CE

성능인증제품

K-INNOVATIVE PRODUCT

World's Best Technology / Best Service

Oil Conditioner

High Vacuum Dual Chamber

Electro-Static Filtering

Micro Bubble Technology

Oil Conditioner

SYT

www.cleanoil.co.kr

Oil Conditioner

Samyong Fil-tech's Oil Conditioner is designed to remove moisture / sub-micro size particles/ varnish from oil and reduces total acid rate using innovative Technologies -1)High Vacuum Dual Chamber and 2)Electro-Static Filter. The newly developed 'Micro Bubble Technology' shortens the time taken for Pipe Flushing with drastic improved result against to conventional pipe flushing method. Samyoung Fil-tec commits to continue the development of innovative technology and delivers high standard products with the best service to our clients.

High Vacuum Dual Chamber

Maintaining high purity of used oil
Double High Vacuum-Electrical Filter

- Moisture removal
- Particle removal
- Total acid number improvement
- Remove varnish

History

1993
- Establish 'Samyoung Tech'

1995
- Development of Flushing Equipment for Military Systems.

1999
- Change Company Name to 'Samyoung Fil-Tech Co.,Ltd.'

2002
- Quality Certification of Environmentally Friendly Equipment.
- Designated as 'Blue-chip Technology Companies'
- Award '2004 Best Venture Design'

2005
- Development of Oil Conditioner equipped with High Vacuum Dual Chamber & Electro-Static Filter.
- Performance Authentication - Flushing Equipment.
- Certified 'Clean Business Establishment'
- Award 'Industry-Academic Joint Technology Development Project'

2006
- NEP authentication
  - Hydraulic oil flushing equipment.
- Establishment of R&D Center.
- Award 'Innovation Technology Merit'
- Award 'Merit Companies for Developing and Utilization Innovative Technology'

2007
- ISO14001 Environmental Management System Certification.
- Establishment of 'Corporate Affiliated Research Institutes'
- NEP Authentication – 'Electro-Static Filter Oil Regenerator'
- Selected as Innovative SME (INNO-BIZ)
- Certified as 'KOMIPO Win-Win Cooperation Excellent Company'
- Award 'Best National Environment – Friendly Company'

2008
- Extend Performance Authentication - Flushing Equipment.
- ISO9001 Quality Management System Certification.
- CE Certification - Oil Flushing Equipment.
- Joint Promotion - Used Oil Regeneration Project (KORAIL)

2009
- Certified as 'Qualified Maintenance Partner' of 5 Power Generation Companies.
- Convention on Waste Oil Recycling Equipment - Resource Regeneration Project (KORAIL)

2010
- Designated as 'Excellent Products' by National Public Procurement Service - Flushing Equipment.
- Selected as One-KEPCO Exporting Companies.
- Selected as a KOTRA Trusted Brand Company.

2011
- Nominated WP-TOPs Top 5 Partner Company
- Selected as the best company for shared growth (KOMIPO)

2012
- Certification of NET – Manufacturing Small size Oil Recycling Machine.

2013
- Release New Version of Oil Conditioner.
- National Procurement Service's Excellence Product - Oil Conditioner.

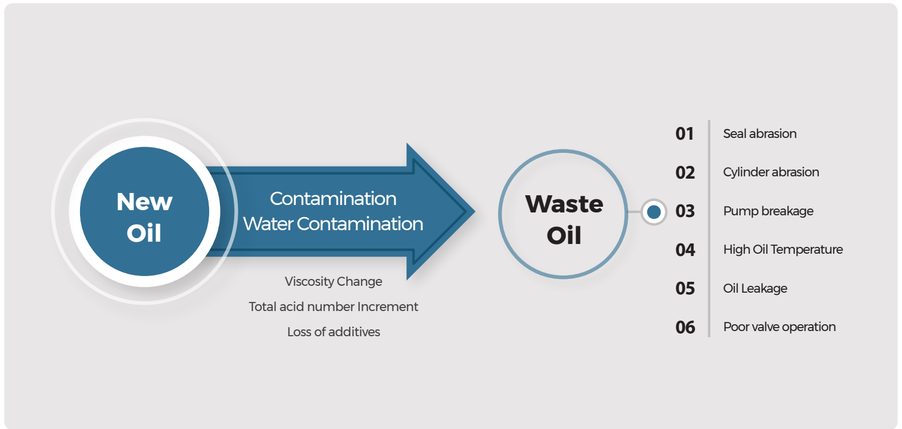
2015
- Development of Flushing Devices for Ship/Off - Shore Station Piping Using Micro Bubble (DSME)
- KEPCO Trusted Partner Certification/DSME – KTP

2016
- Company Moving from Gasan-dong, Seoul → Bucheon-si, Gyeonggi-do.
- New Management & CEO (Mr. Koo → Mr. Lee)
- KOSPO Research and development on localization of power generation facilities (K-10)

2018
- Certification of Technology Competence Companies.
- Acquiring a Patent for Micro-bubble Technology.
- Complete - KOSPO Power generation facility localization development (K-10)

2019
- R&D Selection Product Certification (KOSPO)
- Selected as Good Tax Paying SME Business.
- Conditional Purchase Research and Development of Removing Oil Mist using Plasma(KOMIPO)

Oil contamination and waste oil progression



Contaminated oil shortens the life span of equipment.

Machine Failure and Lubrication Function Failure

Condition & Cause of Machine Failure

High Temperature
- Viscosity Issue.
- Overfeed of Oil.
- Cooling Failure.
- Overload.

Noise/Vibration
- Abrasion.
- Heat Deterioration of lubricants, Poor Design/Assembly.
- Shaft Deformation.

Trip
- Continuation of Overload/High Heat.
- Critical Quality Lubrication.

Causes of Machine Failure

Mechanical Issue 10% ⇔ Misuse 10% ⇔ Poor Lubrication Management 70% ⇔ Overload 5% ⇔ Etc 5%

Causes of Lubrication Failure

Lubricant
- Inappropriate oil (Kind/Viscosity).
- Using a Mixture of Different Kind Oils.

Filling
- Overfed/Underfed.
- Poor Fueling Unit.

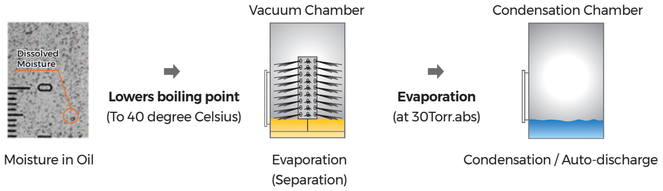
Friction Surface
- Poor material.
- Poor Lubrication System Design.
- Fatigue of Machine.
- Rust.

Lubrication Environment
- Insufficient Cooling
- Contamination
  - Moisture, Gas, Dust, etc.

Introduction to Core Technologies

Moisture Removal Technology

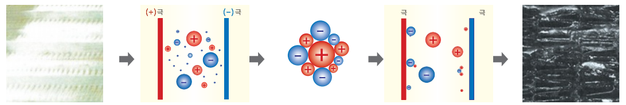
High Vacuum Dual Chamber - Patent 1377189



- Vacuum pump creates a vacuum(at 30Torr.abs) within chamber.
- Vacuum lowers boiling points to 40 degree Celsius.
- Evaporation of moisture from oil.
- Condenses Steam to Water for Discharge.

Particle Removal Technology

High voltage generator for oil impurity removal - Patent 10-2027838

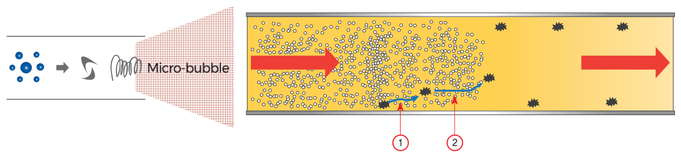


Dielectric substance before absorption | Corona Discharge Layer | Condensing sub-micron (within 1㎛) particle | Removal upon condensation | Picture of absorption treatment of pollutant

- Electrically generates Corona Discharge Layer.
- Electrifies particle by Corona Discharge
  (Metal particles to anode / non-metal particles to cathode).
- Condenses sub-micron particles by electrification.
- Collector holds particles.

Micro-bubble Generation Technology

Flushing System for Pipe Piping Using Micro-bubble - Patent 10-1836953



- Supply of Micro-Bubbles in piping.
- Separation of contaminated particles in pipes
  by Micro-Bubble action.
- Particles float by Micro-Bubble.
- Removes particles away by fluid flow.

Performance Comparison

Performance Comparison by Method

	Filter	Precision Filter	Electro adsorption	Compare
Principle	Simple filtration by filter	Simple filtration by filter	Dust collection filtration by lectric adsorption force	• Filter method : Principle of purification by simply passing through the filter element. • Electro adsorption method : Corona Discharge makes the impurity adsorbent and pushes to the opposite polarity.
Performance	Remove particle size up to 5㎛	Remove particle size up to 3㎛	Remove particle size up to 0.05㎛	• The performance and efficiency of the filter are defined by the Multi-pass test and expressed as beta rates.
	Unable to remove moisture	Unable to remove moisture	2.0 litres water removal per element	• The Parker Filter cannot remove moisture - decomposed fiber component may contaminants oil when exposed to moisture.
	Out of NAS Rating (MIL 500 or higher)	Max. NAS Grade 9 (MIL 400)	Max. NAS Grade 4 (MIL 100 or less)	-
Max. Viscosity	120 cst	120 cst	460 cst	• 120 cst oil cannot be purified when filter size is 5㎛. • The electro-adsorption method is adsorbs the impurities onto collector, allowing high viscosity oil to be used without clogging. • Oil viscosity changes rapidly by temperature Filtration method cannot perform at low temperature even for low viscosity oil. • Filtration method is recommended for 60 cst or less viscosity.
Material	Paper	Fiber	Wool	• Wool has the ability to collect water in large quantities, but does not absorb oil.

Performance Comparison of Moisture Removal Technology

		Centrifugal separation technology	High Vacuum Vaporization	Compare
Principle		Removal of moisture separation by centrifugal force	Removal of moisture vaporization by high vacuum	• Centrifugation : Centrifugal force removes moisture using the different specific gravity between oil and moisture. • High Vacuum Vaporization : Vaporize moisture by lowering the boiling point of moisture under high vacuum circumstance.
Moisture Removal Performance	**Detached moisture**	Remove 95% or more	100% Remove	• It is impossible to remove completely due to the viscosity of the oil by Centrifugal Method.
	Dissolved moisture	Up to 3,000 ppm	Less than 200 ppm	• Dissolved moisture is water dissolved in oil, and centrifugation method can remove moisture up to water saturation maximum. (Water saturation of oil : about 3,000ppm)
Viscosity Limit		120 cst	460 cst	• Centrifugal force cannot remove moisture if oil viscosity is high. • Centrifugal separation is recommended to use for oils with viscosity 60 cst or less.
Equipment Noise		80db or higher	Not more than 75db	• Centrifugation causes excessive noise due to high speed rotation.
Equipment Noise	**Cost**	-	-	-
	Failure rate	High	Low	• Centrifugation causes excessive failure due to high-speed rotation.
	A/S processing time	More than 30 days	Within 48 hours(Domestic) Within 5 Days(Overseas)	• Centrifugal separation is an imported product that takes a long time for A/S.
	A/S Costs	High	Low	-

Naming Convention

SYVEF-B-7000

Standard

Remove fine particle.
Remove dissolved moisture, separated moisture.
Total acid number improvement.
Remove varnish.
Pipe flushing.
Real-time Contamination Level , Moisture Level Checker
Customized Specification (Explosion proof, Higher Capacity)

SY ■■■ - ■ - ▲▲▲▲ - ●●●

V E F - B

- **V**: High Vacuum Dual Chamber
- **E**: Electro-Filter
- **F**: Cartridge Filter (β>1,000)
- **B**: Micro-Bubble Nozzle

[▲▲▲▲]

0600	6 ~ 10 LPM
1080	18 LPM
2160	36 LPM
4200	70 LPM
5580	93LPM
7000	117 LPM
8400	140 LPM
00CO	Customized Specification (Explosion proof, higher Capacity)

[●●●]

PMC	Real-time Contamination Level, Moisture Level Checker

Innovative Product by Korean Government Procurement Service

K-INNOVATIVE PRODUCT

DVEFB-CO-PW

Standard with PMC, OHT

Remove fine particle.
Remove dissolved moisture, separated moisture.
Total acid number improvement.
Remove varnish.
Pipe flushing.
Real-time Contamination Level, Moisture Level Checker.

DVEFB - ■■■ - PW

DVEFB

- **DV**: High Vacuum Dual Chamber
- **E**: Electro-Filter
- **F**: Cartridge Filter (β>1,000)
- **B**: Micro-Bubble Nozzle

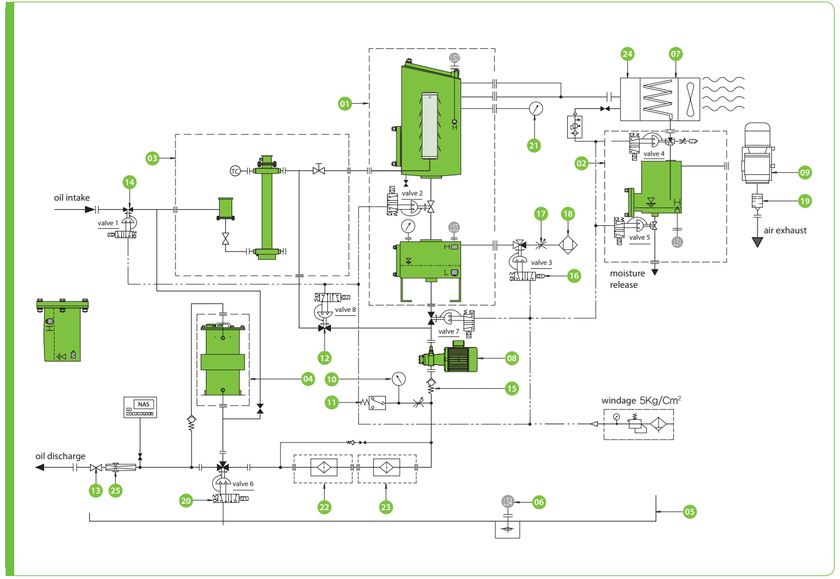
[■■■]

Standard	Flux	Procurement Commodity Identification Number by Korean Government Procurement Servicer
10	100~600 LPM	24047730
18	1,080 LPM	24047731
36	2,160 LPM	24047732
70	4,200 LPM	24047733
93	5,580 LPM	24047734
117	7,020 LPM	24047735
140	8,400 LPM	24047736
CO	8,400~20,000 LPM	24047737
PMC	Real-time pollution level moisture meter	
OHT	Oil Heating Tank (Options)	

Name		SYVEF-B-600 (DVEFB-10-PW)	SYVEF-B-1080 (DVEFB-18-PW)	SYVEF-B-2060 (DVEFB-36-PW)	SYVEF-B-4200 (DVEFB-70-PW)	SYVEF-B-5580 (DVEFB-93-PW)	SYVEF-B-7000 (DVEFB-117-PW)	SYVEF-B-8400 (DVEFB-140-PW)	SYVEF-B-20000 (DVEFB-CO-PW)
Product performance	Particle removal	●	●	●	●	●	●	●	●
	Moisture removal	●	●	●	●	●	●	●	●
	Total acid number improvement	●	●	●	●	●	●	●	●
	Remove varnish	●	●	●	●	●	●	●	●
	Pipe Flushing	●	●	●	●	●	●	●	●
Dimensions		800*1,100*1,380	850*900*1,740	1,700*850*1,820	1,250*1,450*1,860	1,550*1,400*2,000	1,550*1,400*2,000	2,400*1,950*2,200	2,400*1,400*2,350
Power Consumption		3kw	3kw	12kw	15kw	25kw	30kw	45kw	45kw
Vacuum degree(Max Torr.abs)		30	30	30	30	30	30	30	30
Inlet(PT)		1"	1"	1-1/4"	1-1/4"	1-1/2"	1-1/2"	1-1/2"	2"
Outlet(PT)		3/4"	3/4"	1"	1"	1-1/4"	1-1/4"	1-1/4"	1-1/2"
Clean Flow Rate(Max LPH)		100~600	1,080	2,160	4,200	5,580	7,020	8,400	8,400~20,000
image									
Technology		High Vacuum Dual Chamber, Electro-static Filter, Micro Bubble Generation Technology, Voltex Technology, Cartridge Filter(β 〉1,000).							
Options		Real-time Contamination Level, Moisture Level Checker							Oil Heating Unit

Name		SYE-S100	SYF	SYEF	SYVF-E		SYVEB	
					SYVF1-E3	SYVF2-E10	SYVEB1820	SYVEB2020
Product performance	Particle removal	●	●	●	●	●	●	●
	Moisture removal	▲	×	×	●	●	●	●
	Total acid number improvement	●	▲	▲	●	●	●	●
	Remove varnish	●	●	●	●	●	●	●
	Pipe Flushing	×	×	×	×	×	●	●
Dimensions		450*950*1,185	1,000*500*950	1,300*500*1,200	2,700*1,625*1,720	4,500*2,110*3,000	3,800*2,200*2,480	3,800*2,650*2,480
Power Consumption		3kw	2kw	2.5kw	20kw	22kw	220kw	240kw
Vacuum degree(Max Torr.abs)		–	–	–	30	30	30	30
Inlet(PT)		3/4"	3/4"	3/4"	3/4"	3/4"	4"	4"
Outlet(PT)		3/4"	3/4"	3/4"	3/4"	3/4"	4"	4"
Clean Flow Rate(Max LPH)		1,080	2,160	2,160	2,160	2,160	1,800	2,000
image								
Technology		Cartridge Filter(β 〉1,000).	Cartridge Filter(β 〉1,000).	Electrical Filter, Cartridge Filter(β 〉1,000).	Double high vacuum, Electrical Filter, Micro Bubble Generation Technology, Voltex Technology, Cartridge Filter(β 〉1,000).			
Options		Real-time Contamination Level, Moisture Level Checker						

System Flow



1. Vacuum Chamber Assembly
2. Condensation Chamber Assembly
3. Heater Assembly
4. Electrical Filter
5. Base Assembly
6. Oil leak Prevention Device
7. Cooler
8. Pump & Motor
9. Vacuum Pump
10. Pressure Gauge
11. Pressure switch
12. Pneumatic ball valve (3PCS)
13. Ball valve
14. Pneumatic ball valve (3PCS)
15. Check Valve
16. Pneumatic 3way valve
17. Needle valve
18. Air Breather
19. Mist trap
20. Pneumatic 3way valve
21. Vacuum Gauge
22. Filter Assembly
23. Filter Assembly
24. Voltex Assembly
25. Micro Bubble Generator
26. Real-time contamination level monitoring Checker

Product properties

Product Features

- Micro Bubble Generation Technology.
- Hiigh Vacuum Dual Chamber/ Electro-Static Filter.
- Remove moisture under high vacuum(30Torr.abs).
- Capable to treat high viscosity oil(Max.760cst.).
- Automatic Drain of Condensed Moisture.
- Oil leak etection System. (Automatic warning and stop if any leaks)
- Offline operation without affecting main facility operation.
- STS304 / STS316 / Steel(base) / Viton Seal.
- Selective Mode. (Particle removal, Moisture removal, Particle/ Moisture removal)
- Sight Glasses.
- Real-Time Display of Contamination Level(NAS/ISO) and Moisture(%) – Optional.

Product Performance

- Remove contaminated particles up to sub-micron(0.05㎛) by applying an electrical filter.
- High Vacuum Dual Chamber technology to remove moisture in Oil (<100ppm).
- Complete removal of varnish and oxides.
- Total acid number and kinematic viscosity improvement.
- Complete removal of Detached moisture, Dissolved moisture, gas, etc.
- Prevent Oxidizing and extend Oil life.
- No inflence on oil additives.
- Improves productivity, including preventing equipment failures and reducing maintenance costs by optimally maintaining oil conditions.
- Low maintenance costs.
- Micro-Bubble improves 40% on scale removal efficiency.

Application

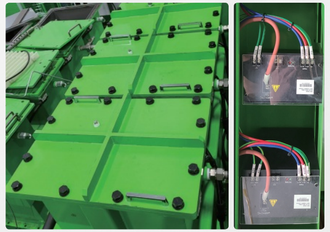
- Minimize wear on fast rotating bearings, Prevent faults such as set in heat (Power plant, Paper plant).
- Prevent wear and blockage of servo valves, cylinders, etc. of hydraulic systems.
- Prevent pump wear breakage and set in heat.
- Flushing contaminated particles in piping (Ship, Heavy Equipment, Industrial Plant, etc.)
- Industrial mechanical devices requiring high clean oil conditioning.
- Recycling and Reusing Waste Oil.

Products and Components

High Vacuum Dual Chamber

Automatic Condensed Water Draining System

Micro Bubble Injection Nozzle



Electrical Filter (High Voltage Generator)

Real-time Contamination /water Level monitoring

Voltex tube

IoT Remote Control

Cartridge Filter

Oil Analysis Equipment

PAMAS-SBSS

- Principles of Measurement : Light Shielding Method.
- Measurement Range : 0.5㎛ (Using Multiple Sensors).
- Applications : Hydraulic oil, turbine oil, Insulation oil, engine oil, gear oil, etc.

MKS-500

- Principles of Measurement : Volumetric Type.
- Measurement Range : 0.1~500mgH2O / 10ppm~100% H2O.
- Detection Range : 0.005ml~100ml.

Oil Flushing Service

SYVF1-L

Moisture removal equipment : 300ppm.

SYE3-HL

Particle Removal Equipment
(Electrical Filter) : =< NAS 6

Flushing Service / Rental / Outsourcing

- Saves budget for purchasing flushing equipment.
- Low operating rate.
- Reduction of work load on for facility conservation personnel.
- Professional oil management.

Advantages

- Call based Site visiting with Mobile Oil Conditioner and Available of On-Line Oil Flushing upon request.
- Continuous use old oil by with top-up of minimum amount of oil.
- Delivers High cleanliness of hydraulic oil in storage tanks and pipes.
- Quality Assurance for Flushing Services.
- Affordable service costs.

Expected Result

- Cost Saving

❶ Purchasing Cost for hydraulic oil.
❷ Labor and maintenance costs.
❸ Waste oil disposal costs.

- Prevent facility failures.
- Increased durability of hydraulic parts.
- Minimize waste oil.

Performance Test

01 Performance Test Overview

Test location	Korea Institute of Machinery and Materials
Testing Agency	Korea Institute of Machinery and Materials
Test equipment	SYVE2
Measuring instrument	WOM.9001 /CM-20
Oil used	ISO VG32
Oil Quantity	200L
Oil Temperature	60℃

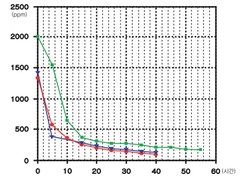
02 Contamination Level

		Running Time			
		Start	After 11min	After 23min	After 36min
Contaminated particle size (㎛)	5 or higher	201,318	57,847	10,822	3,183
	10 or higher	50,141	1,0811	1,923	630
	15 or higher	19,563	3,870	607	348
	25 or higher	5,051	778	180	146
	50 or higher	573	101	45	45
	100 or higher	35	6	2	2
Test results (ML-STD-124A)		Level 300	Level 300	Level 200	Level 200
Test results (ISO4406)		18 / 15	16 / 12	14 / 10	12 / 09
Test results (NAS1638)		NAS 10th grade	NAS 9th grade	NAS 7th grade	NAS 6th grade

03 Moisture Level

	Running Time											
	Start	5min	10min	15min	20min	25min	30min	35min	40min	45min	50min	55min
The first (■) - PPM	2,000	1,565	690	395	287	232	238	229	197	229	195	189
Secondary (▼) - PPM	1,458	410	321	243	220	205	199	186	178	-	-	-
Tertiary (●) - PPM	1,401	573	345	221	198	190	175	164	160	-	-	-

Moisture Change Graph



Variation by Flushing Time (Contamination)

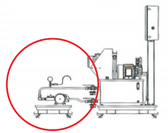
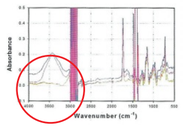
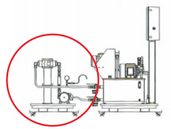
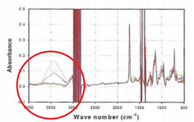
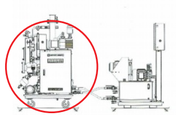
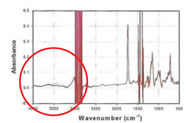
Variation by Flushing Time (Moisture)

Research on the Effective Life of Oil

01 Outline

Test Location	Samyoung Fil-Tech Co.,Ltd. R&D Center
Test Agency	KIMM / Samyoung Fil-Tech Co.,Ltd.
Oil used	ISO VG 32
Test time	1,800hr
Data Source	Reliability Development R&D Report (Ministry of Commerce, Industry and Energy, Jun. 30, 2005)

03 Research Result

Device Separation	Device Configuration	Research Result
Device 1 Basic system		
Device 2 Cartridge Filter system β5≤200, US company P		
Device 3 Oil conditioner system SYVE 1		

02 Laboratory devices and experimental conditions

	Test Unit Operating Conditions	
1	Test oil and capacity	ISO VG 32, 70L (New oil)
2	Test oil temperature	30℃ (Room temperature)
3	Power	3phase, 380v
4	Cylinder pressure	150kgf/㎠
5	Cylinder Transfer speed	68.75mm/sec
6	Cylinder Up and Down Stop Time	3sec
7	Running Time	1,800hr (Continuous operation)

- The results of 1,800 hr continuous operation are shown in the left illustration, with the basic unit, cartridge filter system and oil conditioner attached to each of the three identical hydraulic units.
- Device 1 and 2 have a new peak point in the circle of the indicator and Device 3 has no change.
- The new peak point indicates the presence of chemical substances such as varnishes caused by the chemical reaction of pollutants from outside.
- Device 3 maintains a complete removal of chemical substances such as varnish.
- It is confirmed that Device 3 can run with 'flushed oil' in the same condition as the new oil without changing the oil.

photo of laboratory equipment for research

Research on the Removal of Oil Additives

01 Outline

Test Venue	Samyoung Fil-Tech Co.,Ltd. R&D Center
Test Agency	Korea East-West Power Company Dangjin Coal-Fired Power Complex Yonsei University, KIMM, KPETRO, Samyoung Fil-Tech Co.,Ltd.
Test equipment	SYVEF3
Oil used	EHC HPU Oil (REOLUBE Turbo Fluid 46XC)
Data Source	Research Report (Korea East-West Power Company Dangjin Coal-Fired Power Plant Feb. 10th, 07)

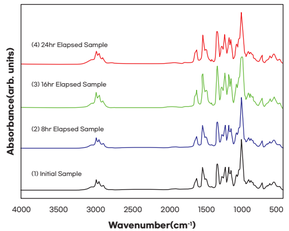
02 Test Conditions

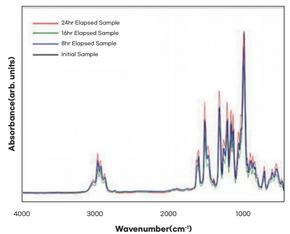
	Setting	Flushing Time and Sampling						
1	Test oil Quantity	400L	Flushing Time	Sampling cycle	Sampling count	Sampling quantity	Sampling Method and Quantity		
2	Storage tank Oil Temperature	60℃	24hr	8hr/time	4pieces	500cc	After initial operation	1time	6pieces
3	Equipment Oil Temperature	60℃					After 8hr	2time	6pieces
4	Power	3phase, 380volt					After 16hr	3time	6pieces
5	Vacuum degree	-98.0~-101.0Kpa					After 24hr	4time	6pieces
6	Pressure in use	Max. 0.5Mpa					Sum	4time	24 pieces
7	Air pressure	Max. 5kg/㎠							

03 Oil Analysis Results (New oil / Used oil / Cleaning oil)

No.	Test Items	New oil Specification	New oil measurements	Oil Replacement Criteria	Cleaning oil measurements			
					Used oil	8hr	16hr	24hr
1	Pollution level NAS (ISO)	-	NAS 6 (-/15/12)	≤NAS 6	NAS 8	NAS 4	NAS 4	NAS 4
2	Moisture ppm (%)	≤1,000 (≤0.1)	300 (0,03)	≤1,000 (≤0.1)	562	239	84	55
3	Total acid number mgKOH/g	≤0.10	0.08	≤0.20	1.1	0.1	0.1	less than 0.1
4	Amount of chlorine dissolved ppm	≤50	7	≤100	Not detected	Not detected	Not detected	Not detected

04 Oil additive change (FT-IR Comparative analysis)





- As a result of synthesizing four graphs according to the cleanliness processing time, the peak points match in all wavelength areas (4000-400cm-1) and there is no new peak point occurrence.
- It confirms that additive component stays same as new oil even after flushing process.
- Treated Oil shows better quality than New Oil.
- Total acid number improvement.
- Complete removal of dissolved gas.

Development & Intellectual property

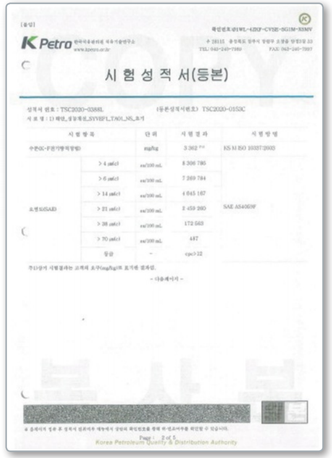
Sortation	Registration number(Date)	Title	Notes
Patent	10-0751490 (07. 08. 16)	Oil Refinery	Registration
	10-0863154 (08. 10. 07)	Mobile Waste Oil Purifier	
	10-0935829 (09. 12. 30)	Waste oil refining system with dualized packing	
	10-0939956 (10. 01. 26)	Tar Remover	
	10-1325156 (13. 10. 29)	Waste oil Recycler	
	10-1377189 (14. 03. 17)	Soluble water removal device of water-containing substances and chambers for this purpose	
	10-1414264 (14. 06. 25)	Fluid Drainage Unit	
	10-1655785 (16. 09. 02)	Water removal systems, methods, vessels or plants present in oil using micro bubbles	
	10-1655779 (16. 09. 02)	Particle removal system and method present in oil using micro bubbles	
	10-1836953 (18. 03. 05)	Flushing System for Pipe Piping Using Micro Bubble	
	10-1999331 (19. 07. 05)	Oil Cleaner with Micro Bubble Technology and Corona Discharge Induction Technology Using Heating Air	

Research period	Business name	Name of the research project
1994. 10~1995. 09	Ministry of Nationalization Development Project	Development of Hydraulic Flushing Equipment for K-1 Tank
1997. 07~1998. 06	Ministry of Nationalization Development Project	Development of Hydraulic Flushing Equipment for K-9 Self-propelled artillery
1997. 04~1999. 03	Capital goods strategic item industrial technology development project	Oil Purifier
1999. 03~1999. 12	Ministry of Nationalization Development Project	Development of localization of 23 types of parts for K-1 tank transmission
1999. 03~2000. 05	Ministry of Nationalization Development Project	Development of localization of 4 types of parts for K-1 tank transmission
2000. 06~2003. 03	Ministry of Nationalization Development Project	Damping oil exchange unit
2002. 06~2005. 05	Development of Next-Generation Environmental New Technology by Ministry of Environment in 2002	Development of High-Performance Waste Lubrication Oil Purification System Using Vacuum and Static Electricity
2002. 07~2003. 04	Joint Technology Development Project of Industrial-Academic Research Institute in 02	Development of Automatic Decomposition Technology for Dry Bullets Using Indexes
2003. 04~2004. 03	Technology Innovation Development Project for SME in 2003	Deposition device
2003. 06~2005. 05	Ministry of Nationalization Development Project	Development of localization of 32 types of parts for K-1 tanks
2004. 05~2005. 02	Joint Technology Development Project of Industrial-Academic Research Institute in 04	Development of Nanoparticle Dispersed Photofunctional Composites
2004. 07~2005. 04	Development of Nanoparticle Dispersed Photofunctional Composites	Development of Fuel Pump and Control Technology Using Power
2005. 07~2006. 04	Joint Technology Development Project of Industrial-Academic Research Institute in 05	Development of Photofunctional Polymer Base Nanohybrid
2005. 06~2006. 05	A project to spread reliability-based technologies for parts and materials in 2005	Increased reliability of hydraulic fluid flushing equipment
2005. 07~2006. 06	Technology Innovation Development Project for SME in 2003	Development of Hydraulic Orbital Maintenance Equipment
2006. 08~2007. 07	Joint Technology Development Project of Industrial-Academic Research Institute in 06	Development of Transparent Conductive Oxide Membranes with Dispersed Nanoparticles for Electromagnetic Shielding
2007. 01~2007. 02	A Joint Study on Korea East-West Power Company Dangjin Coal-Fired Power Complex	A Study on the Removal of Oil Additives and the Change of Oil Properties by Flushing Treatment
2009. 06~2010. 05	A Study on the Removal of Oil Additives and the Change of Oil Properties by Flushing Treatment	Development of Turbine Oil Conditioner
2009. 12~2011. 11	Support projects for product improvement of SME enterprises in 2009	Performance and quality improvement by improving durability of hydraulic fluid flushing equipment
2010. 06~2012. 05	SME relocation technology development project in 2010	Development of Mobile Waste Oil Purification System
2013. 12~2014. 11	Public-Private Joint Investment Technology Development Project in 2013	Development of Flushing Devices for Ship/Ocean Piping Using Micro Bubble
2014. 06~2015. 02	Academic-Research Institute Subsequent R&D projects linked to corporate research institutes in 2014	Development of Small Waste Oil Recycling System with Centrifugal Thin Film Evaporation Technology
2016. 08~2018. 07	Development Project for Localization of Core Components of Power Generation Facilities	Development of Localization of Oil Conditioner for Turbine Oil
2019. 11~2021. 10	Purchase Conditional New Product Development Business in 2019	Development of Large-Capacity Collection System Based on Oil Fume Plasma Technology

Pollution Level (NAS), Moisture (mg/kg=ppm)

Test Items	Primary	Final
Moisture (K-F Electricity Volume Appropriate Method)	3,362	13
Pollution Level (SAE)	CPC 〉12	CPC 5


시 험 성 적 서(등본)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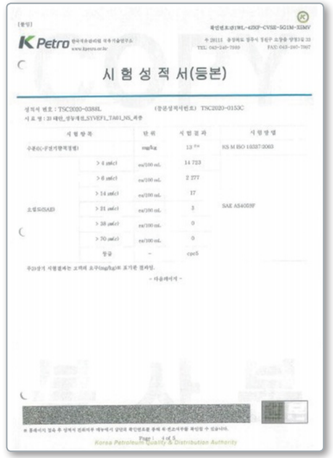
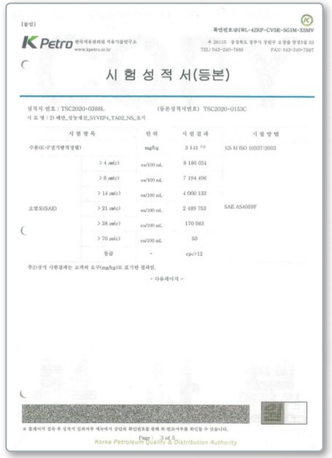

시 험 성 적 서(등본)

Pollution Level (NAS), Moisture (mg/kg=ppm)

Test Items	Primary	Final
Moisture (K-F Electricity Volume Appropriate Method)	3,141	14
Pollution Level (SAE)	CPC 〉12	CPC 5


시 험 성 적 서(등본)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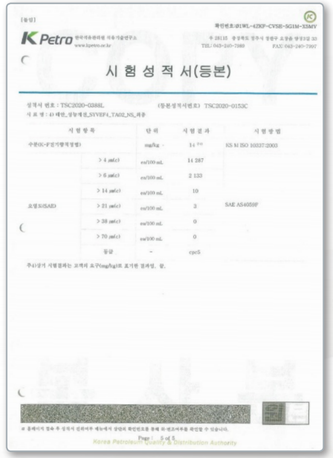
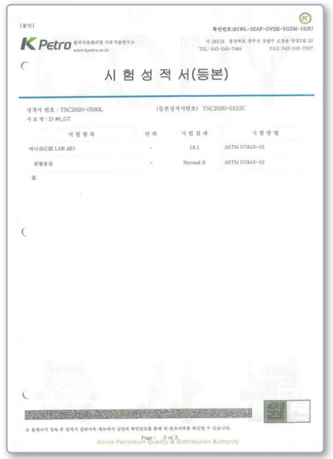
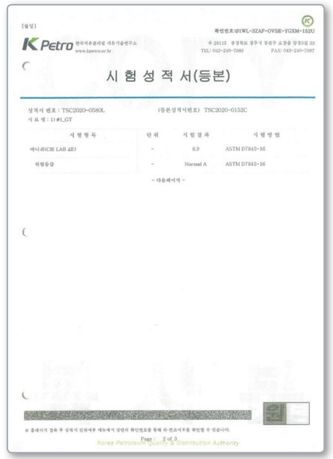

시 험 성 적 서(등본)

Test Items	Primary	Final
Varnish (CIE LAB ΔE)	18,1	11,1
Risk rating	Normal B	Normal A


시 험 성 적 서(등본)

시 험 성 적 서(등본)

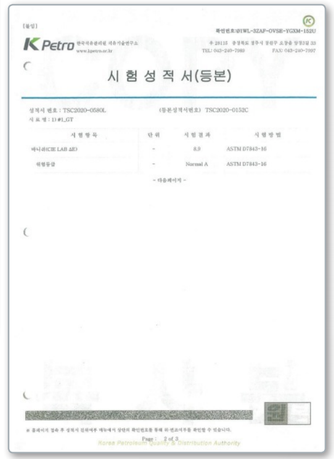

시 험 성 적 서(등본)


시 험 성 적 서(등본)

Test Items	Primary	Final
Varnish (CIE LAB ΔE)	8,9	5,4
Risk rating	Normal A	Normal A


시 험 성 적 서(등본)

시 험 성 적 서(등본)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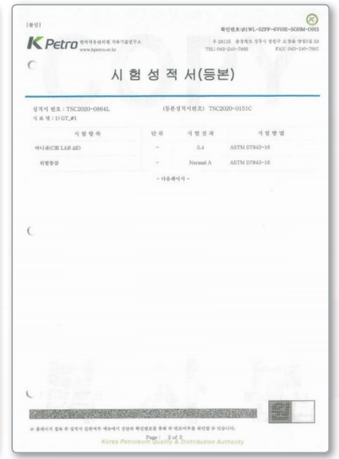

시 험 성 적 서(등본)

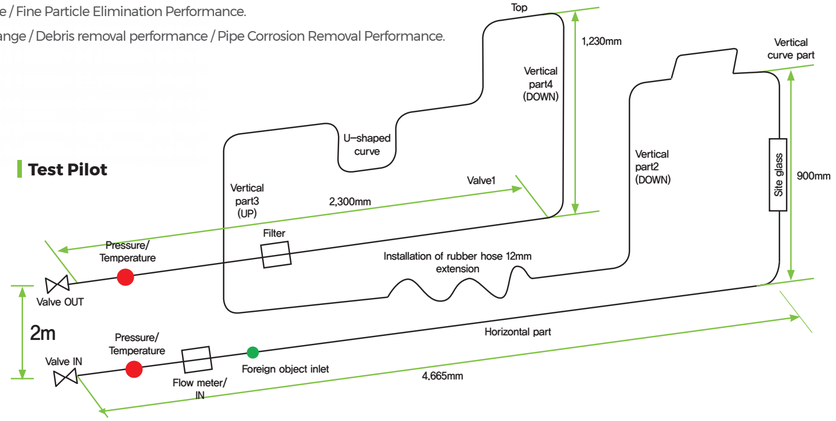
Evaluate Micro Bubble Product Performance

01 Overview of performance testing

1. Test Agency : Korea Testing & Research Institute (Road Technology Center)
2. Test Period : 2020. 10. 26 ~ 2021. 03. 31
3. Test Place : Samyoung Fil-Tech Co.,Ltd.
4. Test Equipment : SYVEF-B-7000
5. Test Items
   1) Durability evaluation : Oil Heating Performance / Vacuum Degree Performance / Noise Level .
   2) Function evaluation : Moisture Removal Performance / Fine Particle Elimination Performance.
   3) Microbubble Performance Evaluation : Flow rate change / Debris removal performance / Pipe Corrosion Removal Performance.
   4) Structural analysis (Liquid flow analysis).

Test View

Test Pilot

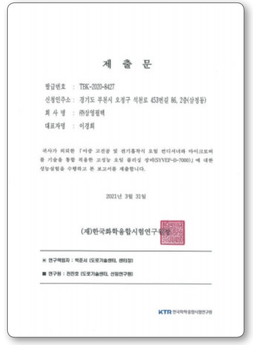


02 Performance Test Results

Experimental Items		Unit	Compare Results	
			Without Micro Bubble	With Micro Bubble
Durability evaluation	Oil Heating Performance	minutes:seconds	36:55	28:25
	Vacuum Degree Performance	MPa	-0.095	-0.096
	Noise Level	dB(A)	72	75
Functional evaluation	Moisture Removal Performance (Reduction Rate vs. Time Taken)	%	88 (2 hours 55 minutes)	86 (1 hour 17 minutes)
	Fine Particle Elimination Performance (6 hours Operation)	ISO	16/14/10	15/13/10
Microbubble Performance	Flow rate change	ℓ /min	114.4	140.0
	Particle removal	%	77	90
	Corrosion Removal (Chemical)	%	66	87
	Corrosion Removal (Seawater)	%	71	85
Flow-Structure Complex Physical Analysis		-	Scale removal efficiency increases by approximately 40% with micro-bubble.	


TEST REPORT
KTR 한국화학융합시험연구원장


TEST REPORT
KTR 한국화학융합시험연구원장


제 출 문

Specialization of Samyoung Fil-Tech

• Exhibition

SYV

Shanghai Exhibition (China)

Orlando Exhibition (United States)

Hannover Exhibition (Germany)

• Power Plant (Yeongheung power plant)

SYVE–S

Power Plant (Yeongheung power plant)

• Automobile (Samsung Motors)

SYVE

Automobile (Samsung Motors)

World's Best Technology / Best Service

• Other various manufacturing fields of Samyoung Fil-Tech Co.,Ltd.

shipbuilding (Samsung Heavy Industries)

Petrochemical (Ulsan SK Oil Refinery)

Petrochemical (Ulsan SK Oil Refinery)

Hydraulic press (Hyundai Heavy Industries)

High Pressure Injector (Daewoo Motors)

Steel Industry (Hyundai Steel)

Paper Industry (Hansol paper)

Oil Conditioner

High Vacuum Dual Chamber

Electro-Static Filtering

Micro Bubble Technology

Samyoung Fil-Tech Co.,Ltd. Main Customer Status

· Power Plant

한국수력원자력㈜ 한국남부발전㈜ 한국중부발전 한국동서발전㈜

한국서부발전㈜ KOEN 한국남동발전 한전KPS㈜

· Defense industry

방위사업청 한화디펜스 HYUNDAI TRANSYS HYUNDAI Rotem

· Railway

국가철도공단 KORAIL

· Construction

posco SK 에코플랜트 DOOSAN HYUNDAI STEEL

· Shipbuilding

DSME 대우조선해양(주) SAMSUNG 삼성중공업 현대중공업

· Chemical

Hyundai Oilbank

World's best technology! Best service!

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• **Homepage** www.cleanoil.co.kr • **production date** April 2021