



# Demulsibility

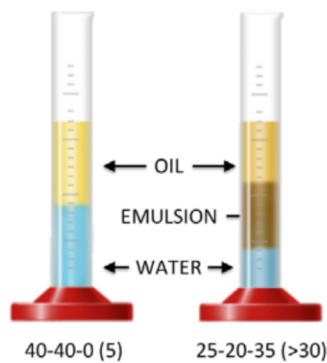
## What is it and why does it matter?

### Restoration of Steam Turbine Demulsibility

#### WHAT IS DEMULSIBILITY?

Demulsibility is the characteristic of your oil to readily separate from water. Free water and even some emulsified can be removed by coalesce technology, but coalescers are disarmed when demulsibility is lost.

Demulsibility is measured by industry standard test ASTM D1401. This test measures your oil's tendency toward emulsion formation through the time required for oil-water separation. For the test, 40 mL of your oil sample and 40 mL of water are mixed for 5 minutes and thereafter monitored as the mixture separates within a graduated cylinder. The test is concluded after 30 minutes or when the oil and water separate to an acceptable level, whichever comes first.

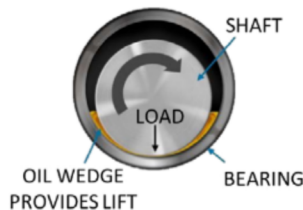


#### Demulsibility is Key for Coalesce Technology

Aside from meaning your oil is out of spec, oil with low demulsibility cripples the ability of coalesce systems to separate water from oil. In steam turbines with high exposure to water ingress, this can mean the end of your oil's useful life and even bearing failure or forced outages.

#### WHY DOES DEMULSIBILITY MATTER?

Steam turbines utilize a rotating shaft in a bearing facilitated by a turbine oil lubricant. When contaminated with water, however, the oil can lose its viscosity and lubricating properties which results in corrosion, breakdown and bearing failure. Demulsibility in oil matters because:



1. It is fundamental to proper lubrication
2. If lost, oil is condemned
3. If lost, disarms coalescers
4. Insurance and regulatory bodies are monitoring demulsibility
5. If lost, results in forced outage
6. It is a leading indicator of varnish formation

#### HOW CAN I RESTORE AND PROTECT MY OIL'S DEMULSIBILITY?

There are two schools of thought in regards to restoring demulsibility:

1. Top-up reservoirs with new oil or aftermarket additives
2. Utilize ICB resins to remove polar contaminants and restore oil properties

Topping up with new or different oils (Group I adding Group II, etc.) or contributing aftermarket additives can provide temporary relief in best-case scenarios; however, these additions, more often than not, result in complex changes to the chemistry of the oils with unknown and unpredictable results. These risky, short-sighted approaches often result in worse conditions than before they were implemented and ignore the root cause of the issue at hand.

On the other hand, ICB has been proven to restore demulsibility by selectively removing polar contaminants from the oil such as acids, metals, varnish, oxidation by-products and other contaminants. ICB resins also reduce the time it takes for oil and water to separate.

# Proven in the Lab:

Lab-scale ICB treatment of 14 different in-service steam turbine oils

In-Service Oil Sample	Initial Demulsibility	Post IX Demulsibility	Emulsion Decrease (%)	Separation Time Improvement (%)
1	40-25-15 (>30)	40-40-0 (10)	100	67
2	39-8-33 (>30)	40-36-4 (>30)	88	0
3	5-0-75 (>30)	40-36-4 (>30)	95	0
4	40-33-7 (>30)	40-40-0 (10)	100	67
5	5-24-51 (>30)	46-34-0 (>30)	100	0
6	15-25-40 (>30)	41-38-1 (15)	98	50
7	40-37-3 (30)	40-38-2 (10)	33	67
8	0-27-53 (>30)	41-37-2 (25)	96	17
9	0-11-69 (>30)	9-22-49 (>30)	29	0
10	40-38-2 (15)	41-39-0 (10)	100	33
11	4-3-73 (>30)	37-37-6 (>30)	92	0
12	40-38-2 (15)	40-38-2 (10)	0	33
13	40-38-2 (10)	40-38-2 (5)	0	50
14	30-18-32 (>30)	40-40-0 (10)	100	67
<b>Average</b>	<b>26-24-30 (26)</b>	<b>40-38-2 (17)</b>	<b>91</b>	<b>35</b>

## UNDERSTANDING THE RESULTS

The table above demonstrates a lab-scale test of ICB on 14 samples taken from steam turbines with varying levels of demulsibility. The results show a dramatic improvement across the board in both separation levels and time.

It is worth mentioning that not all turbine oils will respond to treatment with ICB media based on their existing condition and the chemistry of the oil, as indicated by row 9 in the table. Knowing this, **we will test your oil to prove the effectiveness of ICB before implementing any solutions, risk free.**

As indicated on the bottom line of the table, the average demulsibility improvement (excluding outlier row 9) was staggering, with a decrease in emulsion levels of 91% with separation time improvement of 35%. In addition, the oils on average displayed improvements of:

**43%** ↓ in oxidation by-product levels

**48%** ↓ in acid number

**64%** ↓ in MPC varnish potential

## BENEFITS BEYOND DEMULSIBILITY

ICB is unlike all other ion exchange resin products. With over 50 million hours of operating performance and over 90 million dollars in documented cost savings, ICB is the most utilized resin-based solution in the world for turbine oil care. Beyond the dramatic improvement in demulsibility and through proper utilization, ICB benefits can include:

- ✓ **Varnish removal + prevention**
- ✓ **Prevention of AO additive depletion**
- ✓ **Removal of acids + metal ions**
- ✓ **Oil life estimate based on new turbine oil with SVR+ICB installed**



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