



NAVY OIL/CONTENT MONITOR EXPERIENCE

How In-service Navy Oil Content Monitors (OCM) Work

Naval Surface Warfare Center, Carderock Division
Environmental Quality Systems Department
(215) 897-7639

In-Service OCMs

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□ **Model ET-35N**

- ◆ *First production Navy OCM procured from Parmatic Filter Co. (1988)*
- ◆ *235 units are installed throughout the fleet*
- ◆ *Presently used to back fit and forward fit OCM installations*

□ **Model OMWW0300**

- ◆ *Second Acquisition Contract competitively awarded to World Water Systems Inc. (1994)*
- ◆ *The 58 original units installed are being replaced by ET-35N due to reliability problems*

□ **Commercial of the Shelf OCMs installed by shipbuilders**

- ◆ *Model SRS BA-1: installed on some DDG-51 Class ships*
- ◆ *HF Scientific (Same as Model SRS BA-1): Installed onboard PC-1 class*
- ◆ *Both OCMs are being replaced by ET-35N*

How They Work

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Technology Summary

<i>OCM Model</i>	<i>Principle of Operation</i>	<i>Measuring Mechanism</i>	<i>Emulsification</i>	<i>Interference compensation?</i>	<i>Cleaning Mechanism</i>
ET-35N	<i>Light scattering & Transmitted / Turbidity</i>	<i>Difference between the ratio of light scattered/ transmitted before and after emulsification</i>	<i>High ultrasonic energy</i>	<i>Yes</i>	<i>Ultrasonic Vibration and manual flush</i>
OMWW0300	<i>Light scattering / Turbidity</i>	<i>Difference between the light scattered before and after emulsification</i>	<i>High speed pump</i>	<i>Yes</i>	<i>Automatic flush</i>
SRS BA-1 / HF Scientific	<i>Light scattering / Turbidity</i>	<i>Single light scattered measurement</i>	<i>None</i>	<i>No</i>	<i>None.</i>

Model ET-35N OCM

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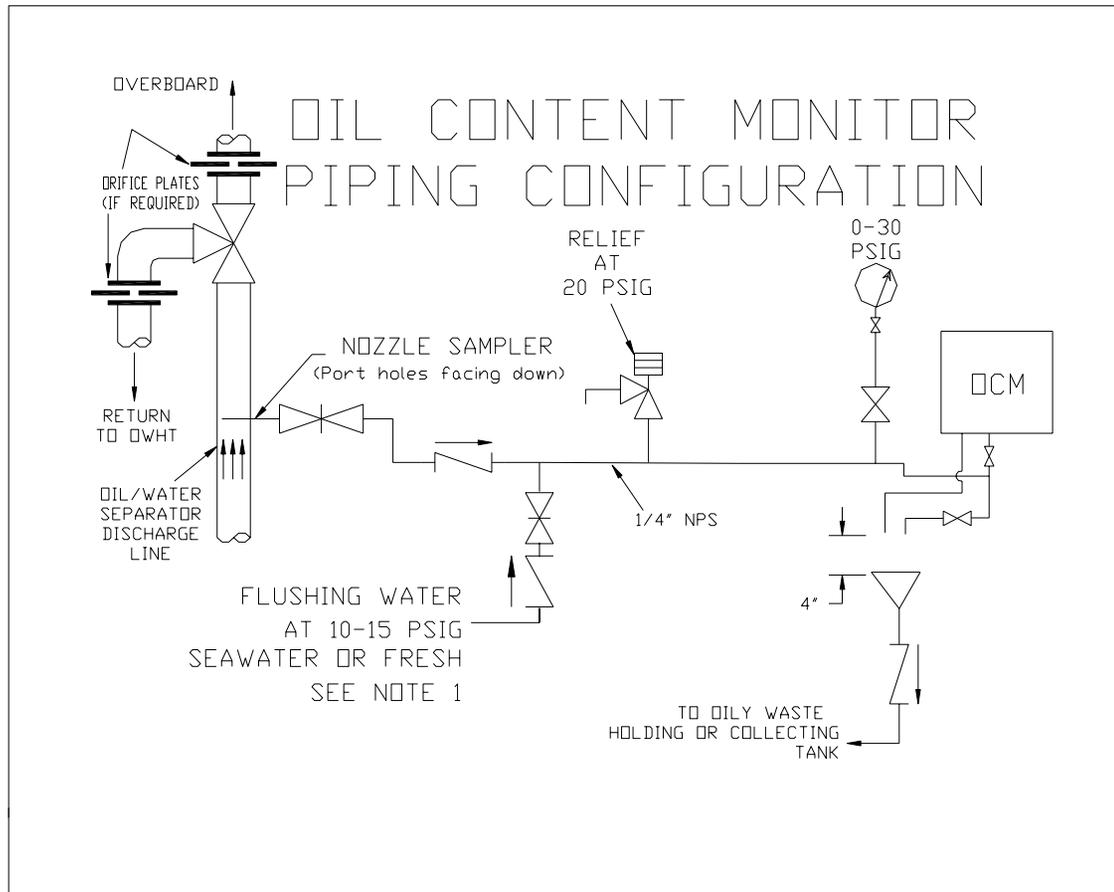
- ❑ Design based on commercial of the shelf OCM modified to meet Navy OCM specifications.
- ❑ First Article Test;
 - ◆ *Complete test performed by manufacturer.*
 - ◆ *Navy validated performance and reliability tests.*



Model ET-35N

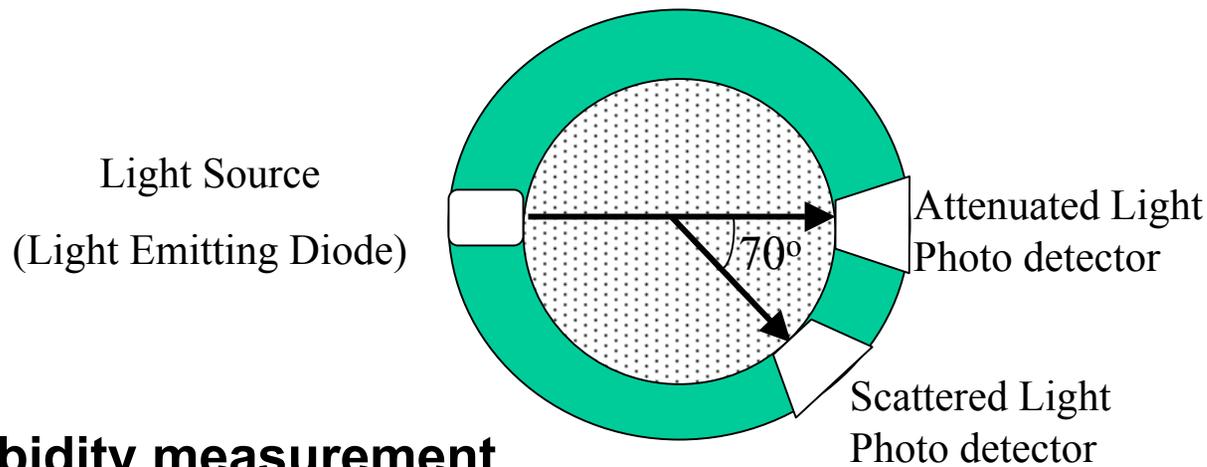
OCM Installation

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ET-35N Sensor (Turbidity Meter)



□ Turbidity measurement

- ◆ *Light emitting diode is used as the source of light*
- ◆ *The attenuated light is measured by a photo detector located at 0 degrees*
- ◆ *The light scattered is measured by a photo detector located at a 70° angle*
- ◆ *Turbidity is measured as the ratio of light scattered / light attenuated*

□ Oil content determination

- ◆ *Difference between turbidity measurement before and after emulsification*

Technology Advantages

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- ❑ **Compensates for low concentrations of interferences by taking a background measurement:**
 - ◆ *Particles, Gas Bubbles, Foam, Color, others*
- ❑ **Compensates for sampling cell deterioration**
- ❑ **Can determine high concentrations of interferences that may affect OCM readings**
- ❑ **Way to determine sensor's failure or abnormal conditions by taking different electrical measurements per sample:**
 - ◆ *Low emulsification energy*
 - ◆ *Low or no flow condition*
 - ◆ *Emulsified Oil*

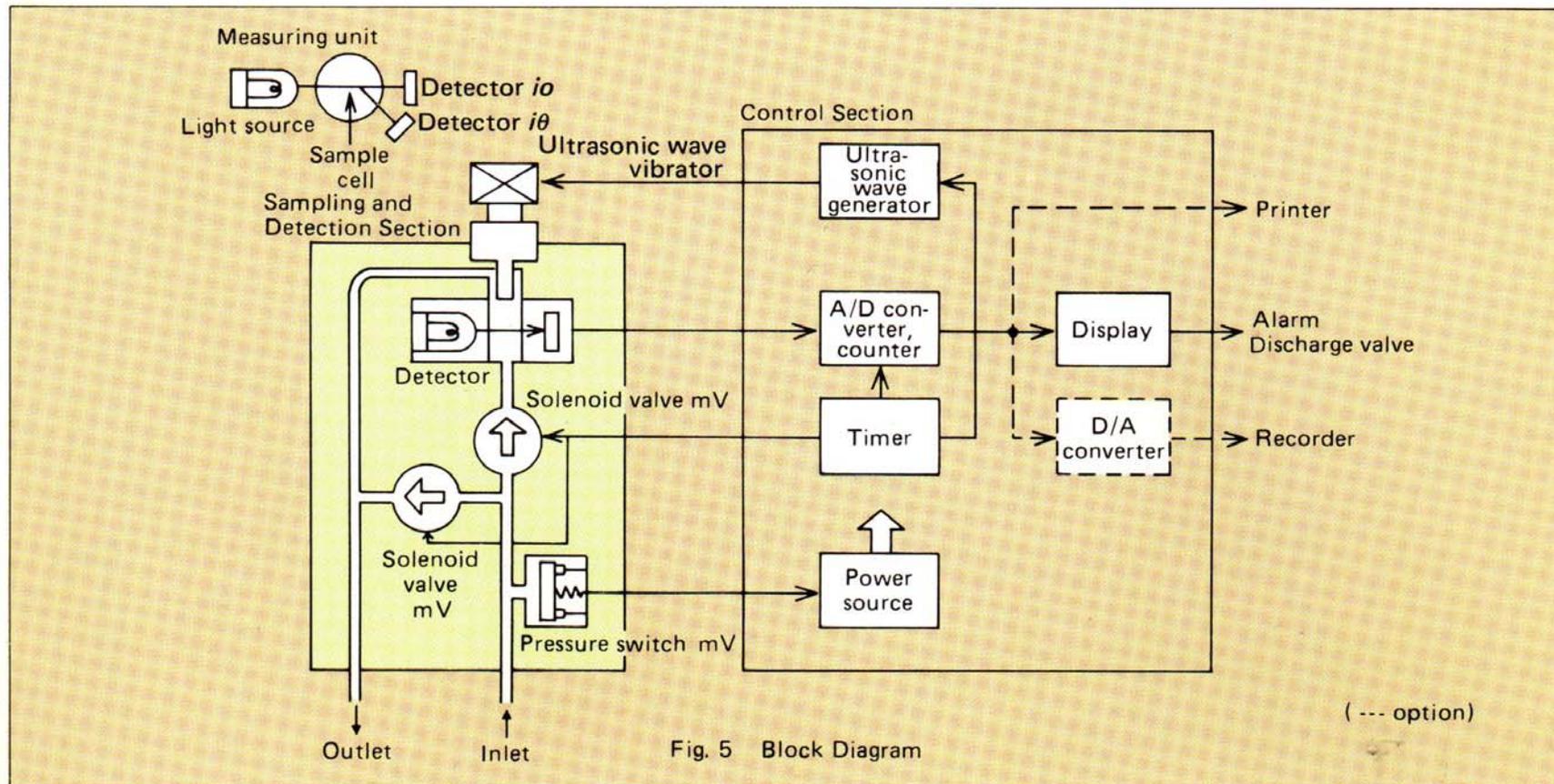
Model ET-35N OCM

□ 15 Seconds sampling Cycle

- ◆ *Sample enters sampling cell*
- ◆ *Debubbling with low ultrasonic energy (Approximately 5 Khz)*
- ◆ *Turbidity measurement before emulsification (background)*
- ◆ *Oil emulsification with high ultrasonic energy (50 Khz)*
- ◆ *Debubbling with low ultrasonic energy*
- ◆ *Turbidity measurement after emulsification*
- ◆ *Oil concentration determination*
- ◆ *Electrical signal displayed as PPM*
- ◆ *PPM display holds until completion of next cycle*

Sampling/Detection Sequence

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- ❑ **Interferences that may affect the OCM measurements**
 - ◆ *Particles*
 - ◆ *Gas Bubbles*
 - ◆ *Foam*
 - ◆ *Emulsified Oil*
 - ◆ *Color*
 - ◆ *Low or no flow*
 - ◆ *Low emulsification energy*

- ❑ **ET-35 N compensates for low concentrations of interferences by taking a background measurement**

- ❑ **Provides warning indicators and control functions for sensor failure or large concentrations of interferences**