

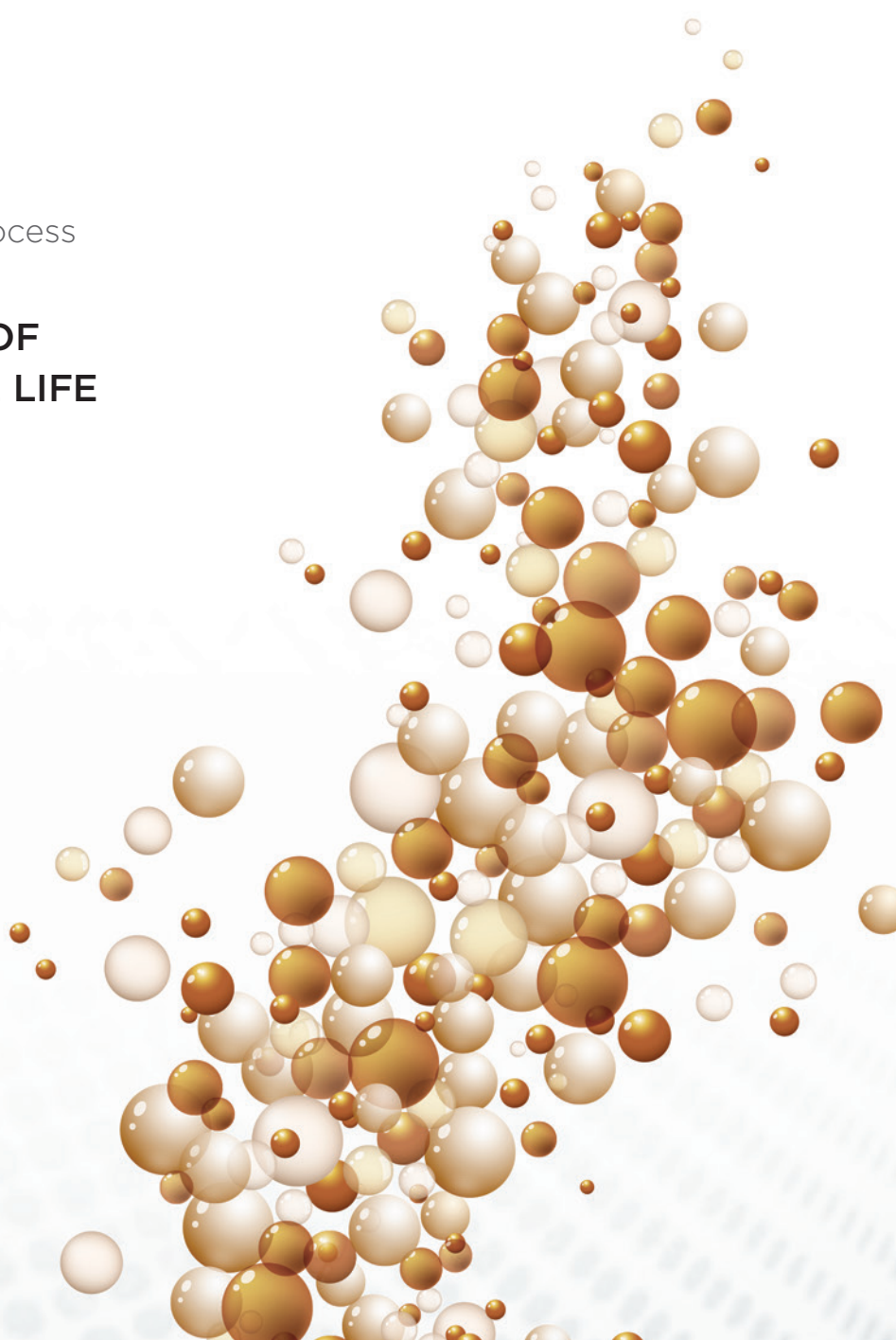


# ESP

Electrophysical Separation Process

**CLEAN YOUR SYSTEMS OF  
VARNISH & DOUBLE THE LIFE  
OF YOUR LUBRICANTS.**

IS IT A MIRACLE CURE?  
ALMOST.



ESP improves reliability  
and slashes O&M costs  
in these industries:



OIL & GAS



CHEMICAL



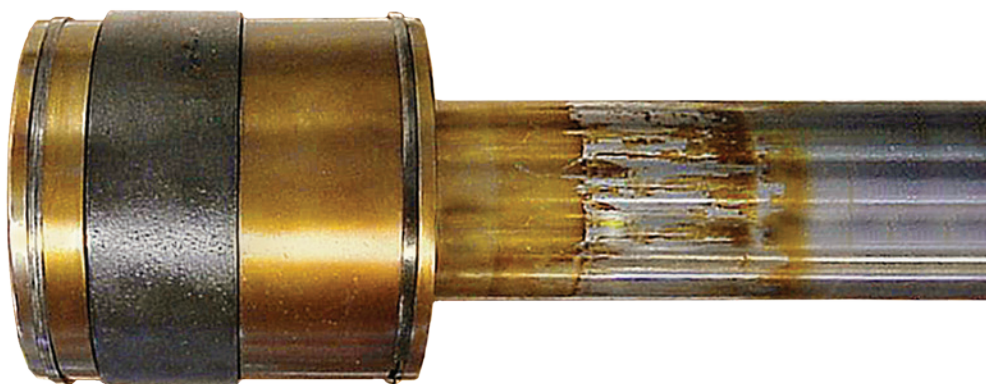
MANUFACTURING



INDUSTRIAL  
GASES



POWER  
GENERATION



## Varnish.

### IT CAN BRING YOUR MACHINERY TO A SCREECHING HALT. LITERALLY.

It's hard to believe something as simple as varnish, the sticky residue created by the decay of both mineral and synthetic lubricants, can bring an entire operation to its knees. But it can – if you don't get it under control. According to turbine OEM Ansaldo Thomassen, 70-80% of all heavy-duty gas turbines suffer to a certain extent from sludge and varnish contaminants in turbine oil.

When varnish settles into sensitive areas of your machinery, it can cause everything from premature failures to erratic component operation. Even a small amount in critical systems can force your plant to shut down for repairs or periodic cleanings, and cost you tens of thousands or more in lost revenues.

#### WHAT CAN YOU DO ABOUT IT?

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# Introducing ESP™

## GIVE NEW LIFE TO YOUR LUBRICANTS and long life to your machinery.

Varnish doesn't have to spell catastrophe for your equipment or business. With the Fluitec Electrophysical Separation Process (ESP), you can have clean oil and a varnish-free system. And once ESP restores your oil, the fluid will begin removing the varnish that's already been collecting in your system. Bearings, gears and valves that used to have a damaging layer of varnish are returned to clean condition, eliminating unplanned outages and improving your plant's reliability.

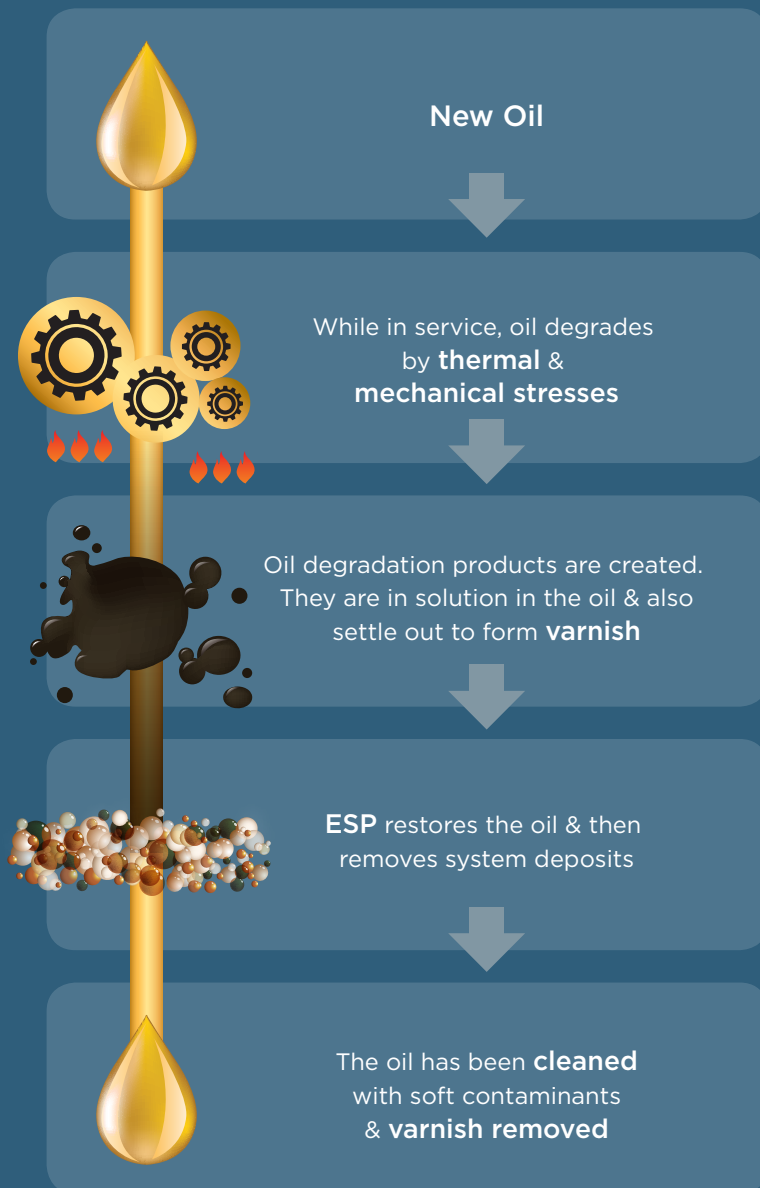
### **The science of varnish build-up and clean up: Our obsession is your lucky day.**

For years, researchers at Fluitec have looked deep into the root causes of varnish build-up and its impact on business and industry. In fact, we may understand the chemistry of oil degradation better than anyone. Fluitec has pioneered the industry's leading oil degradation and varnish detection tests, including RULER (ASTM D6971) and MPC (ASTM D7843). Our hard work in this field has led us to the development of ESP, the world's most advanced varnish mitigation technology. ESP is a proven technology that is embraced by a wide range of industries throughout the globe.

### **The symptoms of varnish build-up in your system:**

- Sticking and seizing valves
- Overheated bearings
- Decreased effectiveness of heat exchangers
- Increased wear on valves and other components
- Shortened life of lubricant, filters and seals
- Impaired equipment functionality
- Increased maintenance and associated costs
- Decreased reliability & availability

## HOW IT WORKS:



Clean your oil of varnish, and it goes to work cleaning out your systems.

As oil in your machinery breaks down, it produces soft contaminants—both in solution and in suspension. It's these contaminants that ultimately cause varnish.

The Fluitec ESP system captures these contaminants by virtue of a special chemical filter that works on the principles of chemisorption and adsorption. Depending on the contaminants you're trying to control, this filtering media can be customized to remove the exact contaminants you need to control.

ESP removes degradation species in the oil before they have a chance to form deposits and damage your systems. Once the oil has been cleaned, over time the circulating oil removes existing deposits throughout the system.

### The High Cost of Varnish



COST:  
**\$1.5M**

Varnish on this thrust bearing was responsible for shutting down a refinery.



COST:  
**\$450K**

Varnish on this bearing sleeve contributed to a compressor failure.



COST:  
**\$80K**

Sludge on this filter caused a trip in a gas turbine.



COST:  
**\$60K**

Varnish on this valve spool prevented a gas turbine from going online.



## Why Customize?

Varnish is sly and elusive.  
ESP can be customized to capture all varieties.

Before you can eradicate varnish and its impact from your systems, you need to determine its chemical makeup. This requires knowing first, what kind of additives or contaminants your lubricant contains, and second, what forces are acting on it: heat, mechanical action, pressure, static electricity and others. Specific varnish problems may require specific treatments. Fluitec can help you make this determination, customizing the ESP media so you have the right configuration in place to meet your specific needs—that means peace of mind and a better bottom line.

A specific varnish problem requires a specific treatment. Fluitec can help you make this determination, and then customize the ESP media to make sure you have the right configuration in place to meet your specific needs—for your peace of mind and your bottom line.



COST:  
\$250K

Journal bearing deposits caused an unplanned steam turbine outage due to higher temperatures.



COST:  
\$1.4M

Deposits on a heat exchanger bundle caused unplanned outage in a hydraulic press.



COST:  
\$750K

Deposits on a gearbox shaft caused a compressor failure.



COST:  
\$175K

Lube deposits on H2 seals caused generator problems.

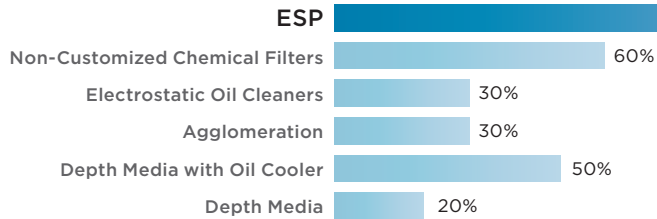
# ESP saves time, money & the environment.

KIND OF A NO-BRAINER.

## ESP is Versatile.

While other technologies on the market are designed to remove varnish in specific situations, only ESP is effective across a range of diverse operating conditions and environments.

## PERFORMANCE AT OPERATING TEMPERATURE



Data collected from over 100 sites using various varnish mitigation technologies.

## ESP is Adaptable.

If you decide to change the formulation of your fluid, even to a synthetic oil, ESP will continue working to eliminate degradation products and varnish in your system.

*"The reliable operation of our turbines & compressors is of critical importance to Siemens. Providing our customers with Fluotec's ESP technology allows them to extend the life of their lubricant assets while improving plant efficiencies and uptime."*

Siemens AG Energy Section

## ESP is Scalable.

Whether your lube reservoirs are large or small, ESP technology can easily be scaled to meet any challenge—providing efficient varnish protection in systems of 100 gallons and more.

## ESP SYSTEM CAPACITY

Reservoir Capacity Gallons (L)	Contaminant Removal Ability			Fluotec System
	Varnish	Dirt	Water	
200 - 3000 (756 L - 11,350 L)	YES	YES	YES	CCS 218
3,000 - 6,000 (11,350 L - 22,700 L)	YES	YES	NO	ESP 136
6000 + (22,700 L+)	YES	YES	NO	ESP 3/436



## ESP is Sustainable.

The life of your oil can be extended by as much as 100 percent when using ESP technology. So you'll use half as much oil to run your plant, with none of the damage done by deposits and its financial impact.



## CASE STUDY #32

For a German paper mill, Fluitec ESP technology was critical in helping keep their operation online, eliminating unexpected outages & costs due to varnish build-up.

**Location:**

Germany

**Industry:**

Paper Mill

**Equipment:**

66MW  
Steam Turbine

**Fluitec System:**

ESP 136

**Cost of Issues  
before ESP:**

\$2 Million

### The Problem

A German paper mill, which operates a 66MW steam turbine, had trouble maintaining the temperature of the turbine's bearings, forcing it to shut down four times over a period of 24 months.

Oil analysis revealed a high varnish potential and particle count. Deposits and premature wear were discovered on journal bearing surfaces, heat exchange bundles and other components throughout the lubricating system. The insulating effects of these deposits caused bearing temperatures to spike to critical levels as high as 120°C.

The outage forced the paper mill to shut down and lower production. Estimate costs due to varnish were over \$2 million.

### The Solution

An ESP 136 system was installed on the steam turbine reservoir and daily samples were taken to track the progress of the cleanup.

The varnish potential values started to drop, as determined by the Membrane Patch Colorimetry (ASTM D7843) test.

As the oil was cleaned, deposits were stripped off the bearings and heat exchangers, allowing temperatures to stabilize at normal levels and the plant was able to stay online, avoiding unplanned outages.

*"Bearing temperatures and turbine oil condition has been maintained since the installation of the ESP 136. Bearing surfaces were also cleaned. We have had no unplanned outages since."*

Plant Manager





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**Fluitec provides expertise to customers  
in 50 countries across 5 Continents**



### Our Story

Fluitec currently has technology deployed in over 50 countries spanning five continents. We are dedicated to discovering ways for our customers and partners to maximize their investment in mechanical lubrication—to optimize type, reliability and productivity of lubricating fluids. Our holistic approach maximizes the life of rotating equipment and hydraulic systems in an environmentally sustainable way.

### Why Fluitec?

The Fluitec team of scientists and researchers has been at the forefront of oil degradation research for over a decade, covering detection, mitigation, root cause analysis and education. Fluitec's ESP technology has successfully solved dozens of varnish problems around the world. It is the most trusted name in varnish mitigation.