

Info Marine Sp. z o.o.

# Electric devices condition & performance survey (electrical package)



Diagnostic solutions for:  
Marine, Oil and Gas



## Diagnostic service of electric equipment on board

### 1.DYNAMIC ANALYSIS OF ELECTRIC MOTORS

5-7 big electric motors per day

### 2.STATIC ANALYSIS OF ELECTRIC MOTORS

5-7 big electric motors per day

### 3.THERMOGRAPHY INSPECTION OF ALL MAJOR ELECTRICAL DEVICES

1 day on board

These three services together offer a full view of the condition of the electric devices on board. All these services are done by 1 service engineer.

**After measurements and analysis, we provide diagnostic reports with technical advice.**





## Dynamic analysis of electric motors

### Dynamic analysis of electric motors

aims to assess the state of the electric motor during operation. This means that the test can be performed during operation, without disturbing operations. The analysis includes parameters of the motor, so you can assess the effectiveness of the operation. Tester is fully portable, battery powered, low voltage measuring device of the highest class





## Dynamic analysis of electric motors

### The test provides information about

- Voltage level
- Voltage unbalance
- Motor performance
- Load
- Condition of the rotor cage
- Effective service factor
- Current overload
- Motor operation conditions
- Torque
- Harmonic distortion and total distortion





# Dynamic analysis of electric motors

## The test procedure allows you to specify

- **Power quality** - it is possible to define the quality of power that can cause additional, excessive motor load.
- **Machine performance** - by assessing the motor during operation it is possible to detect the malfunction and determine its cause.
- **Spectral analysis** - allows to detect problems with the bars of the rotor cage.
- **Torque** - torque allows detection of overloading the motor and to detect problems with machine powered by the motor.
- **The work of frequency converters** - test allows the determination of devices controlled by the frequency converters. It is possible to observe the difference in rotational speed, torque and power over time.



## Dynamic analysis of electric motors

### Many kinds of problems can be determined

- Winding problems
- Feed power quality
- Improper tap settings on supply transformers
- Load condition placed on motor
- Poor distributed single-phase loads
- An excessive number of VFGs without proper filtration
- Excessive non-harmonic frequencies
- Improper filters
- Missing or open correction capacitors
- High resistance connections
- Machine degradation issues
- Cavitation





## Dynamic analysis of electric motors

Many kinds of problems can be determined

- Bearing problems
- Mechanical imbalances
- Eccentricities
- Misalignment shafts
- Broken rotor bars
- Short winding
- Over loading
- Poor connections
- Misconnections
- Miss wound
- Torque related start-up problems





## Dynamic analysis of electric motors

### 2.25 Cargo spray pump – electric motor

Cut out from reports:

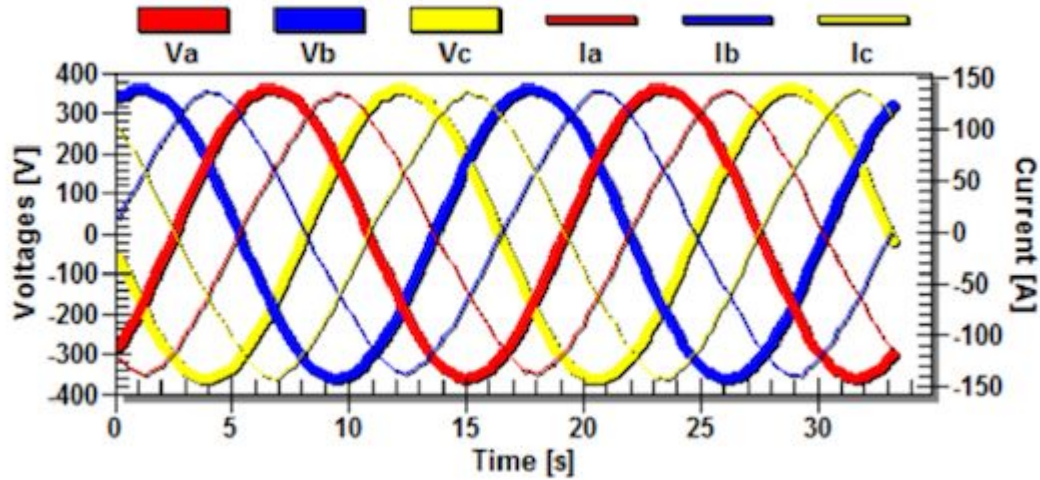
	Name Plate	Measured
Output Power [Hp]	171.58	42.98
Speed [RPM]	1775	1794.47
RMS [V]	440	444.17
RMS [A]	205.00	93.38
pf [p.u.]	N/A	0.48
Nema Derating [p.u.]	1.0	1.00
Torque [[ft-lb]]	507.93	125.85
Efficiency	N/A	92.90
Percent Load	N/A	25.05

Test	Value	Status	Caut. Level	Warn. Level
Voltage Level (Over) [%]	100.95	Good	110.00	120.00
Voltage Level (Under) [%]	100.95	Good	95.00	90.00
Voltage Unbalance [%]	0.20	Good	2.00	3.50
THD [% of fund.]	0.32	Good	7.00	9.00
Total Distortion [% of fund.]	0.67	Good	10.00	12.00
Current Level [%]	46.19	Good	110.00	120.00
Current Unbalance [%]	1.40	Good	10.00	20.00
Load [%]	25.05	Good	110.00	125.00
Ef. Service Factor [p.u.]	0.25	Good	1.10	1.25
Rotor Bar [db]	-38.56	Caution	-45.00	-36.00





# Dynamic analysis of electric motors





## Dynamic analysis of electric motors

### Cargo spray pump – electric motor

- Main parameters are within industry standard limits.
- Percent load of el. motor is high enough to determine there is a rotor bar defect.
- Maximum difference between phases is 0,3A or 0,8kW of drawn power.
- Voltage is stable on all phases, it varies maximum 0,8V.
- No problem with harmonics.
- **General device condition: good, but there is rotor bar problem/deflection. State should be monitored, but no action is required to taken.**



## Static motor analysis

**Static motor analysis** offered by our company together with comprehensive and detailed reports, clearly describe condition of measured devices.



For our services we use effective and reliable measurements equipment - **Baker DX** series analyser which can find early indications of insulation weakness and faults in windings, between phases, coil-to-coil and in ground wall insulation.

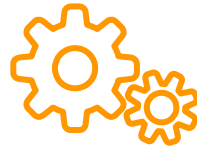
They can identify if contamination by chemicals, moisture, dust, dirt, etc., is impacting insulation strength. Finally, they detect problems with motor connections such as feed cable insulation weaknesses, unbalances, opens or high resistances.



## Static motor analysis

**During each survey, our qualified Service Engineers perform multiplied tests, including:**

- Impedance
- Capacitance
- Phase angle
- Resistance
- Insulation resistance
- DC hipot/step voltage
- Dielectric absorption
- Polarization index
- Surge testing with improved analysis
- Partial discharge

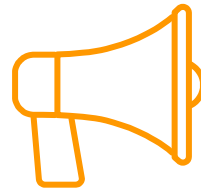




## Static motor analysis

### The most important benefits of this service

- In-depth testing of windings and coils
- Detecting coil to coil and turn to turn shortcuts
- High voltage insulation testing which gives more details about the condition of the windings than ordinary megger test



Cut out from a report:

## Summary table:

	Resistance [mΩ]	Impedance [mΩ]	Capacitance [nF]	Quality Factor	IR [MΩ]	PI
No.1 generator	6,1	309,385	267,8	12,819	7366	3,7
No.2 generator	6,5	301,314	183,4	68,585	2638	5,2
No.3 generator	6,3	343,403	179,8	73,375	4910	3,3
No.4 generator	6,0	310,877	177,2	61,465	8839	5

## Recommendations:

### ➤ No.1 generator

- At the next convenient opportunity interior of generator should be cleaned using oil-free compressed air, for example. Making use of open generator it would be profitable to check tightness of slot wedges in stator and rotor cores. General visual survey should be performed.

Dynamic is used for the collections of data under operation without the interruption of production. Static testing facilitates quality assurance assessments, diagnostic testing on de-energized motors and comprehensive analysis during plant shutdowns.



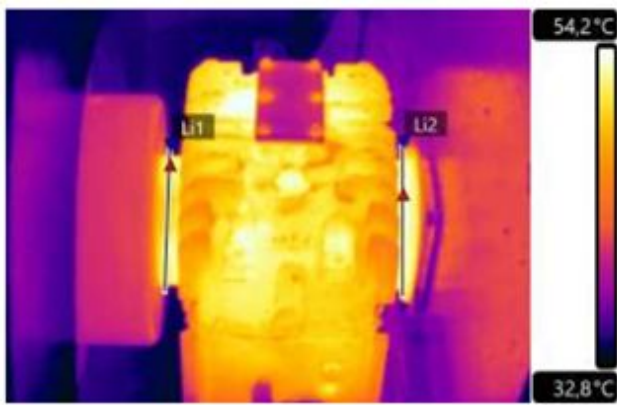
## Thermography inspection

**Thermography** is one of the most popular **non-destructive** diagnostic methods. Thermal test can detect small temperature deviation, which may indicate improper operation of the machinery and cause and unexpected malfunction or breakdown.

List of devices for these surveys:

- Compressors
- Generators
- Exhaust lines
- And others
- Transformers, connectors and electrical components
- El. motor
- Bearings
- Transmissions
- Turbines
- Pumps





Date: 2018-05-10 | 21:28

Location: Engine Room

Equipment: DG 1 drive end bearing

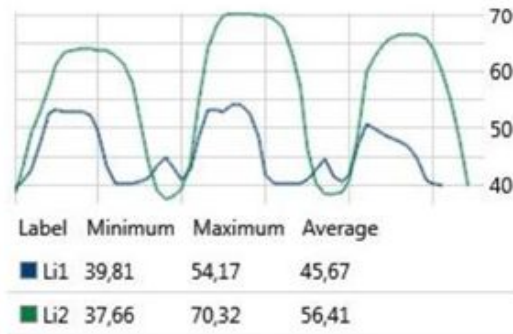
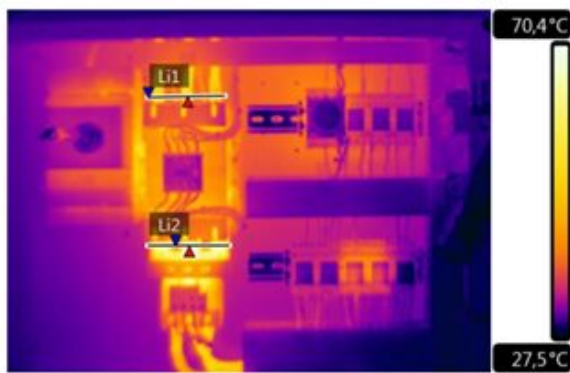
**Problem:**

Routine Check

**Parameters:**

Emissivity 0,95





Date: 2018-04-02 | 07:14

Equipment: Lubrication Oil no.2 pump switchboard

**Problem:**

Routine Check

**Parameters:**

Emissivity 0,95

**Note**

Improper temperature distribution. Higher temperature in Li2, connection needs to be cleaned.



# THANKS!

Any questions?

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