Introduction:
Hydraulic Fluid Management
by
Kleentek: Electrostatic Oil Cleaner (SP Series)

Focus Machinery Pte Ltd, Singapore

x

Kleentek Corporation, Japan

How we operate and works

	Step 1	Step 2	Step 3	Step 4
Client, (You)	• initial contact • expression of interest • initial discussion	• benchmarking of oil performance (using Kleentek Oil Analysis report) • benchmarking of oil performance using independent laboratory	• taking delivery of Kleentek's Oil Cleaner • preparation of materials and resources	• taking delivery of oil cleaner • implementation of oil management control • perform oil top-up and replenishment based on Kleentek's recommendation
Focus Machinery Pte Ltd, Singapore	• understanding of technical background, application • collection of oil samples, (used/new) • membrane patch testing, internal	• negotiation of pricing and payment term • drafting of technical solution based on client's environment • placement of order with the maker	• commissioning, installation of system • boardroom presentation, on-site training	• performance measurement • regular interval oil performance measurement • yearly onsite visit with customer,
Kleentek Corp Inc., Japan	• maker informed of the client, enquiry • processing of oil samples • oil analysis report	• maker produce the Kleentek machine with accordance to technical requirement • tentative lead time: approxi. 3 months	• oil samples are sent back to Kleentek Corp Inc., Japan for oil analysis • provide recommendation based on the oil analysis	• feedback on the performance of client's environment • provide recommendation and feedback on client's environment

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Application of Kleentek: Electrostatic Oil Cleaner

Type of Lubricant/Oil	Specific Application	
Hydraulic Oil VG22 ~ 68	Hydraulic Press; Casting Machine; Forging Machine; Injection Molding; Steel Mill/Paper Mill; Gauge Control System (Steel, Aluminums, Paper); Governor Control (Power Plant); Machining Centers; Test Stand Simulator	
Lubricant VG68 ~ 200	Mechanical Press Machine; Gas & Steam Turbines (Power Plants); Paper dryer bearing; vacuum pumps;	
Turbine Oil	Power Plants	

Summary:

Application Oil	:	Mineral based oil with the exception of engine oil
Viscosity	:	below 200mm^2/s
Temperature	:	below 60°C

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Value Proposition of Kleentek: Electrostatic Oil Cleaner (“EOC”)

To promote **sustainable practice** through
the **reduced use of non-renewable** natural resource
by refocusing the use refined mineral oil
while ensuring **maximum uptime;**
reduce cost of maintenance
and **minimizing operational impact**.

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Working Principle of EOC

Operating Principle of EOC

- Contaminants within the oil are charged using the electrode. The charged particles will move towards the electrode having opposite polarity.
- EOC has the ability to eliminates any kinds and sizes of contaminants including sub-micron contaminants
- Combined both the principle of electrophoresis & dielectrophoresis
- Patented designed collectors materials that deforms the electrical field and neutral contaminants are attracted to the strongest field region (Dielectrophoresis)
- Free-flowing of the fluid within the cleaning chamber. No pressure differences between the bottom and the top of the cleaning chamber

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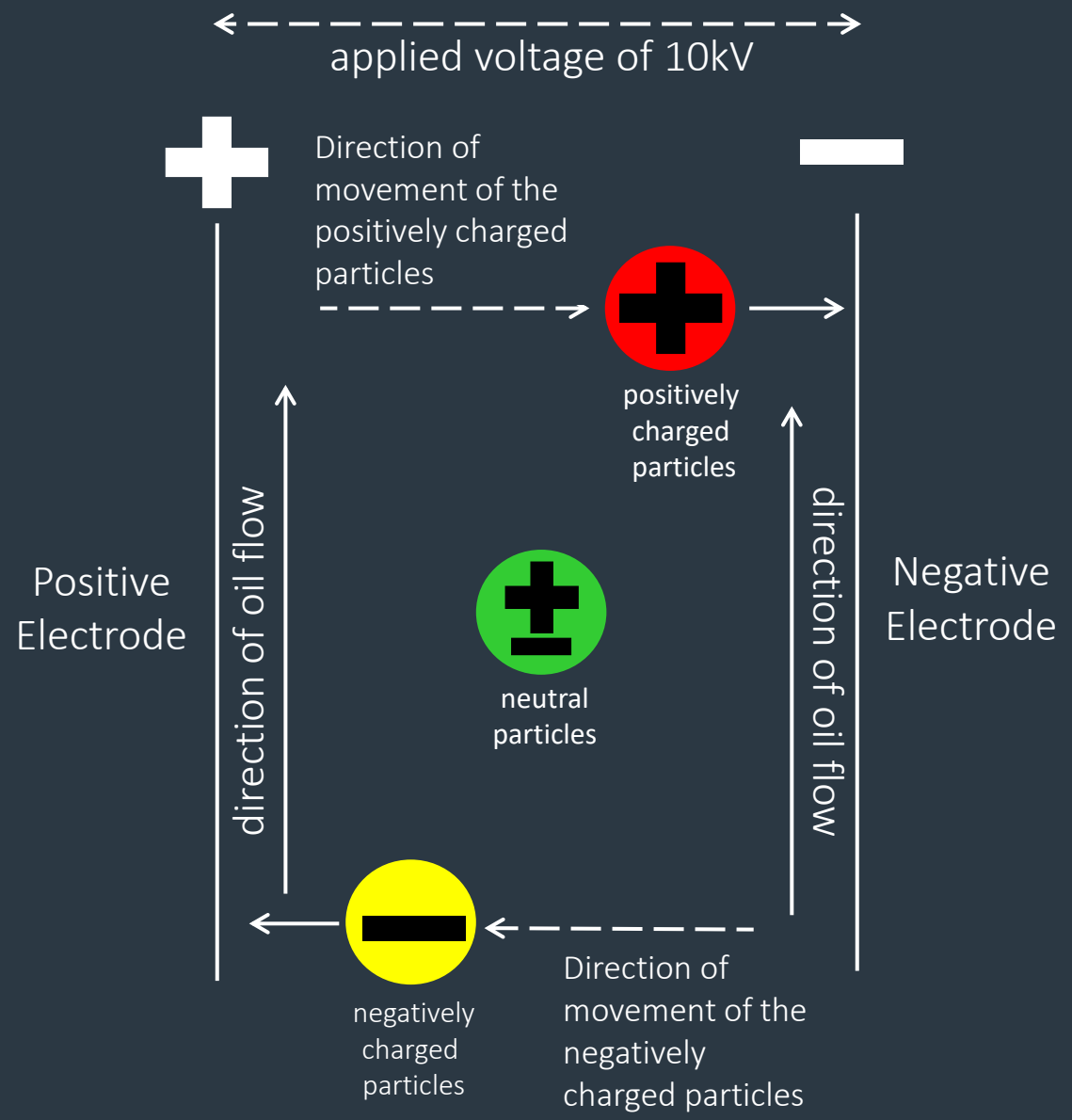
Working Principle of EOC



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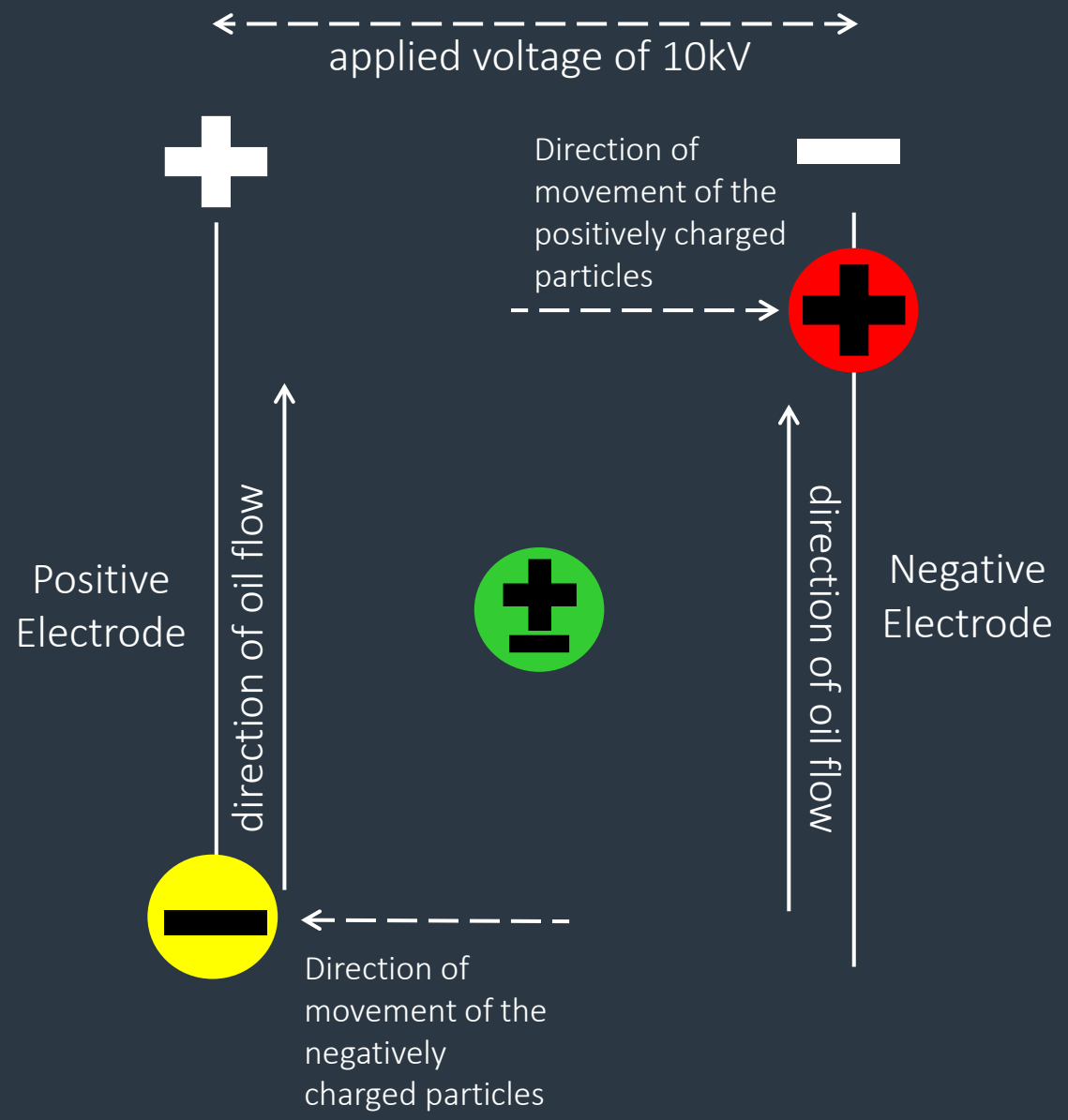

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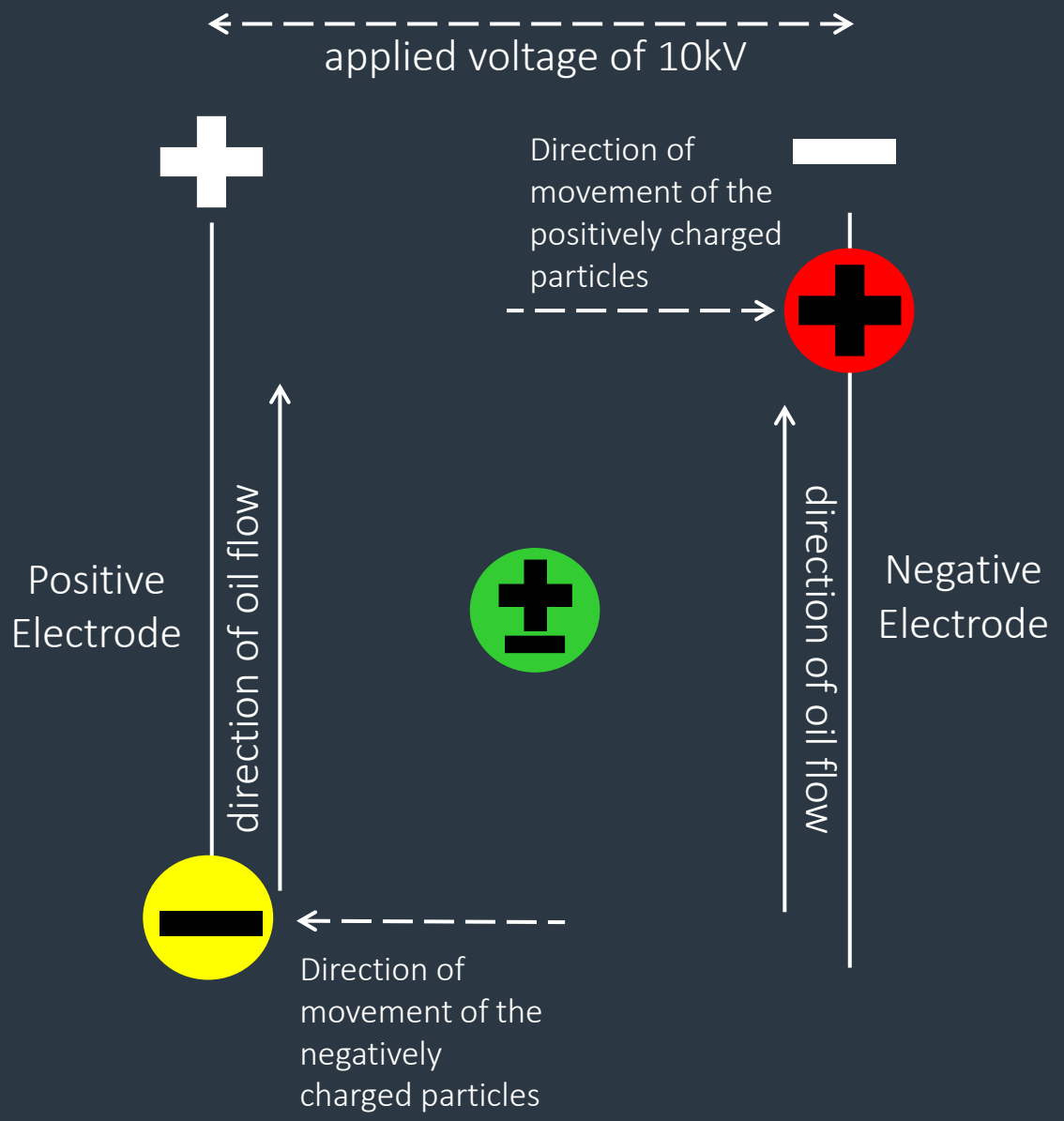

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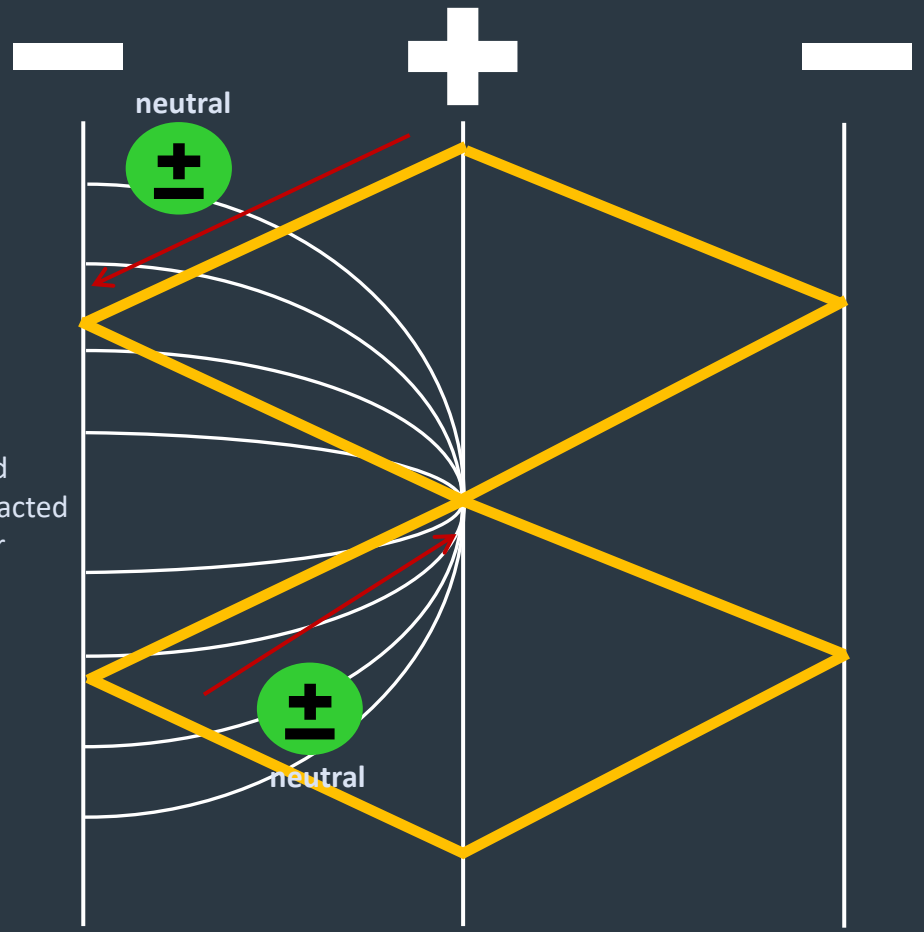

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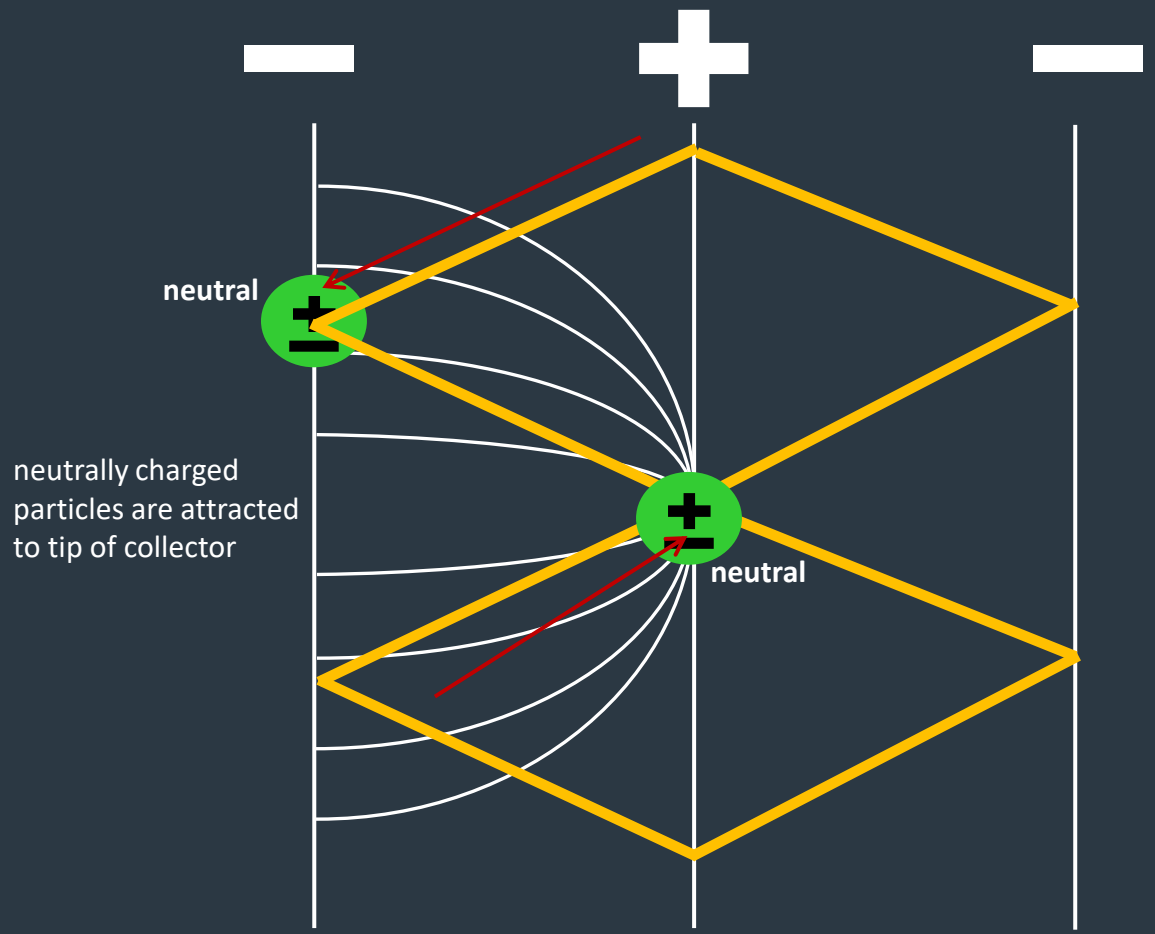

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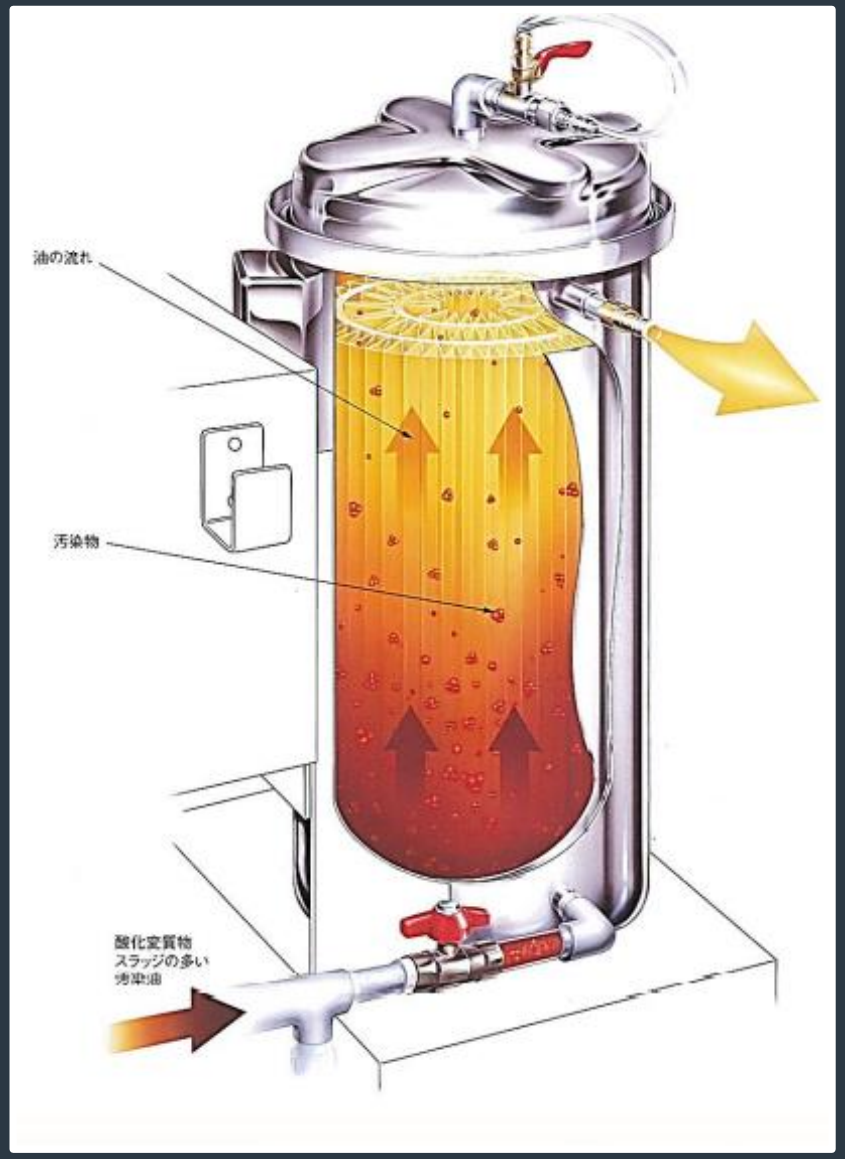

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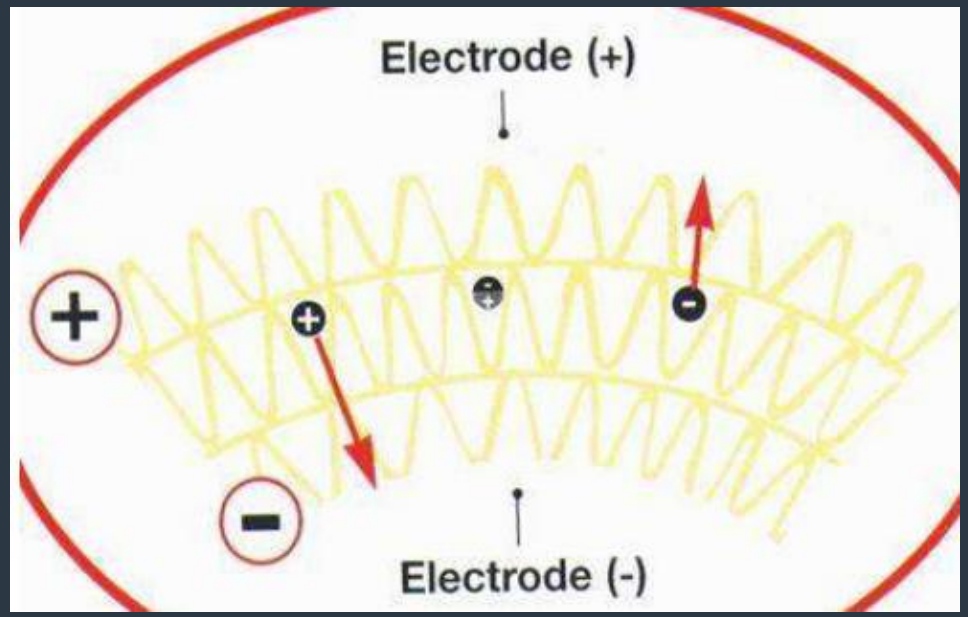

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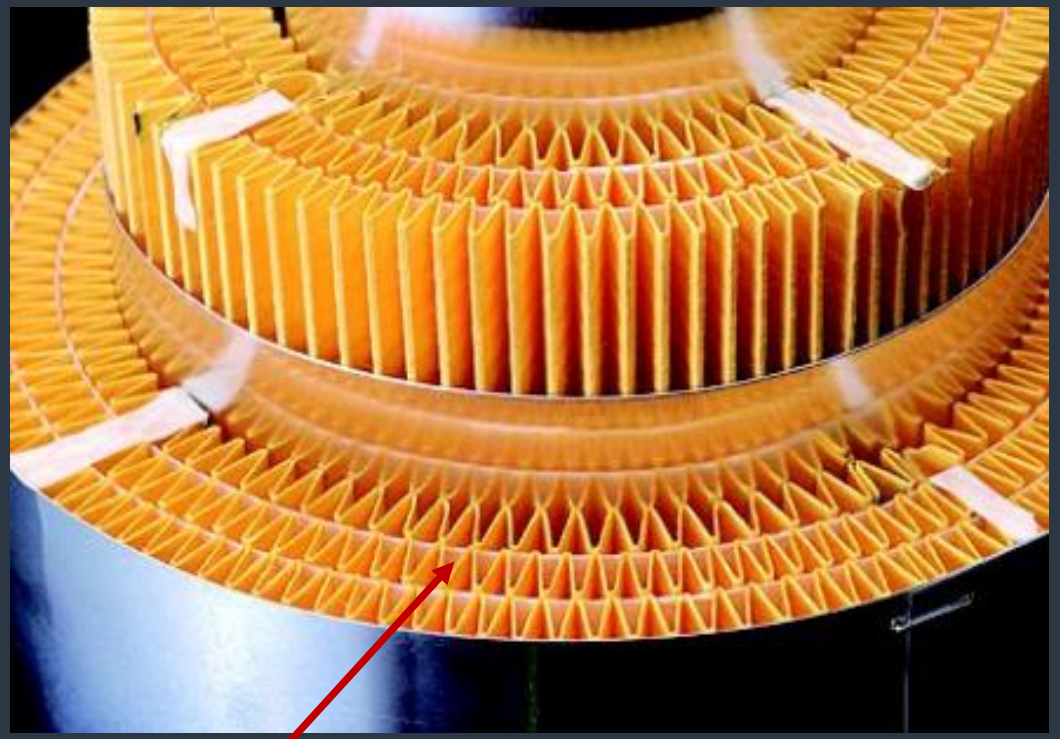

Honeycomb Structure

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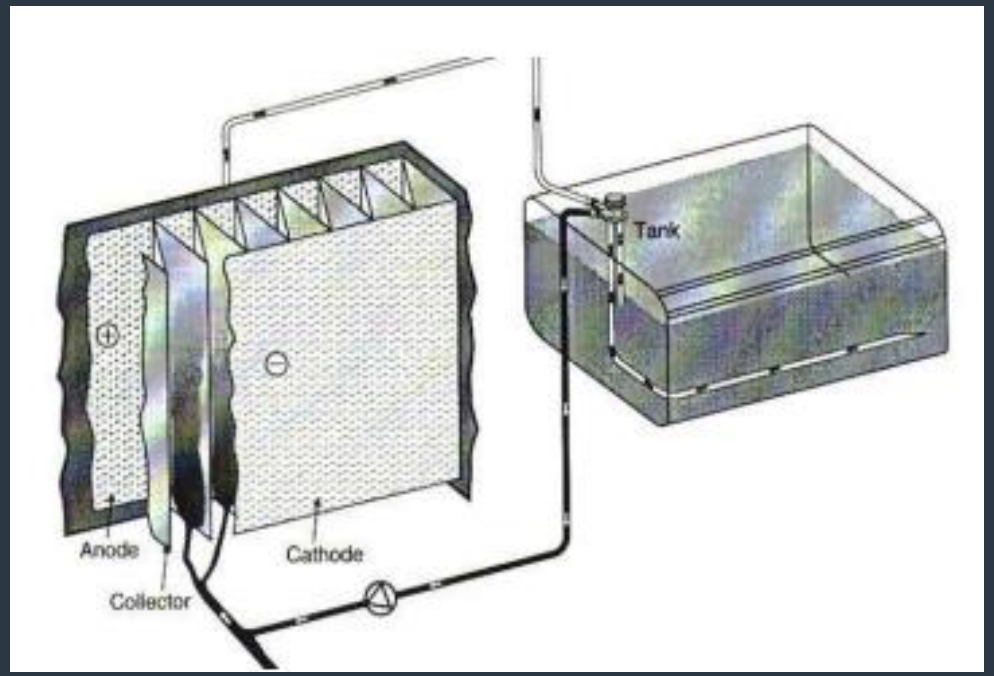
5. Implementing and Operating EOC



Implementing, Operating and Running your EOC

- Simple, quick and straightforward Implementation and Installation
- No modification to your existing machine/system is required
- Promote Active-Active (“online”)/Active-Passive (“off-line”) setup, no downtime is required for mission-critical application
- Just connect the power supply, one inlet and return hose to and from your Kleentek, Electrostatic Oil Cleaner, and your system will be up and running in no time

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Implementing and Operating EOC

Change of Kleentek: Cartridge Collector

- Cartridge Collectors are replaced every 2,000 hours
- Necessary to ensure maximum cleaning efficiency
- Procedure requires only 30 minutes
- Primary machine is not require to shutdown

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Comparison between using an EOC vs Conventional in-line Filter

Using a Traditional and Conventional in-line Filter	Using a Kleentek: Electrostatic Oil Cleaner
✗ Replace line-filter when clogging occurs	✓ No clogging of the Kleentek Cartridge Collectors upon reaching it lifespan of approximately 2,000 hours Note: depending on the level of contamination
✗ Change of oil when hydraulic failures occurs	✓ Removal of sub-micron particles and oil oxidation products that accounts for 70% of the contaminations that take place in a hydraulic system
✗ Change of oil when oil providers recommends a oil change (without system flushing)	✓ Removal of oil oxidation product from the surface of the internal component without removal of complex components
✗ Oil change continue to be part of the requirement of the preventive maintenance schedule with accordance to majority of the manufacturer – environmentally not sustainable	✓ No oil change is would be required Note: small quantity of oil (5% to 10%) top-up would be required in order to replenish the drop in level of oil additive and due to depletion of oil samples for testing
✗ Remove up to micro-level particles (6µm) sized particles only. This is equivalent of particle sized up fine iron oxide	✓ Ability to remove up to sub-micro level particles (0.03µm) sized particles. This is equivalent of up to carbon sized particles at a microscopic level.

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Advantage of Using Electrostatic Oil Cleaner (“EOC”)

Measures	Details
Productivity	• reduce machine downtime • reduce the no. of defective parts produce • ensure consistent and high-quality of manufactured parts
Environment	• extend life of lubricating fluid/oil used • encourage energy saving • reduce oil leakage – from components and oil seals
Cost Reduction	• reduce freq. and vol. of oil purchases, disposing of expenses • reduce cost of maintenances of equipment • reduce and eliminate the occurrence of servo value failure and pump failure
Sustainability	• reduce the use of non-renewable natural resources • refocus of refined minerals oil/lubricant • promote the use of sustainable practices

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Case Study – Tokyo Motomotive Co., Ltd, Japan

Customer, Region:	Tokyo Motormotives Co., Ltd Tokyo Shinangawa	
Department:	Engineering and Production Facilities Maintenance Department	
Equipment:	Hydraulic Press Machine	
	Qty:	5 units
	Vol. of Oil Tank:	4,000 litres
Operating Parameters:	Operating Temp:	45ºC
	Lubri. Brand & Grade:	Shell Tellus, VG46
Current Practice:	Oil Change Cycle:	once every 2 years
	Line Filter Replacement:	once every year
Challenges:	Hydraulic Failures	
	Value Replacement:	once every 3 years
	Pump Malfunction:	once every 2 years

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Case Study – Tokyo Motomotive Co., Ltd, Japan – Cost Benefits Analysis

Item	Description of Content	w/o Kleentek Implementation (USD)	with Kleentek Implementation (USD)	Cost saving (Dollars/year) (USD)
servo valve replacement	*average 3 times a year (@USD 6,250/year)*	*18,750*	*0*	*18,750*
cost of oil replacement	$\frac{7{,}000\ litres}{3\ years} = 2{,}333 litres/year$ $2{,}333\ litres \times USD\ 4.00 = USD\ 9{,}333$	*9,333*	*0*	*9,333*
cost of collector per year	*replacement of collector twice per year @ USD 820 per collector*	*0*	*1,640*	*-1,640*
oil addition (recommended)	*5% of tank capacity of 7,000 litres (7,000 litres x 5% = 350 litres) (350 litres x USD4.00 = USD1,400.00)*	*0*	*1,400*	*-1,400*
energy saving	*reduce 5% of power consumption of hydraulic pump motor 417kW (150kW x 2 machine x 95 x 22kW (417kW X 46% X 18h X 22 days X 12 months X 5% X USD013USD/kWh)*	*118,500*	*112,580*	*5,920*
	Total Saving	*146,580*	*115,620*	*30,960*

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Case Study – Tokyo Motomotive Co., Ltd, Japan (cont.)

ANALYSIS REPORT

No. 20669-1 (T-H) 47307
DATE OF REPORT : 03MAY2021
SALES CONTACT : TSUBACO

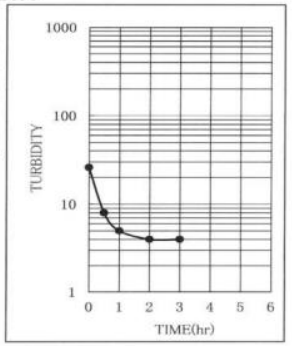
Customer: AQUA ELECTRIC APPLIANCE VIETNAM
We're pleased to report the analysis results of your oil as follows :

1. TEST

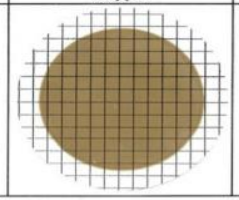
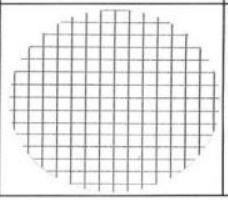
SAMPLE DATA	
OIL NAME	Shell Tellus Oil S2 M46
EQUIPMENT	Injection machine
CLEANER	NONE
OPERATING HOURS	
OIL VOLUME	2,500L
FLUID TEMP	40-50
TESTING CONDITIONS	
CLEANER TYPE	EDC-03
TRIAL QUANTITY	1.0L
TEMPERATURE	18.6→27.0℃
VOLTAGE	14kV
CURRENT	0.7→1.5 μ A
FLOW RATE	0.34ℓ/min

2. SHIFT OF TURBIDITY

TIME(hr)	TURBIDITY
0	26
0.5	8
1	5
2	4
3	4



3.TEST RESULT

SAMPLE	USED OIL	EDC 3hrs	
GRAVIMETRIC LEVEL	7.1mg/100ml	0.4mg/100ml	
WATER CONTENT	60ppm	—	
Membrane Filter MILLIPORE CAT No.AAWG04700 Size : 0.8 μ m Fluid Volume :100ml			

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KLEENTEK

Sample Oil

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enquiry@focusmachinery.com.sg

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www.focusmachinery.com.sg

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