



## CASE STUDY: MIRACLE BOY ON TRANSFORMERS

### CUSTOMER

Tokyo Electric Power Co.

### APPLICATION

Transformer insulation oil

### STARTING CONDITIONS

- Each transformer is tested before shipment and the oil would become contaminated over several tests. Large amounts of oil were being dumped.
- If problems occurred in the test the oil would have to be changed and tested. The transformer would be serviced to find the problem. This was time consuming and labor intensive.
- If a system failed in the field the service call and oil change were expensive and would sometimes be covered by the company's warranty.

### CURRENT CONDITIONS

- The MB filter is now reconditioning the testing oil and very little oil is being dumped.
- Most of the problems that would occur during testing were eliminated.
- Due to the success in the testing area many of the transformers are shipped with a MB filter system.
- Portable MB systems are used in the field to recondition insulation oil and eliminate oil changes.
- With several years of installations many of the transformers have had their lifetime extended.



| INDUSTRY STANDARDS       |              |
|--------------------------|--------------|
| Total Acid Value,        | <0.1 mgKOH/g |
| Breakdown Voltage 2.5mm, | >40 kV       |
| Surface Tension 25°C     | >25 mN/m     |

| STARTING OIL TEST RESULTS                           | MB OIL TESTING RESULTS                              | CHANGE     |
|---|---|------------|
| Total Acid Value = 0.062 mgKOH/g                    | Total Acid Value = 0.036 mgKOH/g                    | - 58%      |
| Breakdown Voltage 2.5mm = 42 kV                     | Breakdown Voltage 2.5mm = 50 kV                     | +18%       |
| Surface Tension 25°C = 14.4 mN/m                    | Surface Tension 25°C = 24.1 mN/m                    | +66%       |
| Water = 1.7 ppm                                     | Water = 1.3 ppm                                     | -20%       |
| Kinematic Viscosity 40°C = 9.012 mm <sup>2</sup> /s | Kinematic Viscosity 40°C = 8.901 mm <sup>2</sup> /s | -1%        |
| Dielectric Tangent 80°C = 46.1%                     | Dielectric Tangent 80°C = 2.73%                     | -94%       |
| Volume Resistivity 80°C = 5.0x10 <sup>-4</sup> TΩ•m | Volume Resistivity 80°C = 7.4x10 <sup>-4</sup> TΩ•m | 14.8 times |

### TESTING NOTES

- Testing was done on contaminated testing oil for 15 minutes and the test still showed strong results despite many of the contaminants in this application are difficult and generally take a longer time to effect a change. We however know of no other technology that can recover oil like the MB system for this type of application.
- ISO oil rating on contaminants was 13/11 and was reduced to 12/9 by the MB filter.