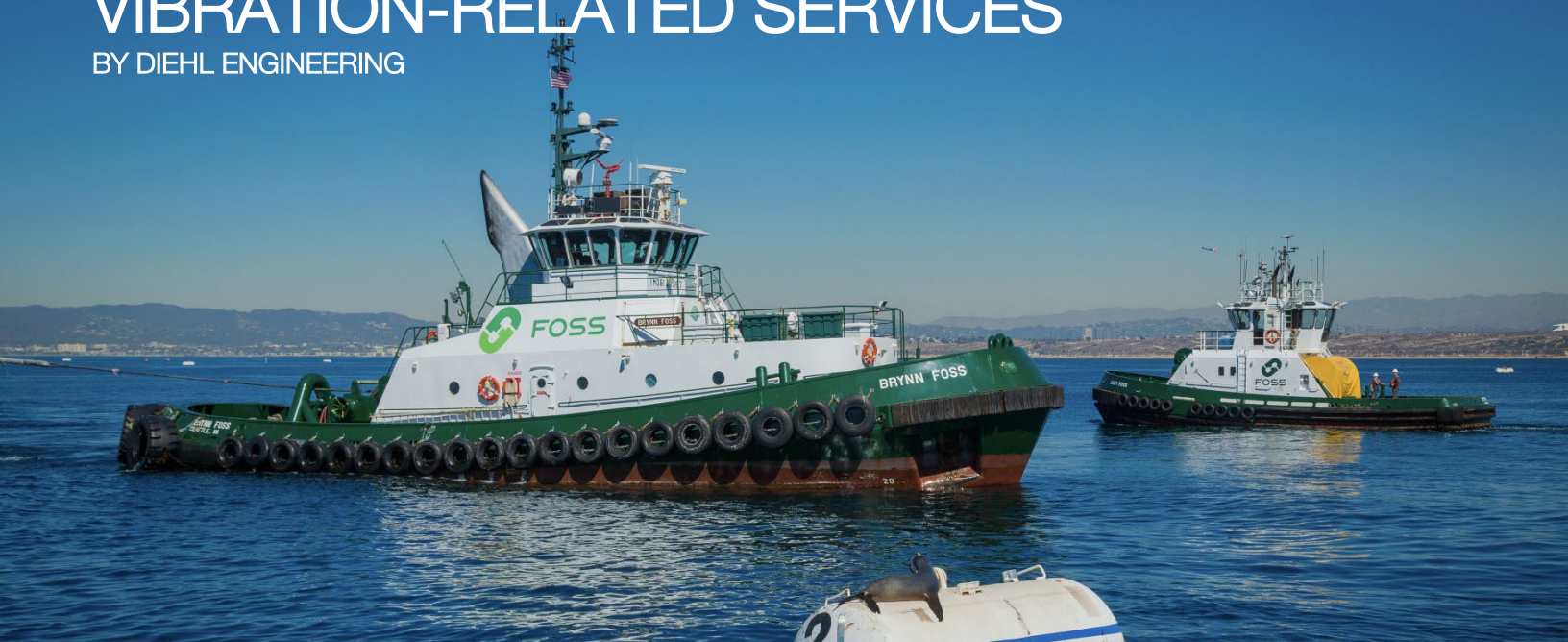


# VIBRATION-RELATED SERVICES

BY DIEHL ENGINEERING

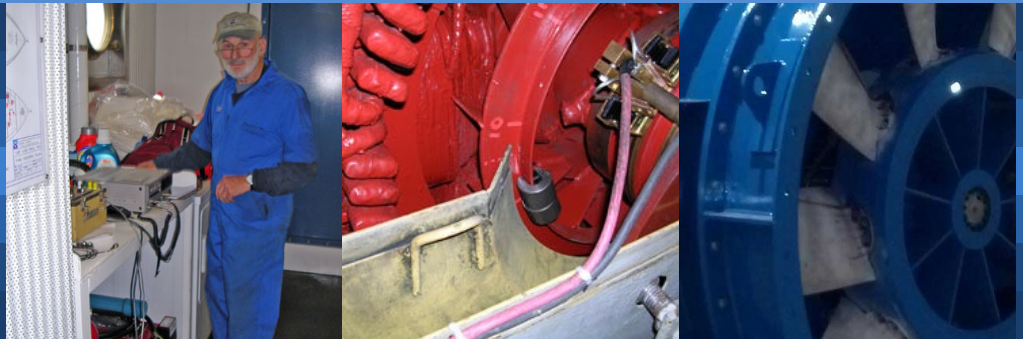


MACHINERY VIBRATION ANALYSIS

HULL VIBRATION ANALYSIS

VIBRATION TROUBLESHOOTING

IN-PLACE DYNAMIC BALANCING



## Vibration Analysis & Field Balancing Services

Sea-going vessels are often a floating vibration laboratory, and keeping those vibrations at an acceptable level can be a challenge. The solution of vibration problems quite often requires a four-step process:

1. Determine the vibration frequency and vibration mode shape of the item that is vibrating over the vessel speed range, and match the vibration to excitation sources;
2. Determine from the vibration survey if the vibration is forced or resonant;
3. If forced, determine what can be done to repair the source to reduce excitation, or isolate the source;
4. If resonant, determine by analysis if the stiffness across the vibrating system can be changed, and/or the suspended mass of the system can be changed to move the resonance out of the operating speed range.



**DIEHL**  
ENGINEERING  
COMPANY

## Machinery Vibration Analysis

Diehl Engineering Company has a history of finding practical solutions to shipboard machinery vibration problems. We will perform a vibration survey to determine the strength and frequency of the vibration at the critical locations on the machine, and perform the analysis necessary to determine if the vibration is forced or resonant.

If forced, we will look for the cause internally in the machine. If resonant, we will determine what stiffness or mass changes are necessary to move the resonance outside the excitation range. Diehl Engineering Company will design white metal sleeve-type bearings to suit any reduction gear and/or propulsion shafting application, including selection of size, clearance, load, speed, lubricant, and compute the resulting hydrodynamic bearing loss and oil flow. We will inspect this type of bearing for proper installation and load distribution, and for wiping, galling, fatigue, or any other signs of failure.

When a problem bearing is identified, Diehl Engineering will provide the analysis and recommendations for the proper correction to obtain the most effective and economical solution. Our engineers are not afraid to use an old-fashioned scraper to correct faulty contact on white metal bearings, to increase clearances, or to correct gear tooth contact, when there is an obvious need.

## Hull Vibration Analysis

Hull vibrations are a special case in which the hull as a beam is often resonant at some excitation frequency, such as a propeller blade passing, or propeller shaft rotational.

We can survey the hull vibratory motions underway and determine the mode shape, either vertical or athwartships, but quite often this is a function of the hull structure and not easily changed. Sometimes, the problem can be solved via changing the number of propeller blades, or isolating the engine on resilient mounts.

## In-place Dynamic Balancing

Machinery imbalance is one of the leading contributors to machine vibration and wear, particularly if the forced vibration of the unbalance works in conjunction with a resonant structure.

Diehl Engineering offers comprehensive in-place machinery balancing services. Using the latest in multi-plane, multi-speed balance software and hardware our engineers can provide an accurate, efficient and stable balance solution. From electric ventilation fans to turbine generators of all sizes, we can fill your machinery balancing needs.

---

## Contact Us Today!

If you have questions or would like to learn more about our services, contact us by telephone or email and one of our engineers will be happy to discuss your project, and how we can help you.



TEL: (+1) 360-297-8781

EMAIL: [info@diehlengineering.com](mailto:info@diehlengineering.com)

WEB: [www.diehlengineering.com](http://www.diehlengineering.com)

MAIL: P.O. Box 1573, 26076 Iowa Avenue, Kingston, Washington 98346 USA