

CASE STUDY I – HF CIRCULATING CURRENTS IN A PROPULSION DRIVE

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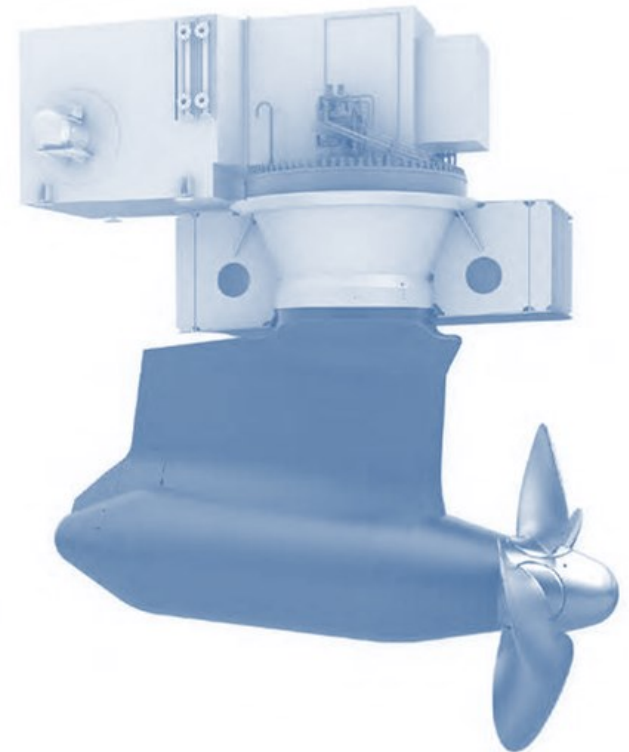
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The problem

“...Bearing damage was observed ~4000 hours after commissioning in the second propulsion motor of a vessel which was equipped with two propulsion units.

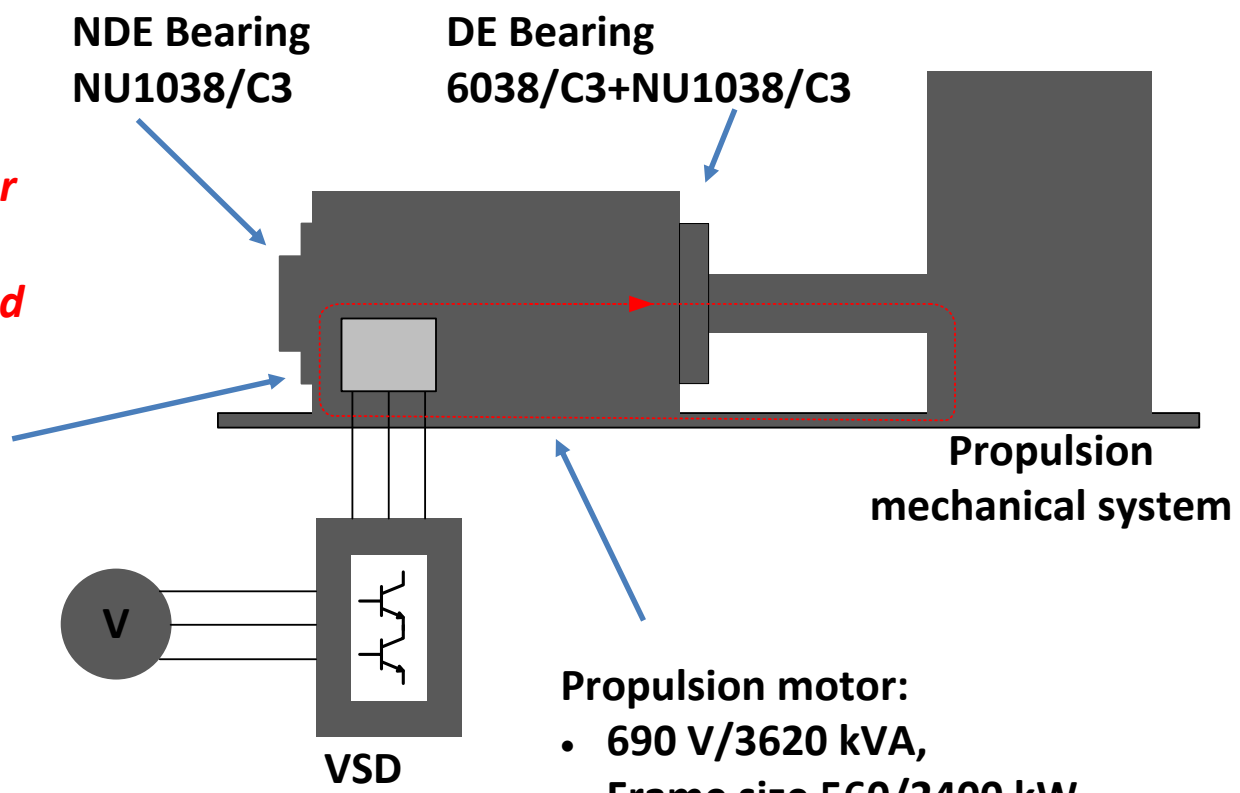
After inspection of the bearings, it was found out that the damage had been caused by hf circulating current (both motor bearings indicated typical signs of current passage related damage).

Because both the motor and the VSD were equipped correctly in order to avoid circulating currents, and because no problems were detected in the other propulsion motor, it was decided to carry out field measurements and site inspection on both propulsion drives....”



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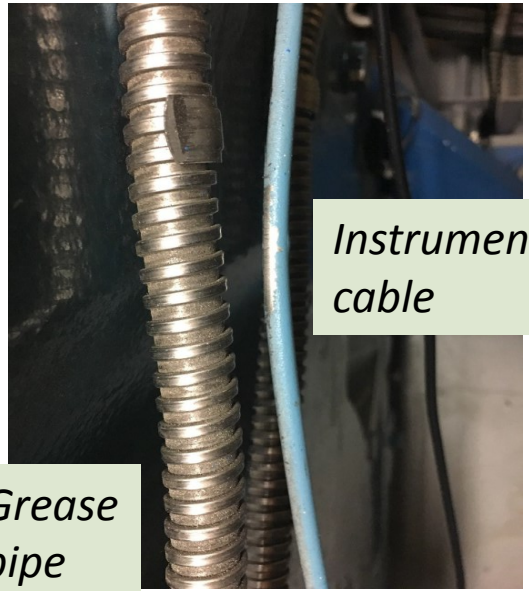
A hf circulating current passes through both motor bearings, then through the earthed motor frame or through the main shaft and external earthed main bearings.



- Propulsion motor:**
- 690 V/3620 kVA,
 - Frame size 560/2400 kW
 - 0-1000 rpm
 - Shaft end diameter 180 mm

HF circulating currents result from machine flux asymmetry inducing a shaft voltage inside the motor, if the voltage is high enough to overcome bearing insulation, or the insulation is compromised, then current flow occurs.

CASE STUDY I – HF CURRENT – PROPULSION SYSTEM



Instrument cable

Grease pipe

Measurements and site inspection revealed that the NDE bearing insulation was randomly and intermittently shorted via NDE bearing grease pipe and a loosely hanging, instrumentation cable grounded protective cover. This caused a large circulating current to appear.

If the short would have been continuous, the bearings would have failed in weeks possibly leading to motor destruction.

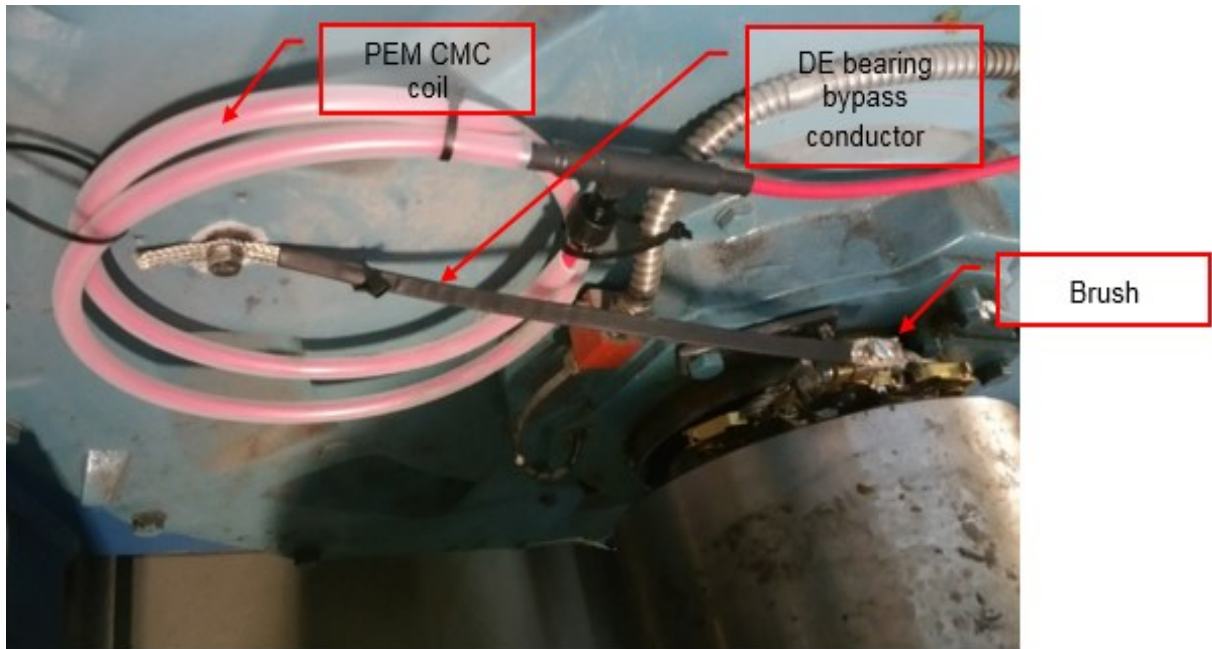
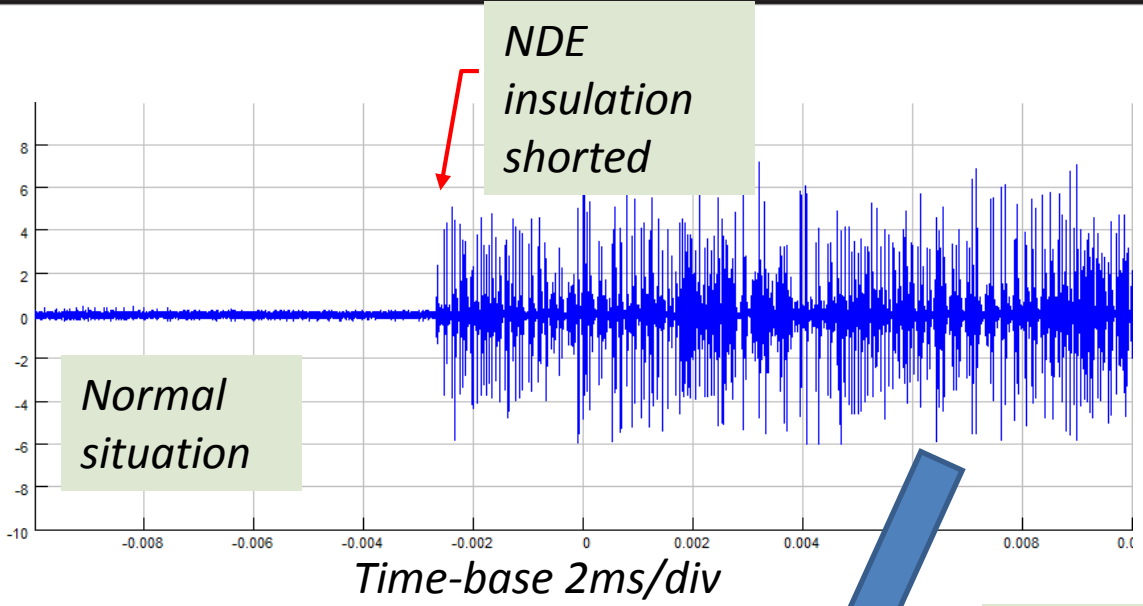


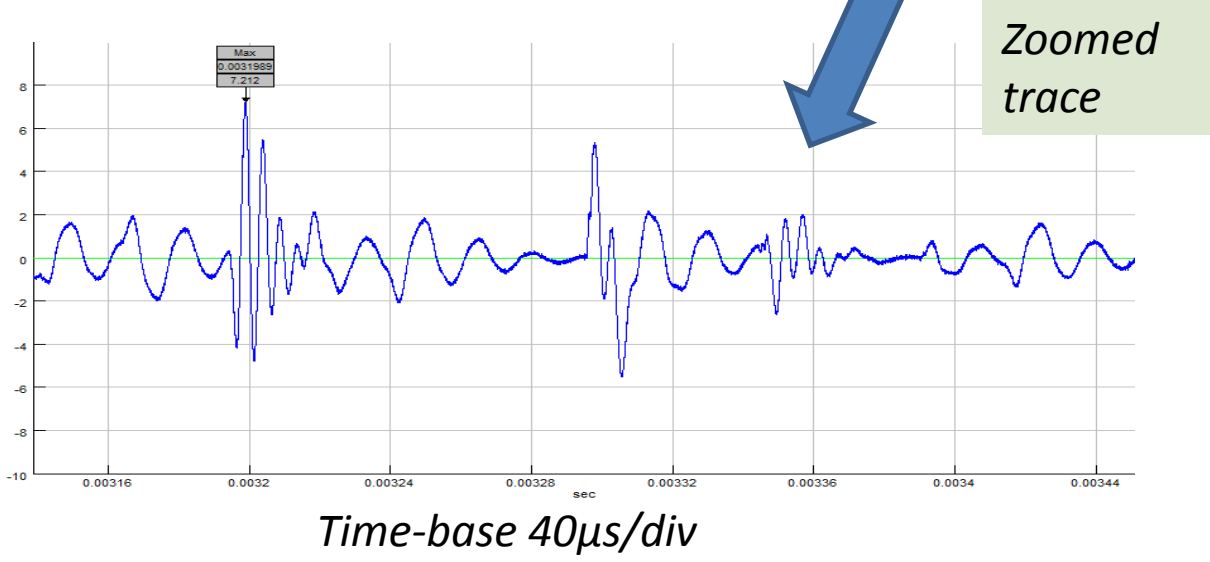
Photo of circulating current measurement from the DE bearing bypass conductor attached.

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Current measured by CMC
(2A / div)



Current measured by CMC
(2A / div)



Rohde & Schwartz RTH 1004 scope are used, because it has a long digitizing memory which enables accurate calculation of the RMS-value of the HF transient type currents.

