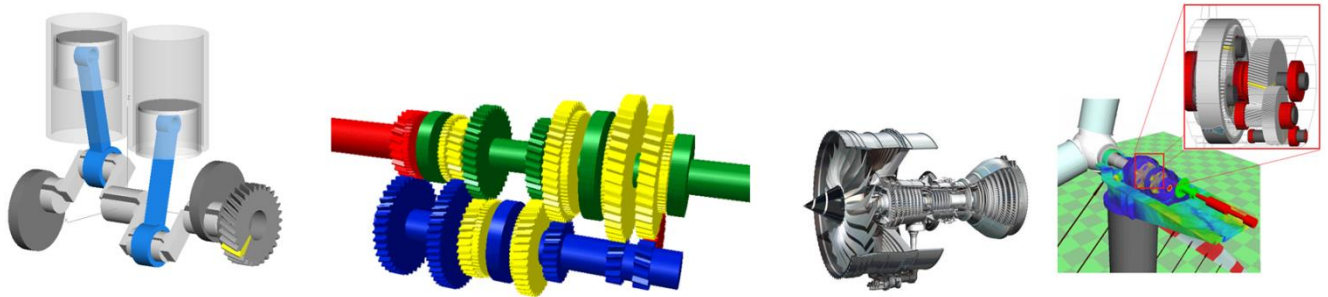


1. Order Analysis

All the machines which have moving parts within the system exhibit vibrations. The vibrations can be random or repetitive. For example, an engine, a gearbox, a generator and a turbine exhibit cyclic vibrations.

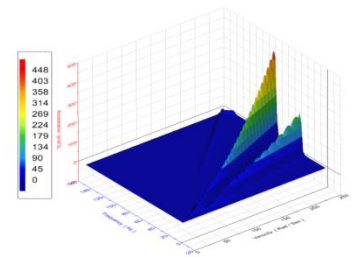


These vibrations occur at the torque/power transmitting components to, till the housing surface and which leads to produce noise. It can be identified and isolate these sound and vibration patterns and to analyze the performance and quality of each component individually.

- **Order analysis is a technique for analyzing sound and vibration signals from rotating or reciprocating machinery.**
- **An Order:** Its normalization of rotational speed or in other words frequencies that correspond to the input speed or multiples of it are called orders.

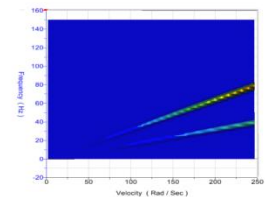
Campbell 3D-Diagram

- Type of 3D plotted result
- Shows which torque transferring component from the system is reason for complete system excitation



Inputs for resonance analysis

- Gear macro and micro geometry
- Bearing locations, stiffness and damping characteristics
- Flexible shafts and housing components
- Mounting locations of housing components, mount stiffness and damping characteristics
- Bolt stiffness and damping characteristics
- Gear material properties
- Input torque
- Reverse torque at output shaft
- Definition of gear contacts
- Maximum RPM of the gearbox in one particular gear engagement



2. Efficiency of Gearbox

- Power losses in gearbox are associated primarily with tooth friction and lubrication churning losses. Churning losses are independent of nature of gears and gear ratios. These are related to peripheral speed of gears passing through the fluid. Frictional losses are related to gear design.
- By teeth profile modification it is possible to optimize gear design to get less transmission error which leads to rise in efficiency.

3. Duty Cycle

- Duty cycle is the proportion of time during which a Gearbox is operated.
- The duty cycle can be expressed as a ratio or as a percentage.

Suppose a gearbox operates for 1 Hour, then is shut off for 99 Hours and then is run for 1 Hour again, and so on. The gearbox runs for one out of 100 Hours, or 1/100 of the time, and its duty cycle is therefore 1/100, or 1 percent.