



ENVIRONMENTAL PROTECTION TECHNOLOGIES



Oil Pollution Abatement / Oil Spill Prevention Products

NAG Business Profile



- **HQ Norfolk, VA**
 - Founded 1999
 - CA, FL, MD, TX/LA
 - Global Service Partners
- **Oil Spill Prevention Systems**
 - Radar Level Sensors
 - LevelLogix Tank Mgmt Software
- **Environmental Systems**
 - NAVSEA CRADA Partnership
 - Oil Content Monitors
 - Oily Water Separators



**UV Fluorescence
Oil Content Monitor**

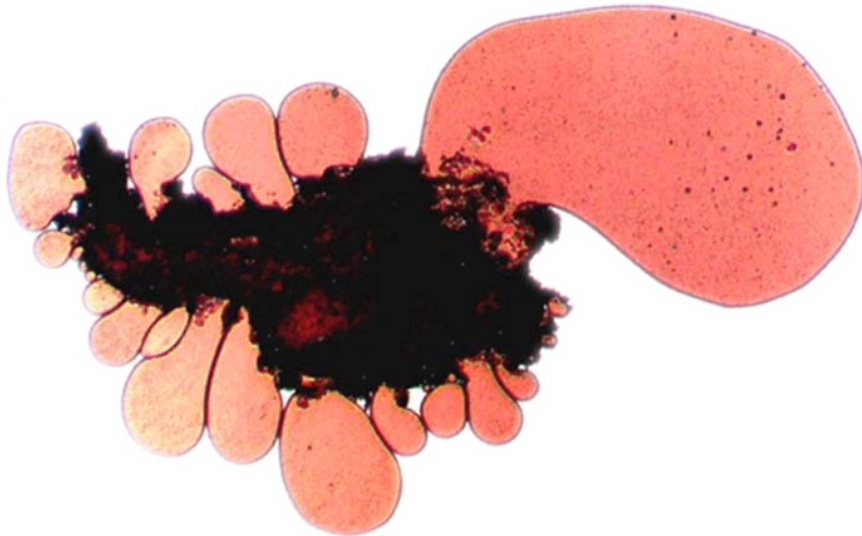
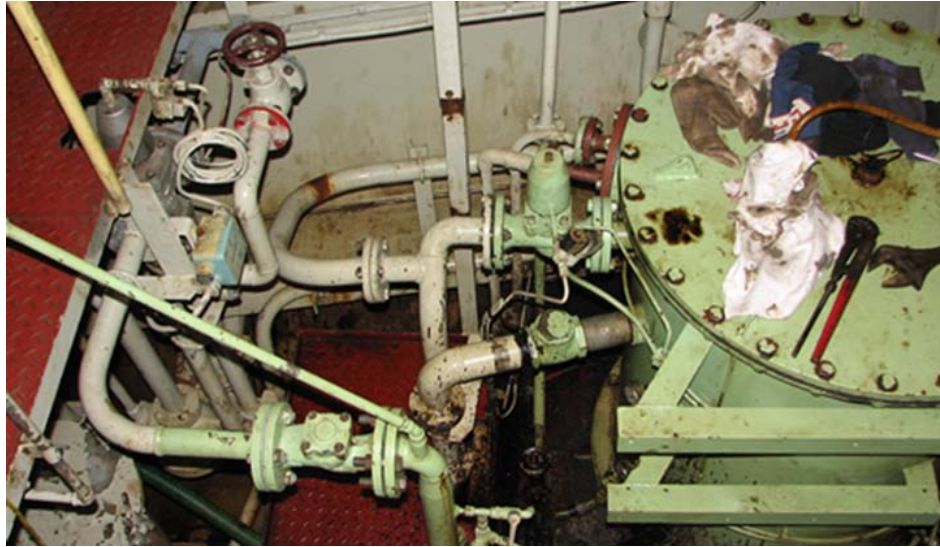


**IMO MEPC 107(49)
Oily Water Separator**



- **NAG markets - US Navy, USCG, MSC, Commercial Marine vessels**
- **NAG global support - Asia, Middle East, Europe, S. Pacific**
- **NAG turn-key systems installations and programming**

Problem: OWS in Constant Re-circ



- **IMO MEPC 107(49)**



- *Emulsified Oils*

- **Detection Challenges**

- Old Ships, Dirty Bilges
- Rust, Soot, Silt, Ash
- Surfactants, Cleaners

- **Technology Constraints**

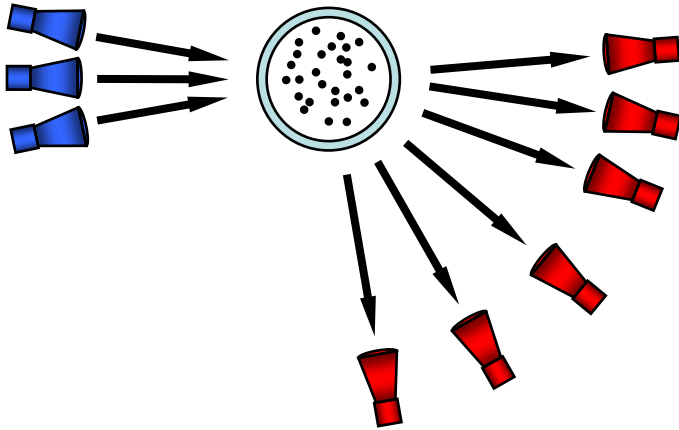
- Light Scatter Only in 2005
- Fluorescence in 2008

- **Problem is most likely the OCM, not OWS**

- Keeps OWS in Re-circ

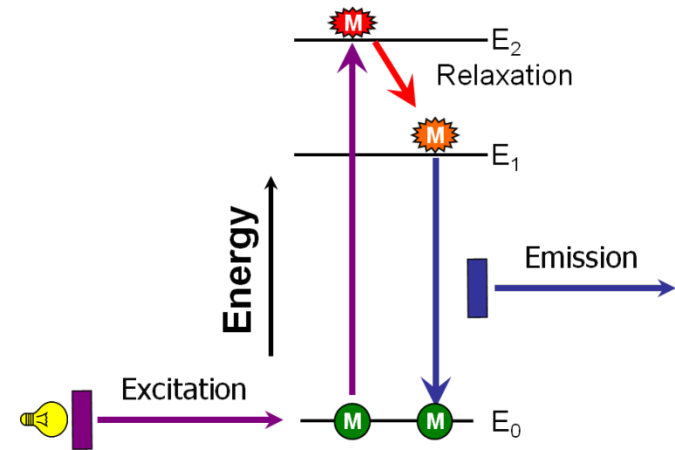


Light Scatter Technology



- Principle: Oil reflects and refracts light at predictable angles
- Cannot discriminate between solids or detergents
- False high from solids
- False high from detergents

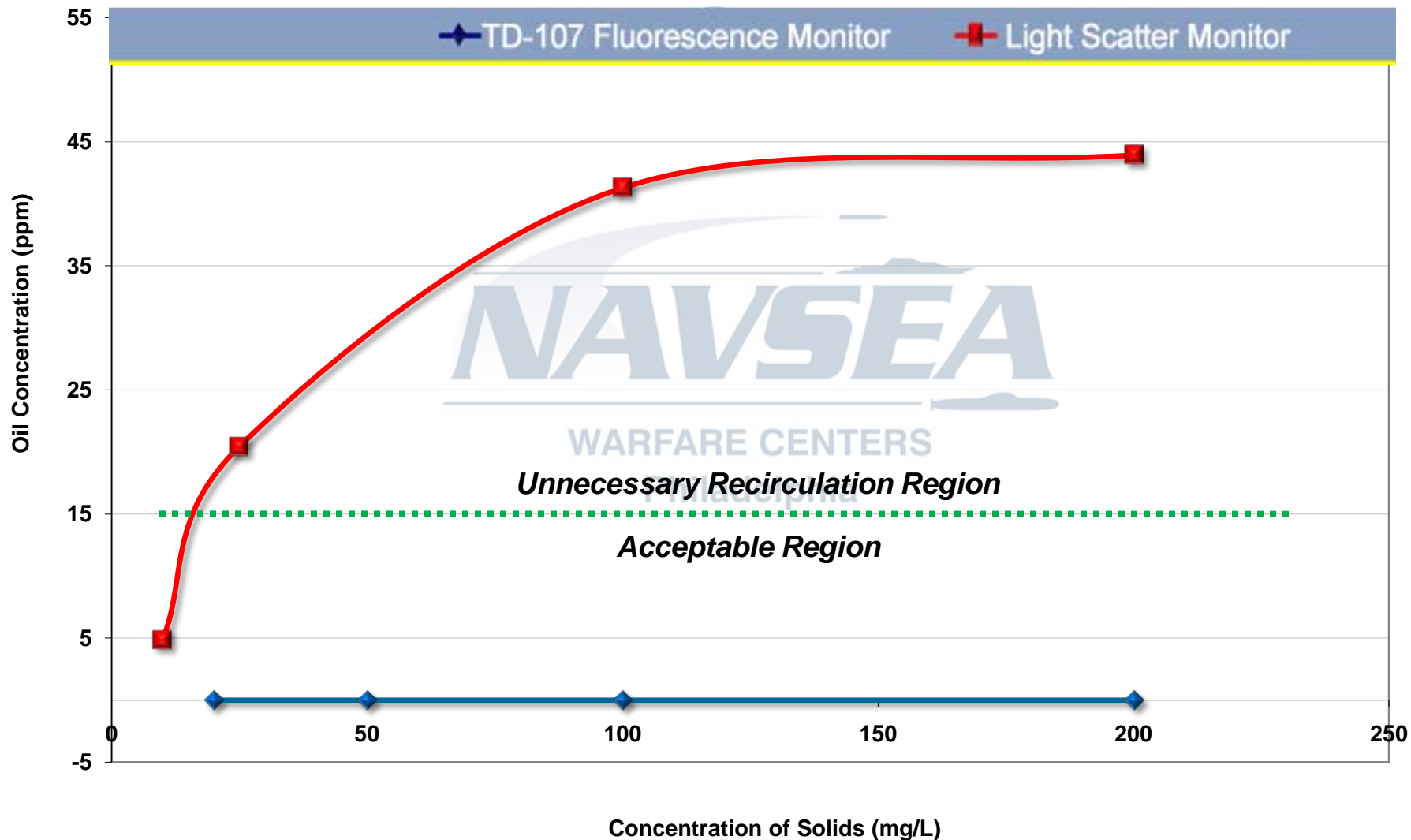
Fluorescence Technology



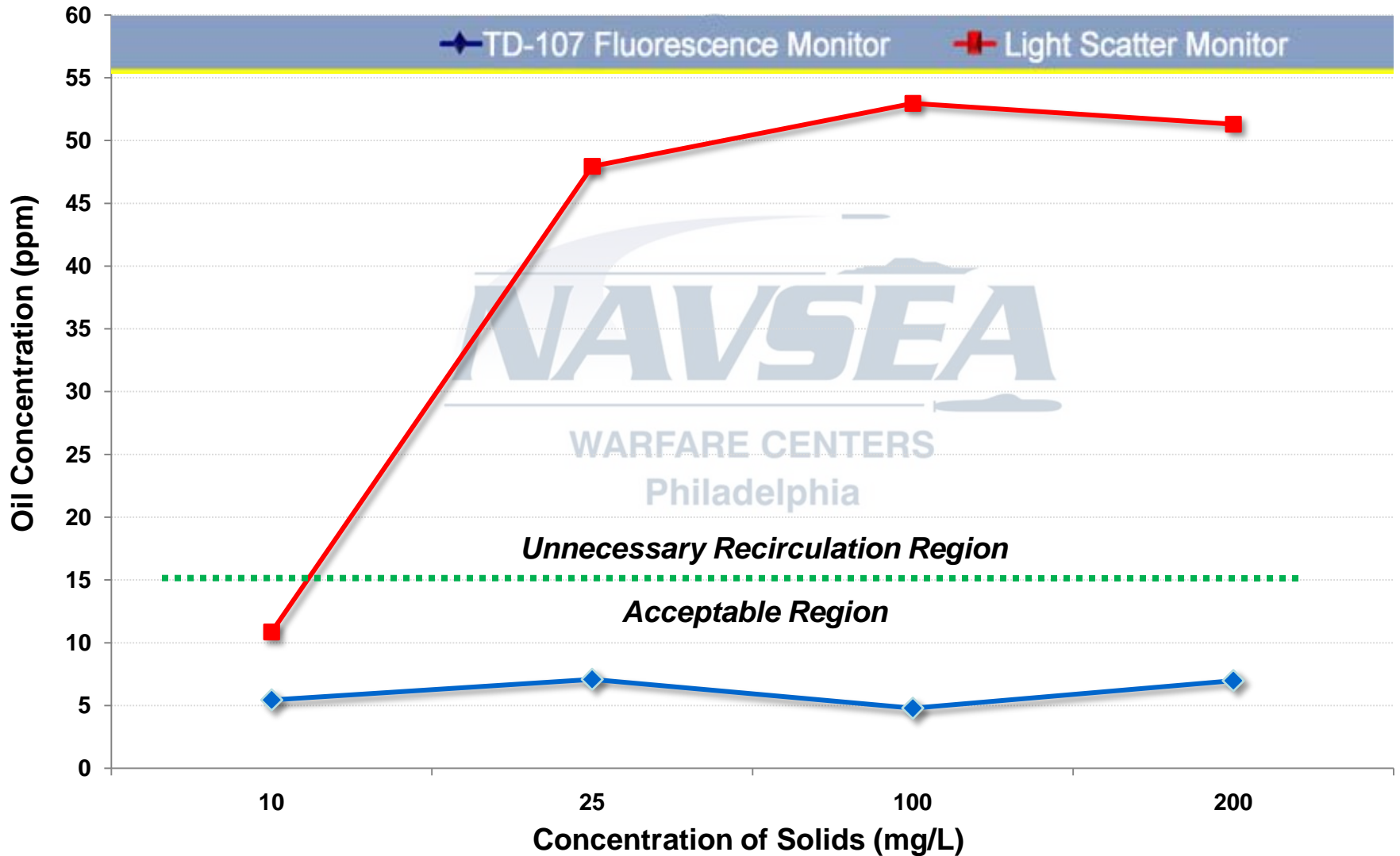
- Principle: Oil absorbs and emits energy at specific wavelengths
- Only oil will fluoresce at specified wavelengths
- Ignores solids
- Ignores detergents

NAVSEA Solids Test at Zero ppm Oil

Solids Interference Test (Comparison with no oil injection & Light Scatter OCM)

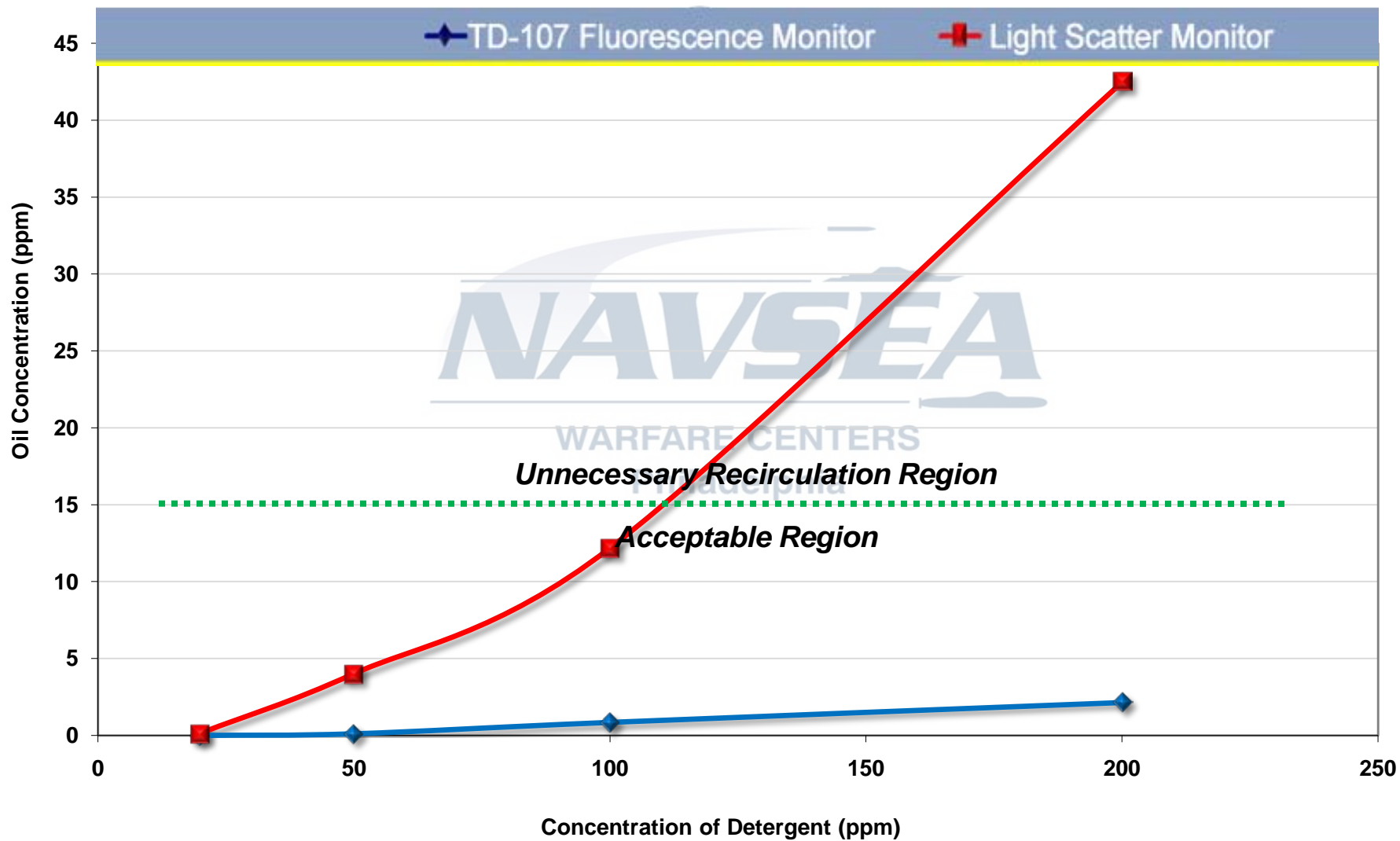


NAVSEA Solids Test at 8 ppm Oil



NAVSEA Detergents Test Zero ppm Oil

Detergent Interference Test (Comparison with no oil injection & Light Scatter OCM)



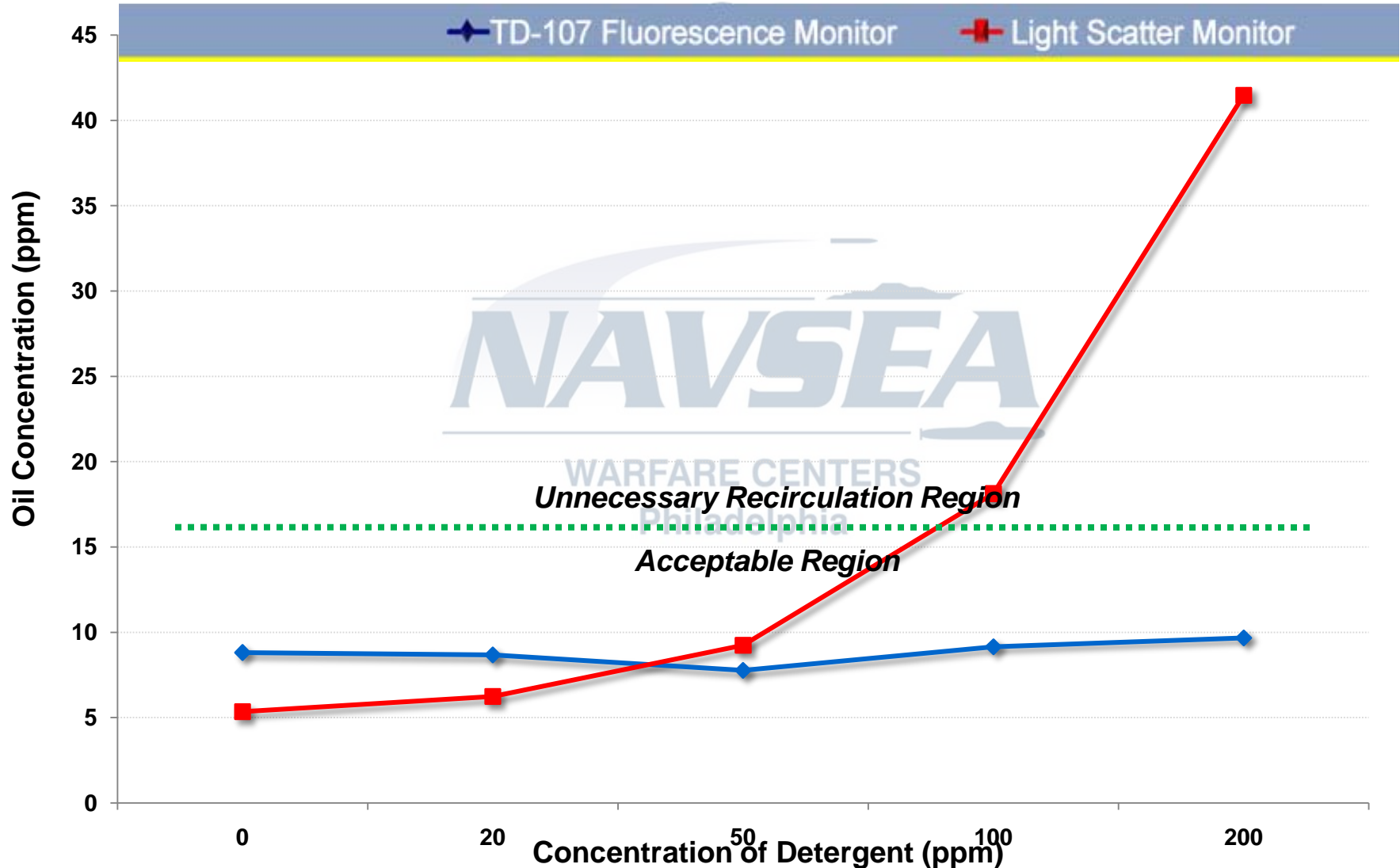
Unnecessary Recirculation Region

Acceptable Region

NAVSEA Detergents Test 8 ppm Oil



Detergent Interference Test (Comparison with 8ppm oil injection & Light Scatter OCM)



Concentration of Detergent (ppm)

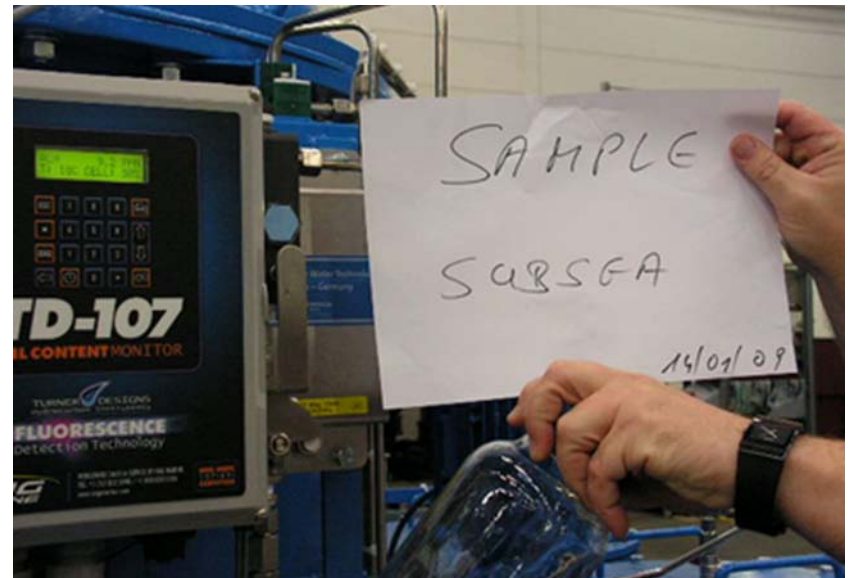
OWS Manufacturer's Test

- **Major OWS OEM**
 - Head to Head Lab Testing
 - TD-107 superior to light scatter in all tests
- **'Real Life' Test**
 - Difficult customer bilge application
 - EE (error!) Lightscatter results
 - TD107 9ppm
 - Independent ISO Lab testing confirmed 9ppm results
 - Customer buys TD-107s for fleet



Tests with different kinds of liquids
Liquids were mixed for 30 seconds@500rpm

Procedure	Light Scatter	TD-107
Water/Iron Oxide 800ml / 0.1g	13 ppm	1ppm
Water/Iron Oxide 800ml / 0.2g	27 ppm	1ppm
Water/Iron Oxide 800ml / 0.5g	EE ppm	1ppm



TD-107 Features

- Accuracy down to the parts per billion detection level
- Downloadable history via USB
- Self-diagnostic Cell Condition Monitor
- 4-20 mA, standard alarm relays
- Pre-wired with Pigtail Connectors
- Can retrofit to any legacy OWS
- Simple Maintenance – Injectable cleaning solution



TD-107 Benefits

- **Decrease pier-side disposal costs**
 - Process your oily waste at-sea
- **Improve OWS efficiency**
 - No wasteful recirculation because of solids
- **Retrofit to any legacy OWS**
 - Fluorescence OCM can solve OWS problems
- **Extends the life of your OWS**
 - Less needless recirculation on your coalescer
- **No need for special chemicals**
 - Unaffected by surfactants/detergents



Key Takeaway: Upgrading to a Fluorescence OCM is much easier and cheaper than wholesale replacement of the entire OWS system.

TD-107 Partner List



• Maersk Lines



• Crowley Maritime



• BP Shipping



• Intl Ship Holdings



• Subsea 7



• Interlake Shipping



• Princess Cruises



• Central Marine



• Carnival Cruises



• US Navy



• Matson Navigation



• MSC



• ABB (Wind Platform)



WARFARE CENTERS
Philadelphia



- **CRADA Partnership for COTS OWS**
 - May 2006
- **NAG Introducing RWO to US Navy**
 - 11,000+ systems installed
 - 30 Years in OWS specialty
- **NAG modifying RWO for US Navy**
 - USCG Certified
 - IMO MEPC 107(49) certified
 - Eventual Mil-Spec Shock/Vibe testing
- **Global network of strategically placed engineers and support personnel**
- **100% subsidiary of Veolia Water**
 - \$50 billion in 2008 revenues

Coalescer 1st Stage



- **Polypropylene Weave**
- **Gravity Separation**
- **Durable with 50 micron filtering effect**
- **Inexpensive**

Activated Carbon – 2nd Stage



- **Activated Carbon**
- **Proven**
- **Inexpensive**
- **Cartridge Based for easy swap out**

Fluorescence + Intelligent Discharge



PLC Logic constantly checks if effluent is below IMO limit (15 ppm)

Fluorescence Oil Content Monitor unaffected by solids or detergents

If effluent is less than 14ppm, then 2nd stage filters are bypassed.

Intelligent Discharge + Fluorescence = Less Lifecycle Cost!

Compact Footprint, Simple Installation



2.2 GPM
507 lbs



4.4 GPM
573 lbs



6.6 GPM
749 lbs



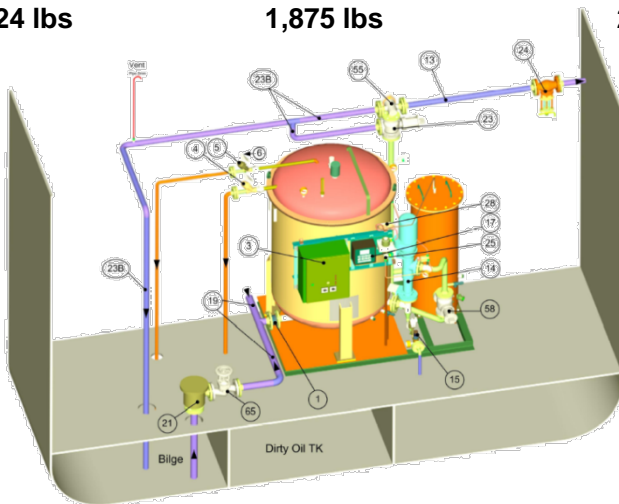
11 GPM
1,124 lbs



22 GPM
1,875 lbs



44 GPM
2,645 lbs



- **Delivered skid-mounted with all necessary accessories and controls**
- **Fully automated**
 - Automatic PLC controls
 - Choice of OCM technology
- **Shipped complete with motor, pumps, piping and controls**
- **Components can be broken down in order to fit through a hatch and remounted**

Benefits of the TD-107 System



- **UV Fluorescence OCM**
 - Ignore solids, decrease pier-side offload costs
- **Intelligent Discharge System**
 - Decrease consumable costs
- **Activated carbon cartridges**
 - Most inexpensive consumable cost
- **Approvals**
 - IMO MEPC 107(49) Certified
 - USCG approval
- **Shipped completely skid mounted**
 - Motor, pumps, piping and controls included
 - Fully automated, minimal maintenance
- **Excellent manufacturing experience**
 - over 11,000 in world's largest fleets