

Suggestion for machinery / product to maintain the best function and productivity

# Contamination control tool of Oil **MICRO SEPARATOR**

**SAN-S** **PAT·PATPEND**  
Micro Separator



SAN-S Micro Separator  
TYPE: MSR-200



Support an environmental management system  
 **SAN-S INDUSTRY CO.,LTD.**

SAN-S Micro Separator



# How is the condition of your machinery?

Does your machinery suffer from early failures or reduced accuracy?  
Does your machinery suffer from breakdowns or seizures?  
Are you plagued with frequent repairs or parts replacements?  
Does your machinery suffer from clogged filters, oil leaks or require frequent oil changes?

These problems are caused and made worse  
by contaminants in the oil.

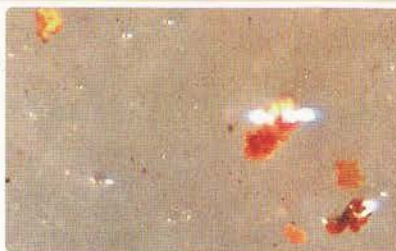
□ Microscope image showing contaminants of hydraulic oil  
over a period of time (Example of hydraulic oil without contamination control)

Contaminants on a 0.8 micron  
membrane filter

Contaminants attracted to the end of  
magnetized needle in the oil on a slide glass

## New Oil

Even in new oil, the purity of oil can be degraded due to contaminants from containers, atmosphere, or from degenerated oil particles. The purity of new oils normally falls in the range of the NAS-9.  
( See page 3 )



## Flushing Oil

Large quantities of adhering particles are generated and mixed in the oil during machining and assembly processes.



## Oil under operation

Minute contaminants are generated at the areas where friction is present or consists of transformed substances.



## Change required oil

The contaminants in this oil consist primarily of accumulated abnormal abrasion formations, including dense formations, transformed and mixed substances, etc.



100μm

100μm



# Contamination Control ⇒ Reduced Cost · Reduced consumption of materials and energy · Less maintenance

For humans, our health depends on keeping our blood clean.

Machines, as well, require contamination control of lubrication system to maintain high accuracy and high operation efficiency.

## □ Purpose of Contamination Control

The purpose of contamination control is to exclude all substances ( contaminants ) and energy that adversely affect the relevant machines or products, and to maintain the functions and productivity at the highest level possible.

## □ Development of Contamination Control Technology

In original research in 1963, SAN-S Industry Co.,Ltd. working with Nippon Steel Corporation led to the discovery that machinery breakdowns occurred in proportion to a very small amount of minute contaminants. In response SAN-S Industry Co.,Ltd. developed the unique contamination control system ( which cleans hydraulic oil and lubricating systems by using the magnetic field of the Micro Separator ). Since then, the Micro Separator and Cleaning Tank System have shown actual reduced consumption of materials and energy, and less maintenance in various industrial fields.

## □ Results without / with Contamination Control

### Example of Hydraulic Oil Without Contamination Control

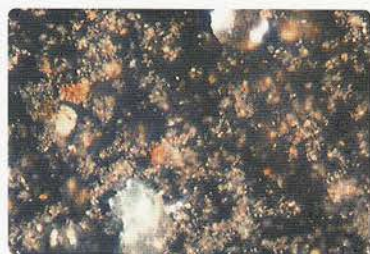


### Example of Hydraulic Oil With Complete Contamination Control (Micro Separator and Cleaning Tank System)



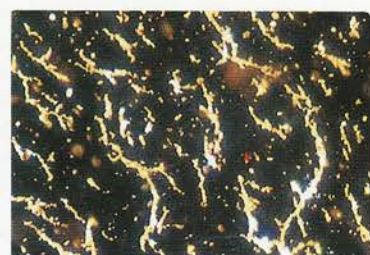


# Cleaning Tank System and Micro Separator



Contaminants in oil

100μm

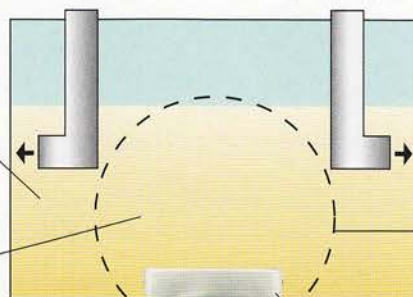


Collection of contaminants

100μm

## Oil Contaminants

Contaminants consist of sludge forming minute particles of magnetic substances, semi-solids and liquids. These contaminants are generated with normal machine operation, and they decrease the lubrication capability of oil.



Magnetic field

Sedation duct + cohesion magnetic field  
Tankage / pump discharge duct full length / duct section

Sampled sludge precipitation on the Micro Separator

## Cleaning Tank System and Oil Purifying Function

Cleaning Tank System is made by installing the Micro Separator, which produces a special magnetic field, in the sedimentation oil laminar part of the tank. The tank therefore entirely works as an oil purifying device.

The magnetic field of the Micro Separator precipitates sludge contaminants and prevents them from circulating and increasing.

Spectral analysis of the Micro Separator separation substances

Fe	Ti	Si	Cu	Cr	Zn	Al	Ca	Ni
4	4	3	3	2	2	2	2	1



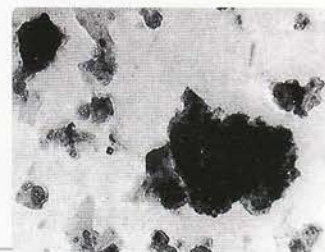
## Advantage of the Cleaning Tank System

- This system separates sludge that a conventional filter system cannot separate, and prevents it from circulating.
- Oil can be purified in the tank only without any need for an extra cleaning line.
- The high-level contamination control prevents such machine troubles as erroneous operations, seizures, seal damage and oil leaks.
- This system decreases the oil and energy consumption, reduces maintenance cost therefore providing nearly maintenance-free operations.



The sludge which is collected on a Micro Separator

100μm



Enlarged electron micrograph of sludge

1μm

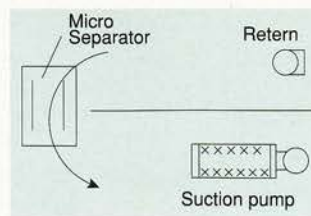
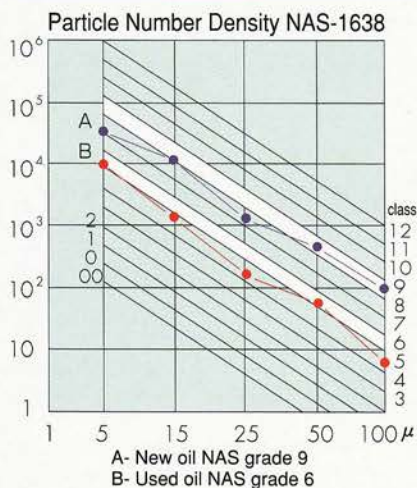
NAS1638 Standard ( Number of Particles in Hydraulic Oil )

Size Classification (μ)	Class													
	00	0	1	2	3	4	5	6	7	8	9	10	11	12
5~15	125	250	500	1,000	2,000	4,000	8,000	16,000	32,000	64,000	128,000	256,000	512,000	1,024,000
15~25	22	44	89	178	356	712	1,425	2,850	5,700	11,400	22,800	45,600	91,000	182,400
25~50	4	8	16	32	63	126	253	506	1,012	2,025	4,050	8,100	16,200	32,400
50~100	1	2	3	6	11	22	45	90	180	360	720	1,440	2,880	5,760
over 100 (including 100)	0	0	1	1	2	4	8	16	32	64	128	256	512	1,024



# Example of Contamination Control using the Cleaning Tank System

- Example of a machine adopting the cleaning tank system from the initial design stage

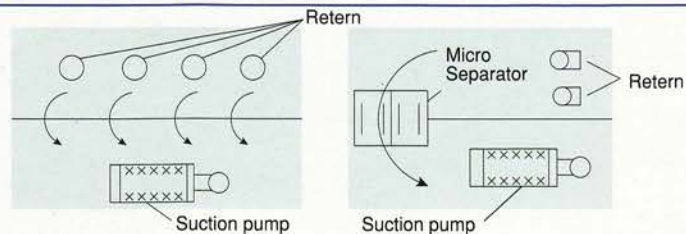
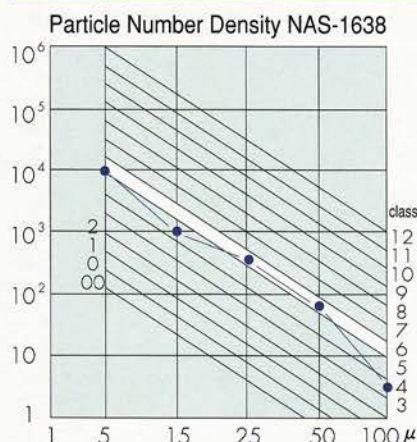


Power Molding Press Hydraulic Oil Unit	
Tank capacity	100 ℓ
Pump delivery	20 ℓ /min
Pump pressure	140kg/cm <sup>2</sup>
Initial structure of tank	U-turn flow structure
Micro Separator	MSR-200 1unit

## Effectiveness

No early failures  
No oil change or resupply for 12 years (as time of writing).  
Continued maintenance-free operation

- Example of a machine adopting the cleaning tank system (rebuilt the tank) after operation started



## Automatic Grinding Machine Fluid Bearing Lubrication Unit

	Before rebuilt	After rebuilt
Tank capacity	250 ℓ	250 ℓ
Pump delivery	195 ℓ / min fixed displacement pump	60 ℓ / min variable displacement pump
Pump pressure	10kg/cm <sup>2</sup>	10kg/cm <sup>2</sup>
Structure of tank	Overflow structure	U-turn flow structure
Micro Separator	Not installed	MSR-200 2units

## Effectiveness

Rate of re-machining	Approximately 1/10
Energy ( power / compressed air ) consumption	Approximately 1/4 reduction
Cost of maintenance and consumable parts	Approximately 1/5 reduction
Oil change	No oil change after rebuilt
Trouble	Such problems as seizure, filter clogging, and cavitation were eliminated.



(PhotoA)

100μm



(PhotoB)

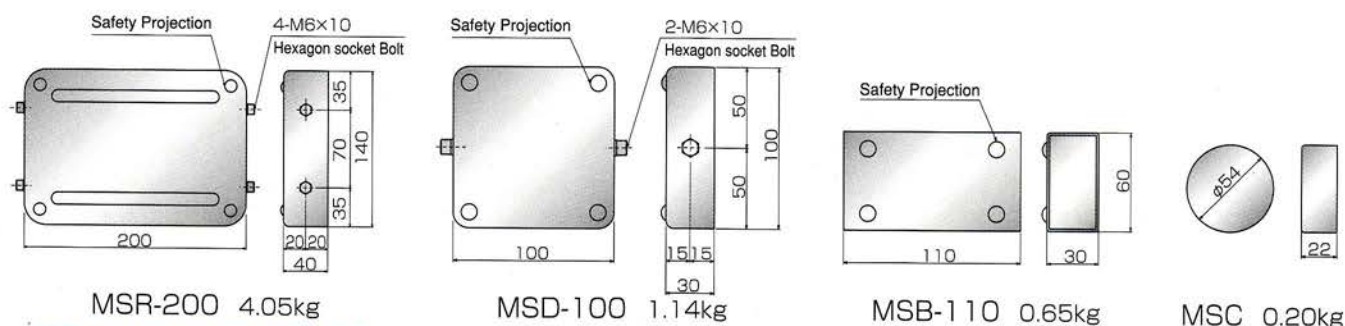
100μm

Oil contamination level before rebuilt was extremely high, and contaminants mainly consisted of large quantities of sludge ( see the PhotoA ). Moreover, the HIAC automatic particle counter could not be used because of over scale. After rebuilt, the level has been able to be maintained at the NAS grade 6 for 5 years (as time of writing). Oil has been kept clean at a high purification level.



# General Specifications of Micro Separator

## 1. Standard type dimensions and weight



## 2. Material

Top and side surface	SUS304
Base surface	Epoxy resin · SS400 · JIS-3101 · SUS304
Magnet	Strontium ferrite
Securing bolts	Steel alloy

## 3. Temperature limit

Normally type (80°C)	MSR-200 MSD-100	MSB-110 MSC
Heat-proof type (150°C)	MSR-200H MSD-100H	

## 4. Applicable oils

(1) Mineral oil base hydraulic oil	—
(2) Synthetic base hydraulic oil	Water glycol · Phosphoric ester · Fatty acid ester
(3) Emulsion base hydraulic oil	W/O · O/W
(4) HWBF	—
(5) Mineral base lubricating oil	Circulating type · dripping type
(6) Cleaning solvent	Oil / water base
(7) Metal rolling oil	Mineral oil, Emulsion type
(8) Coolant for cutting or grinding	Oil / water base Emulsion type
(9) Fuel oil	Shipping

## 5. Micro Separator

The type of oil	The quantity of oil in the tank / MSR-200 1 unit	The quantity of oil in the tank= Q Pump discharge rate ℓ / min= P
Mineral oil base hydraulic oil	~50 ℓ	Q/P=less than 4
Synthetic base hydraulic oil		
Mineral base lubricating oil	100~200 ℓ	Q/P=More than 20

The structure of  
Cleaning Tank System

Make a division board in the oil tank and oil returns by a flow of oil as long flow of the river road sedation type and suction part as the most long distance.

## 6. Maintenance of Micro Separator

- (1) The function of Micro Separator is semi-permanent, and it is not necessary to check or repair.
- (2) Cleaning cycle of Micro Separator  
【For hydraulic oil】 2 to 10 years    【For lubricating oil】 1 to 5 years ( when oil changes )

# Ideal Tank Structure for Contamination Control

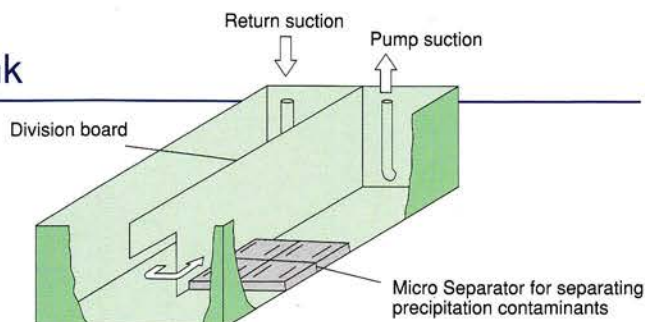
## Micro Separator standard method of SAN-S Industry Co., Ltd. (Cleaning tank system)

- Return hydraulic oil must flow along the division board.
- Micro Separator must be easily removed when maintenance is performed, and it must be installed between the return oil side of the oil tank and the strainer.

### □ Hydraulic oil / lubrication tank

#### Application oil

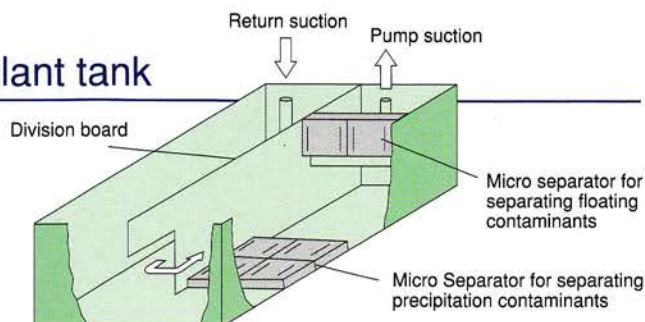
General mineral oil base hydraulic oil  
General mineral oil base lubrication oil  
Fire-resistant hydraulic oil (Fatty acid ester)



### □ Hydraulic oil / cleaning / coolant tank

#### Application oil

General fire-resistant hydraulic oil  
(Synthetic base / emulsion base / HWBF)  
General cleaning solvents  
(Water base / non-water base)  
General coolants  
(Water base / non-water base)

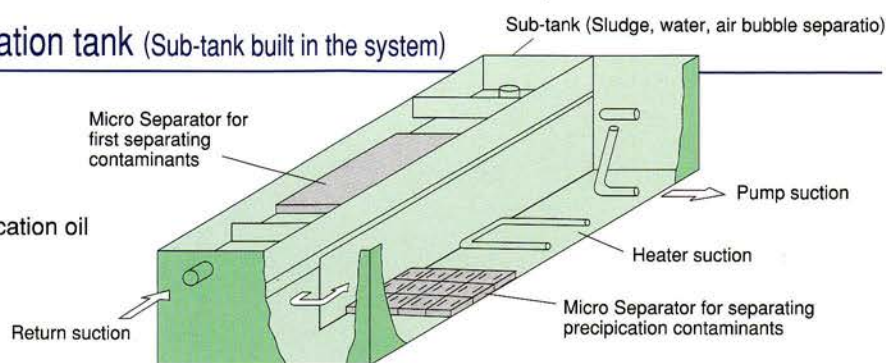


### □ Super large lubrication tank (Sub-tank built in the system)

Utility model No.1360058

#### Application oil

General mineral base lubrication oil



### □ Applicable uses of cleaning tank system and Micro Separator

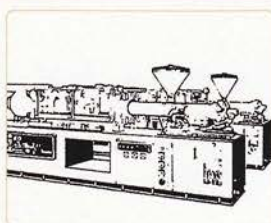
- Oil cleaning and water separation unit Patent No. 9167007
- All types of lubrication oil cleaning unit Utility model No.1360058
- Cleaning solvent cleaning unit Utility model No.1492437
- Machine tool coolant cleaning unit / automatic chip removal unit
- Other special applications of the Micro Separator and tank system



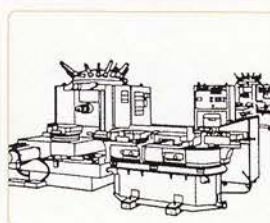
# Consulting of contamination control



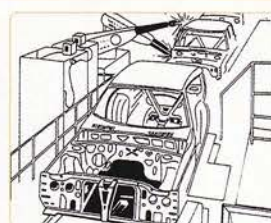
## Micro Separator



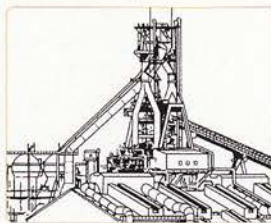
Molding machine



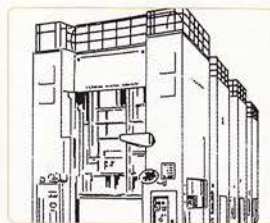
Machine tool



Automobile plant



Steel plant



Press

For the facilities  
such as oil pressure /  
a lubrication tank  
and oil pressure /  
washing / a coolant tank  
or a supersized  
lubrication tank

The contamination control of the cleaning tank system capability consists by a position / area of capacity / structure / a magnetic field of a tank. Therefore, we show the system and the most suitable use (software) based on a condition of a tank at the time of the installation of a Micro Separator. In addition, we carry out the following service about oil pressure / lubrication contamination control for payment.

- ☐ Oil sampling and spot system investigation / diagnosis / data making
- ☐ Ferrograph analysis (Abrasion article analysis)
- ☐ Microscope observation / Photograph of oil and contaminants
- ☐ Contamination particle calculation / gravimetry (NAS-1638)
- ☐ Contamination analysis and form of oiliness inspection
- ☐ Offer the lecture of oil pressure / a lubrication contamination control

In addition, we guide you related to contamination control.

Support an environmental management system



**SAN-S INDUSTRY CO.,LTD.**

<http://www.san-s-separator.co.jp>

- The main office / factory  
4-9-9, Ibori, Kokurakita-ku, Kitakyushu-city,  
Fukuoka 803-0835, JAPAN  
PHONE:+81-93-581-3851  
FAX:+81-93-591-2870
- The branch office of Hokuriku  
463, Araya, Mimuro, Toyama-city,  
Toyama 930-1314, JAPAN  
PHONE:+81-76-483-1850  
FAX:+81-76-483-9116

In order to provide a better product, the specifications and design are subject to change without notice.