

SOM-A

Automatic Spread Oil Measuring Apparatus



■ Outline and Features

In the production line of rolled steel sheet, coating process of antirust oils such as DOS, CSO, ATBC is available and the quality control of the coated oil amount is essential.

This apparatus performs the measurements of small amount of oil coated on rolled steel sheets with the technique called "Hydrophil Balance method". It uses natural characteristics of oil to spread over water surface and can measure such small amount of oil precisely

This apparatus also can be used in the production line of aluminum sheet for the same application.



- ◆ Small amount of oil in the range of μg on a test piece can be measured.
- ◆ Surface film pressure to determine oil volume is detected precisely with Wilhelmy plate method
- ◆ Easy cleaning of the detecting plate.
- ◆ Oil volume can be directly read on LED in the unit of mg/m^2 .
- ◆ The trough is coated with Teflon for easy cleaning and corrosion resistance.
- ◆ Periodical calibration of balancing system can be done by user.
- ◆ Temp. control system allows stable data under the different circumstances in temperature.

■ Partial List of Users

Japan:

Nippon Steel & Sumitomo Metal / JFE Steel / Kobe Steel / Furukawa Electric / UACJ /
Showa Aluminum Can / Toyo Seikan / Toyo Kohan

Overseas:

Ton Yi Industrial (Taiwan & China) / China Steel (Taiwan) / Pohang Steel (Korea) / Shin-Hwa Silup (Korea) /
Perstima Tin Plate (Malaysia, Vietnam) / Baoshan Iron & Steel (China) / Ereğli Iron & Steel Works (Turkey) /
Siderar S.A.I.C. (Argentina) / Siam Tinplate (Thailand) / UACJ (Thailand) / Tinplate Company of India

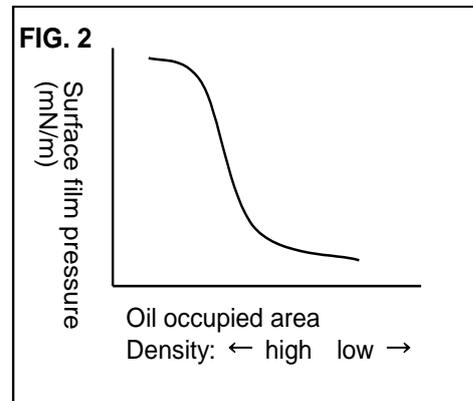
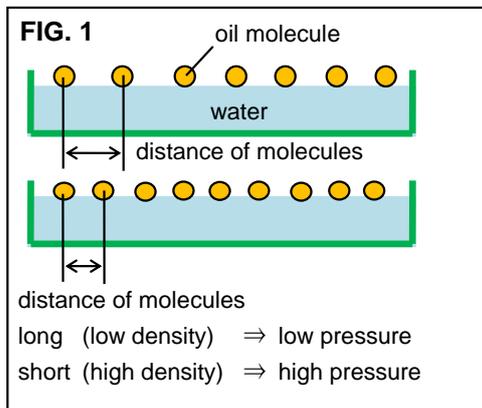
■ Principle

Most oils have property to spread over the water in monolayer status if the area is large enough for oils to spread freely. And the oil spread area should be in proportion to the oil volume (numbers of oil molecules) if the density of the oil molecules per unit area is kept evenly. Therefore, if we can control the density of oil molecules per unit area when oil is spreading over the water, we can determine the oil volume from the relationship between spread area and experimental results obtained beforehand.

How the even density of oil molecules can be controlled?

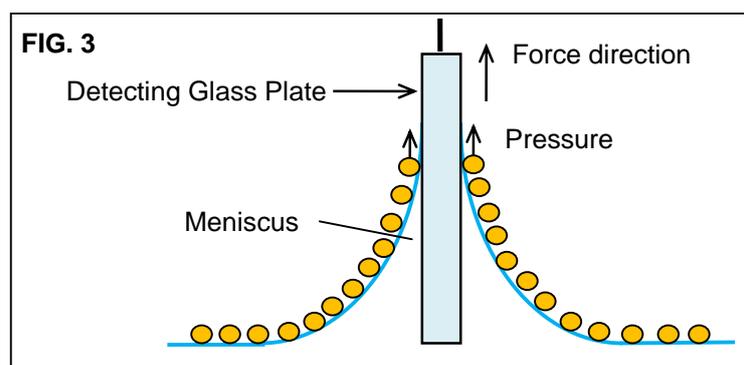
Oil molecules raise pressure when the distance of each molecule becomes close. It is called Surface Film Pressure and that is why the oil molecules spread over the water in monolayer status. (See Fig.1.) And the relationship between the oil spread area and the surface film pressure indicates a constant curve as the graph of Fig.2.

By specifying the Surface Film Pressure, even density of oil molecules can be controlled. Normally the SOM-A sets up the Pressure at 8 mN/m which is called Torque Angle.



How to measure the Surface Film Pressure?

When the bottom of detecting glass plate is immersed in the sub phase water, a meniscus (a phenomenon of water wetting up to the plate surface) is formed as shown in the Fig.3. The oil molecules spread over water are arranged on the water surface and have pressures each other. The pressure gets the glass plate to bring upward, which can be detected by the precise balance.



■ Specifications

<Main Unit>

Power requirements	AC100V Single Phase, 50/60Hz, 2.7kVA
Dimensions	1300 (W)×650 (D)×860 (H)mm (excluding water circulators)

We recommend using purified water as filling water. (In case of using running water; flow rate not smaller than 1L/min, water tap with a certain level pressure, tap diameter from $\phi 15$ to $\phi 15.5$).

*Salt water cannot be used on this standard system.

<Components>

Oil Volume Meter (Operation Box B)

For displaying oil volume and operating automatic sample washing/spreading unit, 3 kinds of oil can be set.

Measuring range	0.3-17.5mg/m ²
Digit & Resolution	0.1mg/m ²
Display method	LED digital display
Accuracy	±2%FS on 35°C basis

* Data based on both faces measurement of a specimen size $\phi 57.3$ mm and DOS oil. Unit "g/BB" is possible.

Actual oil volume on the specimen must be within the range 0.7-50.0 μ g.

Automatic Surface Film Pressure Meter (Operation Box-A & Detecting section)

For detecting surface film pressure, displaying the result, setting the torque angle and operation of the film pressure compressing unit.

Measuring method	Wilhelmy Plate method
Measuring range	0-50.0mN/m (Analog meter)
Accuracy	±0.5%FS

Oil Film Spreading Trough

A trough to pour water and spread oil over the water surface is coated with Teflon for excellent water-repellency. Jacket system is modified inside for temp controlling. Four level adjustment stands are equipped.

Inside dimensions	700(W)×140(D)×5(H)mm
Cylinder section size	$\phi 90 \times 90$ (D)mm

Film Pressure Compressing Unit & Drive Motor

The drive unit of barrier to compress the oil spread area, drain pan and the drive motor.

Compressing speed	300mm/min (fixed)
Dimension	1,120(W)×280(D)×220(H)mm

Environmental Chamber

A case to protect measurement from wind and dust. Metal frame, glass panel slide-door, two fluorescent light sources.

External dimensions	1300(W)×650(D)×700(H)mm
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Automatic Sample Washing/Spreading Unit

An equipment to hold test specimen and dip it into water repeatedly by up/down motion to transfer oil on the specimen into the water.

Hot Water Circulator

For circulating a certain temp water in the jacket of trough.

Temperature range	5°C above room temp. to +95°C
Control accuracy	±0.05°C
Control method	PID
Safety functions	Diagnosis functions (max/min temp abnormality, Heater breakage, Sensor abnormality)
Heater capacity	1kW (SUS316L)
Bath vol./material	5.5L/SUS304
Circulate pump	Max.5L/min
Tube inlet/outlet	$\phi 10.5$
External dimensions	194(W)×306(D)×359(H)mm
Power consumption	1.1kVA

Hot Water Supplier

For providing a certain temp water for spreading oil.

Temperature range	About +35°C to +70°C
Control accuracy	±5.0°C
Control method	Thermistor
Safety functions	Temp fuse, manual restoration
Heater capacity	1.1kW
Pressure	0.08MPa
Bath volume	25L
External dimensions	434(W)×395(D)×395(H)mm
Weight	About 38kg (when filling water)

Standard Accessories

Teflon Coated Barrier	2 pcs (STD) + 2 pcs (spare)
Micro-syringe 250 μ L	1 pce (STD) + 2 pcs (spare)
Glass Plate	1 pce (STD) + 14 pcs (spare)
Calibration weight 200mg	1 pce (STD) + 1 pce (spare)
Tubes ϕ : inner diameter	Silicone tube: $\phi 15 \times 5$ m & $\phi 10 \times 10$ m Pressure vinyl tube: $\phi 10 \times 5$ m

*The specifications and designs are subject to change without notice.

2002



<http://www.face-kyowa.com>

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