What is HAT?

HAT is *Digital Health Monitoring System* for ship rotating machinery developed by FNT research and development team of vibration analysts specialized in advance Digital Signal Processing and Control Systems.

HAT is an advance portable vibration meter, equipped with a 3-axis IEPE accelerometer. Powered with an Intel processor, with a data acquisition unit of 48,000samles/sec per channel and 24bit dynamic range, HAT captures with very high frequency resolution machinery dynamics up to 20 kHz. In the background of HAT, an embedded machine diagnostics algorithm is running continuously, analyses vibration readings and instantly provides to user a detailed report of machinery condition, analysis findings and straightforward recommendations for remedial actions, if required.

HAT Features

- **Simplicity**: No training is required due to its highly interactive graphical user interface.

- **Instant results**: No delays for report. An embedded powerful diagnostics and troubleshooting algorithm is running in the background of HAT, providing in just a few seconds meaningful reports.

- **Extremely Low bandwidth requirements**: No limitations due to bandwidth. HAT, when connected to the ship's network, transmits only an encoded data file of diagnostics results and machinery fault indicators for sharing the information

with superintendents and fleet managers and not entire vibration data files for post processing by onshore engineers.

- **Business Analytics and fleet KPIs**: Instant sharing of information. Machinery report is uploaded to an On-Line Condition Monitoring and Business Intelligence platform. From there the information is securely accessible to the ship's superintendents and fleet managers. This feature gives to fleet managers the unique advantage of instant information, without delays for analysis by onshore engineers or due to ship network congestion.

- **Machine Learning Algorithm**: Improvement through lifetime. Machinery fault indicators, are transmitted through ship's network and populates a data lake of vibration levels and fault indicators of similar machinery types. A Supervised Machine Learning algorithm is continuously processing the data and updates HAT diagnostics algorithm, minimizing by that the probability of false positive or false negative events.

HAT Specifications

HAT design and its embedded diagnostics algorithm is highly customized to ship machinery by taking in account the different types, the orientation, the mounting, the speed, the bearings and the induced by main engine and shaft vibration.

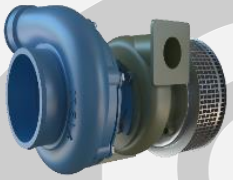
Machinery condition report is based on:

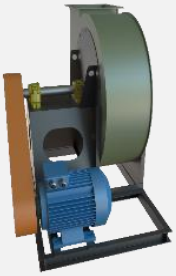
- ISO standards
- Class recommended limits
- Manufacturers recommended limits
- Industry proven methods
- Supervised Machine Learning algorithm

Several analysis techniques and fault indicators are utilised:

- High Frequency up to 10,000 Hz Time waveform analysis
- Low Frequency up to 1000Hz Spectrum analysis
- High Frequency up to 10,000Hz Spectrum analysis
- Demodulation analysis
- Crest factor
- Spectral Kurtosis
- Reciprocating Factor Index for reciprocating compressors
- Autocorrelation curve analysis

Types of failures capable to be detected at early stage are:





- misalignment
- unbalance
- bearing wear or lubrication issue
- rotating looseness
- mounting problems
- belt wear
- gear defects
- pump impeller wear
- pump cavitation
- rotor or stator related faults
- resonance and induced vibration