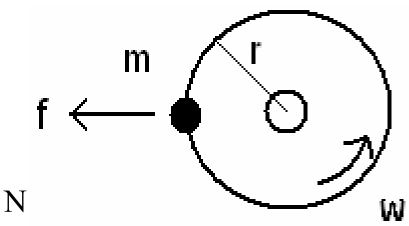
EPL 331 BALANCING ROTATING MACHINERY HORIZON GITANO

INTRODUCTION

Balancing of rotating equipment very important in many areas. Imbalanced equipment vibrates causing noise and oscillating forces which can lead to fatigue failure and wear of the equipment and its supporting structure.



The force of a rotating imbalance is:

$$f = m\, r\, \omega^2$$

Where: f is the force created by the spinning imbalance in N
m is the imbalanced mass in kg
r is the radius of the imbalanced mass in m
ω is the rotational frequency in rad/sec

Obviously the imbalanced force is proportional to the mass of the object, and the size, so the proper balancing of large or heavy objects is more important than small, light objects. Also notice that the magnitude of the imbalance force is proportional to the *square* of the speed, so balancing is very critical in high speed applications.

The typical method of balancing a rotating imbalance is to add weight opposite the imbalanced mass, or remove weight from the imbalanced side. Which method is chosen depends on the application: Tires are balanced by adding weights to the light side, flywheels by drilling out weight from the heavy side.

TWO PLANE BALANCING

If a rotating object is imbalanced in one plane, and has an equal imbalance in another plane (eg. Your tire has a heavy spot on the inside (side facing the car) near the air valve, and an equal heavy spot on the outer face opposite the air valve) it is said to be in "**static balance**". This means that if allowed to spin freely it will not rotate "heavy side down". At high speeds, however, the forces from the imbalances in different planes will cause a rotating bending moment on the supporting shaft, resulting in noise, vibrations and fatigue. In this case it is "**dynamically imbalanced**". This must be corrected by adding or removing weight in more than one plane.