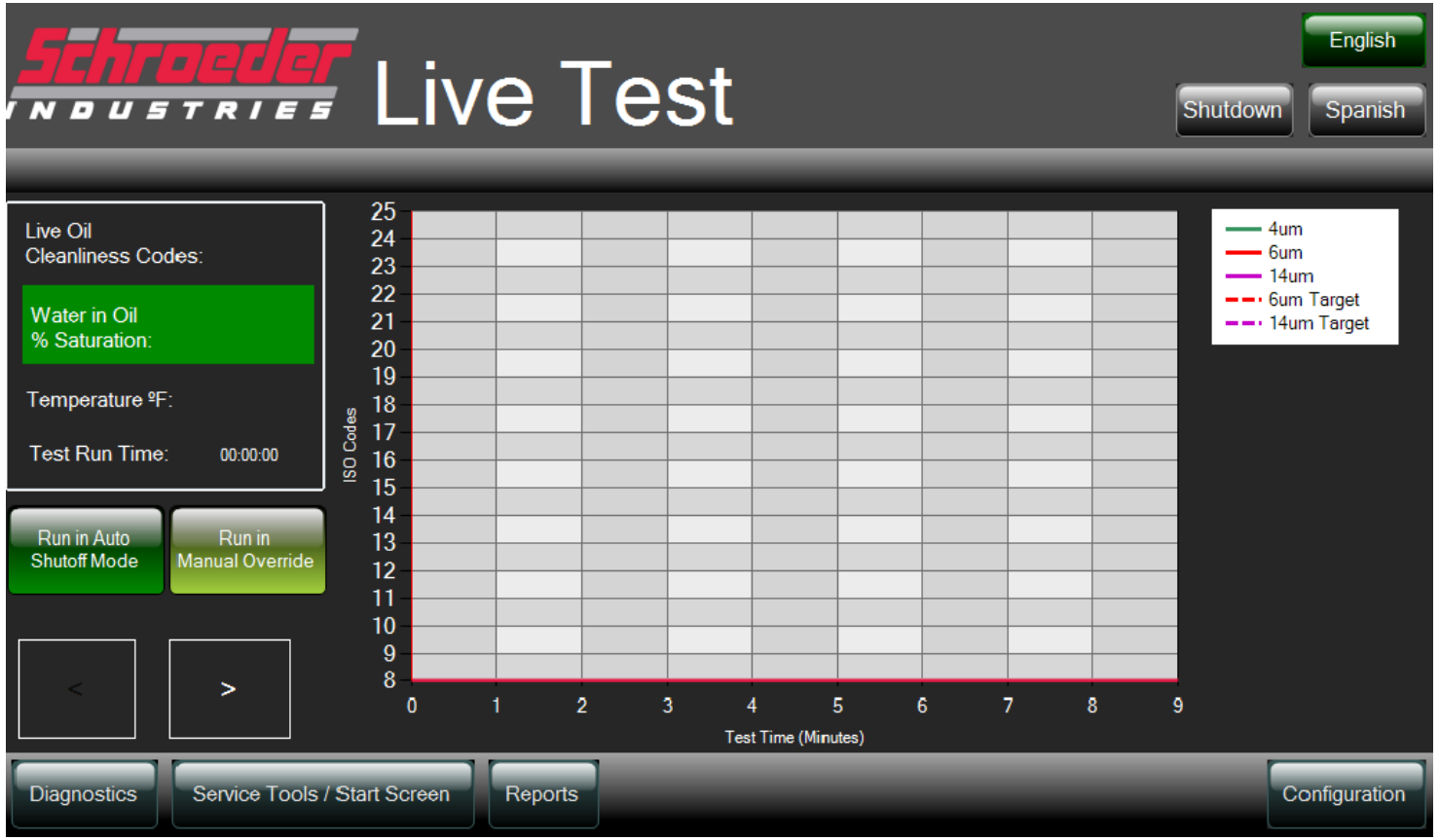
- **Organized by machine ID and the operator performing the PM routine**

- **Complete 4 sections and hit “Start Test”**



AMFS Asset Management Filtration Station®

Real Time Data



Display gives live data showing:

- Target ISO cleanliness level
- Water Saturation
- Current ISO level of fluid

Roll-off Cleanliness Programs

Market: Specialized Equipment Manufacturer Roll off Cleanliness

Problem:

- **High initial Failure Rate / Increased Warranty Costs** after delivery (main problem through larger particles > 100 Micron) Company noticed an increase in warranty costs

Solution:

- AMFS used to filter/flush document and record ISO cleanliness levels before shipping product to end user.
- Noticed high initial contamination levels >22/20/18
- Able to determine their tank vender was suppling tanks with high levels of initial contamination. Company was able to have tank vender improve cleanliness levels on future deliveries.
- ROI was less than 6 months and warranty claims were greatly reduced below previous years.

AMFS Fleet Application

Order received for 22 AMFS and 20 MFDS

$375K with $120K element sales over 5 years (Geo-seal)

- Large multi-state utility company had numerous breakdowns occur during winter months. They had water and contaminates in their hydraulic systems, causing the booms to freeze in the extended or collapsed mode during the winter season.
- A demo unit was sent to the customers facility in 2014 to show the customer the condition of their fluid before and after filtration. All utility trucks had high contamination/moisture levels.
- A combination of water and dirt removal elements ensures clean, dry fluid. The customer no longer needs to worry about equipment breakdowns caused by water in the oil freezing during the cold weather or dirt contamination affecting the hydraulic movements.

Additionally, the AMFS provides the Maintenance Manager with the documentation for each individual asset. <u>The reduced "Paperwork Shuffle" was a key selling point for this application</u>.

STATIONARY OFF-LINE FLUID CONDITIONING UNITS

KLS / KLD

OLF Compact

OLF Series

Offline Kidney Loop Filtration Skids

- Stationary systems for permanent installation on hydraulic reservoirs
- Flow Rates to 20gpm and Fluid Viscosities to 15,000SUS
- Fluid Conditioning Options available
- High efficiency, high-capacity elements for dirt and/or water removal

X-Skid Series Filter Skid Filtration

- Protects and extends life of expensive components
- Minimizes downtime and maintenance costs
- Units from **17-82 GPM** capable of handling **viscosities up to 25,000 SUS**
- Many component combinations and variable starter options allow for flexibility to meet user requirements
- **Optional Staged Filtration** through use of dual standard or high-capacity filter housings
- **High DHC Elements:** up to 1000 grams of dirt depending on element
- Sample valves at filter base
- Integral drip pan with drain plug prevents oil from spilling on ground
- **Optional 4 wheeled cart** for product portability

X-Skid Series Filter Skid Filtration

Filter Skid features:

- Particle Counter (CS 1210)
  - Displays codes per ISO 4406:1999 to screen
  - Fault recognition for flow and counting faults
- Saturation Sensor (AS 1000)
  - Measure relative humidity of oil
  - Alarm if level is too high

Filtration combined with Monitoring offers a complete and advanced diagnostic Preventive Maintenance system.

X-Skid Series Filter Skid Filtration

Filter System Automation:

Filter Skid features:

- **Optional Touch screen panel** (HMI) allows easy interface for:
  - Setting ISO shutdown points or continues operation
  - Displaying relative humidity, temperature of oil
  - Displaying maintenance lights, e.g. change element indicator

- Available with **remote monitoring, operation and setting** via Internet Website

X-Skid Series Filter Skid Filtration

X-Skid – Application: Bulk Fluid Storage

- State of the art system will not only ensure clean oil to equipment, it also:
  - Filters and monitors incoming oil
  - Measures contamination levels
  - Records data

- This one piece of equipment reduces the need for additional measuring equipment and tests, lowering the overall cost of maintaining oil cleanliness

FLUID CONDITIONING UNITS

TRITON-A

TRITON-E

NAV30

Positive Pressure Dehydrator

- Water Removal and Filtration of hydraulic reservoirs
- Flow Rates from 1.5 to 22 gpm with variable flow options available; Viscosities to 500cSt
- Essentially *Maintenance Free* – only change filter elements and breathers

Vacuum Dehydrator

- Water Removal, Degassing and Filtration of hydraulic reservoirs
- Flow Rates 5 & 30 gpm; Viscosity to 700cSt
- Dry Running Claw Pump with yearly maintenance

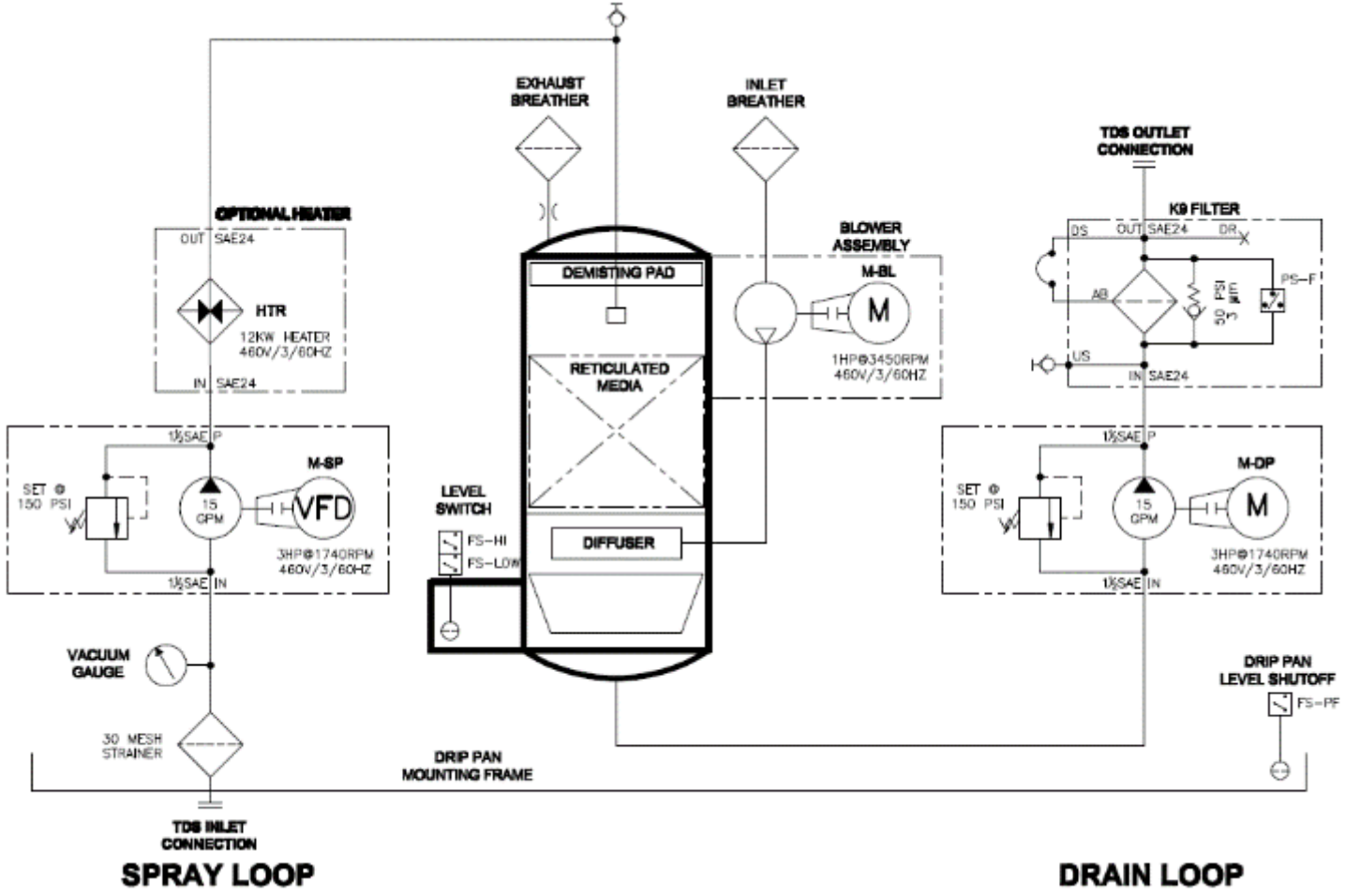
TDS-A Triton Dehydration Station®

- Flow rate: **1.5 gpm**
- For fluids up **75 to 1000 SUS**
- Very simple operation
- Attainable water content <50 ppm
- **Very low maintenance** (no vacuum pump)
- Patented with superior water removal capabilities compared to any product currently offered
- **Aqua Sensor with display standard**
- High Efficiency Filtration
- Connection Points at same location

TDS-E Triton Dehydration Station®

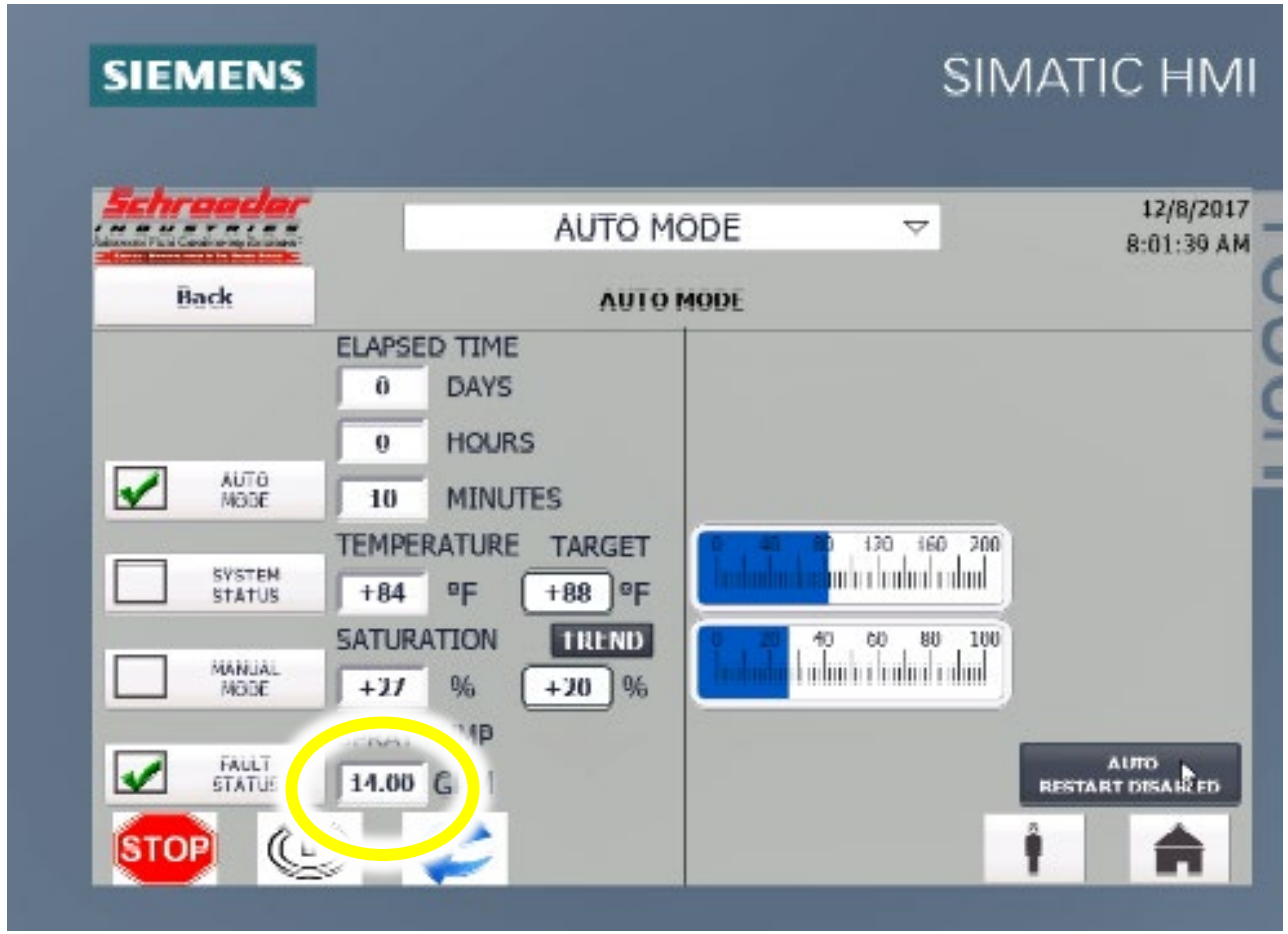
- Two gear pumps run continuously; outputs are balanced (no cycle)
- The fluid is then pumped from the reaction chamber and returned to the system
- Schroeder Industries has a US Patent for this technology

TDS-E



TDS-E 3-15 Variable Flow Rate Option

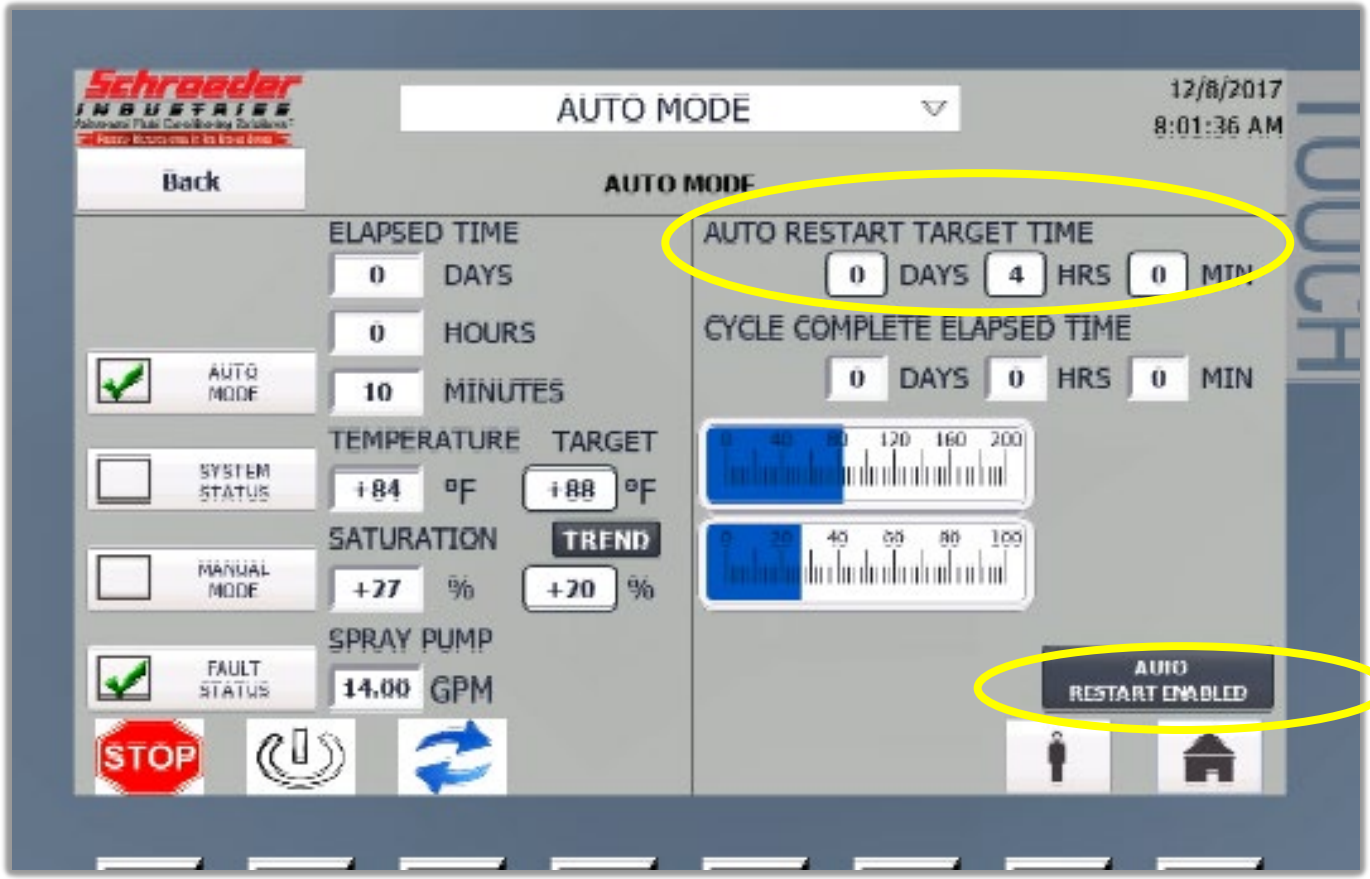
- Allows the unit to operate on reservoir sized from 55 - 4000 gallons.
- Flow rates are adjustable. Desired flow rate selected in the start-up screen.
- Flow rate can be adjusted while in operation in 1-gallon intervals.



TDS-E | Auto Restart Function

New PLC has added function for “Auto Restart”

- After target saturation levels are achieved the Triton E automatically shuts down.
- The new “Restart” function allows users to set time intervals that for the Triton to restart and check saturation levels.
- If saturation levels are exceeded, unit will continue to operate until desired level achieved.
- If levels are below, the Triton shuts down after 10 minutes runtime.



Application Success – TDS-E

BACKGROUND:

- A domestic stainless-steel producer was experiencing failures in their water-cooled heat exchanger leading to high concentration of water present in their hydraulic fluid.

PROBLEM:

- With the reoccurring problem of water ingression into the hydraulic fluid, the producer rented a dehydrator from Des-Case. Unfortunately for the customer, the rented equipment made little impact on the reduction of water concentration in the fluid, after running the unit for one and a half weeks.

SOLUTION:

- A TDS-E Dehydration Station® was sent from on a Demo agreement with the customer replacing the competitor's equipment.

RESULTS:

- By conditioning the customer's fluid with the TDS-E, and with Schroeder's knowledge on where to appropriately apply offline suction and discharge to the customer's fluid reservoir, their hydraulic fluid water saturation was reduced from 100% to 50% in just 15 hours of operation. Ultimately, the customer was able to reach and maintain a saturation level of 30% with the TDS-E effectively and efficiently.

NAV Series Vacuum Dehydrators

The Schroeder NAV Vacuum Dehydrators provide the technology to dewater/de-gas and filter hydraulic and lubrication oils.

Water, Gas and Solids removal

- Separation of 100% free and 90% of **dissolved water**
- Removal of 100% free and 95% **dissolved gases**
- Efficient filtration 39” QF housing
- Flow rate 30 or 5 gpm, Easy operation with the PLC controller
- User friendly touch screen diagnostics
- Standard Water Sensor provides % water saturation
- 15 KW fluid heater

For complete cleanliness control from start to finish:

1) Assure the fluid being used is clean to start
   - Filtered from delivery point to point-of-use
2) Assure the components supplied are clean
   - Free of oil, dirt, packaging material, etc.
3) Assure not to Build-In contamination in manufacturing and assembly
   - Proper filtration and contamination control measures are being used

At the end of the day (or end of the assembly line) the best way to assure that the desired ISO cleanliness level is reached is to include an offline filtration system.

Filter Systems can also build custom solutions or provide standard units to help get your customers started.

Filter Systems Quick Delivery Program

Filter Systems stocks standard items for Quick Delivery

- **1-2 days for Filter Carts / Sensors**
- **Less than 1 week for Dehydrators**





Filter Systems has initiated an equipment rental program in 2021.
We have the following
equipment available

- NAV 30 GPM Vacuum dehydrator
- TDSE 22 GPM positive pressure dehydrator
- TDSA 1.5 GPM dehydrator
- FSA 3-8 GPM filter cart with CS monitor
- VMU 4 Varnish Mitigation Unit

Rental Program Details

- All rental equipment is managed and housed in our Leetsdale, PA office.
- Customer must fill out rental agreement form and send in a PO for rental terms
- All equipment is designed and manufactured in the USA.
- End User is responsible for freight cost to and from Leetsdale PA
- Dehydrators and Filter Cart will come with connection hoses and power cables.
- Our preferred rental period for dehydrators is 1 month.
  - FS filter cart can be rented 2-weeks at a time, if necessary.
- All dehydrators come with new elements and breathers.
  - Highly recommend that customers purchase spare elements at time of rental.
- All equipment will be shipped in a heavy-duty crate. End user must use the same crate to return the equipment to SI Leetsdale.

Schroeder UNIVERSITY

THANK YOU FOR YOUR ATTENTION!

Together we Succeed