

Advance Siam Tech Co.,Ltd.



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IRD® Balancing
was formally known
as

IRD Mechanalysis Inc.

IRD Mechanalysis pioneered the use of vibration measurement as a judge of the mechanical condition of rotating machinery.

For over 50 years IRD has supplied balancing machines to all segments of industry World-Wide, with rotor weight capacities ranging from a fraction of a kilogram to over 300,000 kilograms

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IRD Balancing locations:

- * **Worthington, Ohio, USA**
Chester, England, UK.

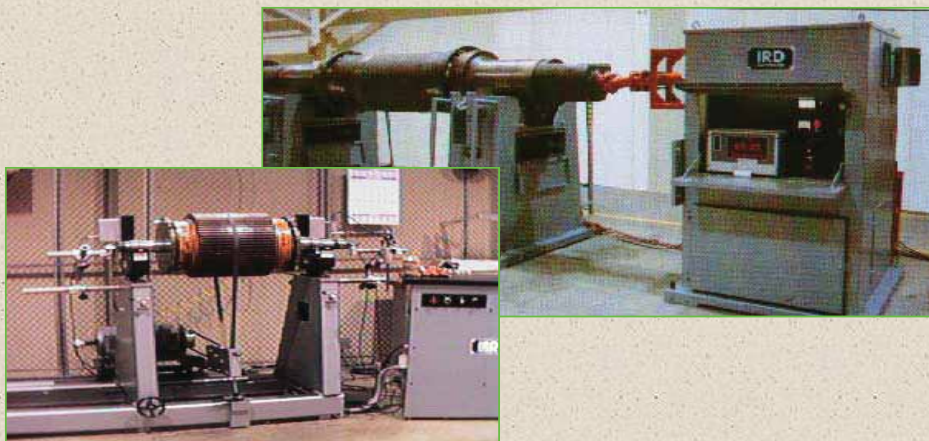
**Each office has independent Sales, Engineering,
Manufacturing and Service Staff.**

www.irdbalancing.com

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IRD Balancing Machines:

- ✧ **All shapes, sizes, and configurations.**
- ✧ **Hard and Soft-Bearing solutions.**
- ✧ **Portable balancing systems.**
- ✧ **Rugged, Reliable, Extremely Accurate.**



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Transportable Balancing Systems

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- ◆ All machines vibrate.
- ◆ PM Programs are designed to detect and identify increases in vibration.
- ◆ Unbalance is the largest cause of machine vibration.

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What is unbalance ?

- ◆ **ISO Definition**
"That condition which exists when a rotor causes a vibratory force at its bearings due to centrifugal forces."
- ◆ **Common Definition**
"Unequal distribution of the mass of a rotor about its rotating centerline"

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What is unbalance ?

"That condition which exists when a rotor causes a vibratory force at its bearings due to centrifugal forces." (I.S.O. Definition)

Unequal distribution of mass of a rotor about its rotating center line.

Why is balancing important ?

- ◆ Unbalance produces force.
- ◆ Force acting on the bearings is very destructive.

Force Formula

Force (F) generated by unbalance can be calculated from formula:

$$F (\text{lbs}) = 1.77 \times W \times R \times (\text{RPM}/1000)^2$$

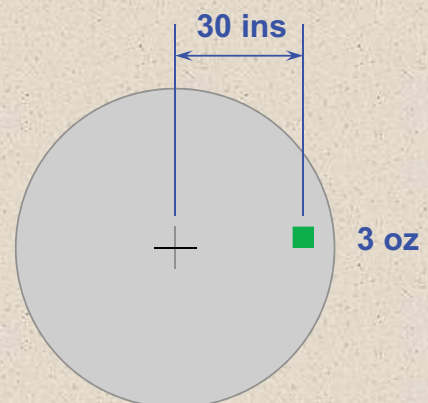
where W = unbalance weight in ounces
and R = radius in inches

Force Formula

Force (F) generated by unbalance can be calculated from formula:

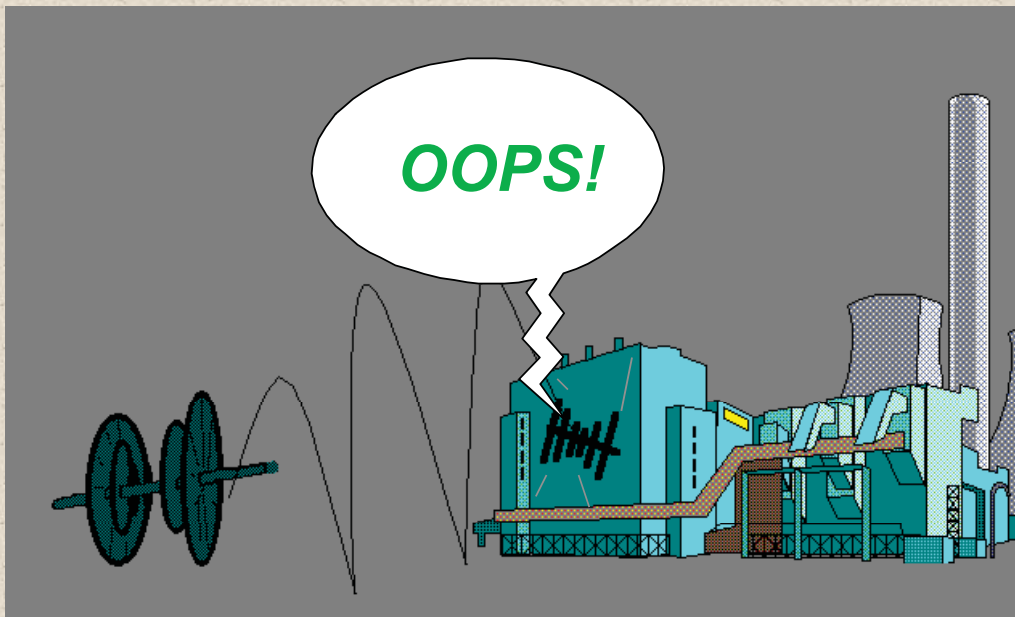
$$F (\text{lbs}) = 1.77 \times W \times R \times (\text{RPM}/1000)^2$$

- where W = unbalance weight in ounces
- and R = radius in inches



@ 3600rpm F = 2,064 lb

@ 7200rpm F = 8,258 lb !



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- ◆ Unbalance can often be corrected "in-place," without disassembly.
- ◆ Many of our instruments, including data collectors, have balancing capability.
- ◆ When you can't get at the rotor to add or remove weight, you need a balancing machine.

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- ◆ All rotors have to be balanced at some time.
- ◆ New rotors in a "Production" type machine.
- ◆ Rebuilt rotors in a "Maintenance" type machine.

◆ Aug 2003 We have both.



What is a Balancing Machine ?

"A device that holds and spins your rotor while you balance it."

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There are two types of balancing machines:

- ◆ Subcritical or "Hard" Bearing.
 - the motion of the rotor is restricted.
 - measures force.
- ◆ Supercritical or "Soft" Bearing.
 - the rotor is free to vibrate.
 - measures displacement.

We have both!

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- ◆ In "Soft" machines the rotor is mounted horizontally.
- ◆ Both horizontal and vertical mounting is available in "Hard" machines.

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- ◆ We make machines that can handle rotors weighing less than an ounce.
- ◆ We make machines that can handle rotors weighing more than 500,000 lbs (300 tons)!!!

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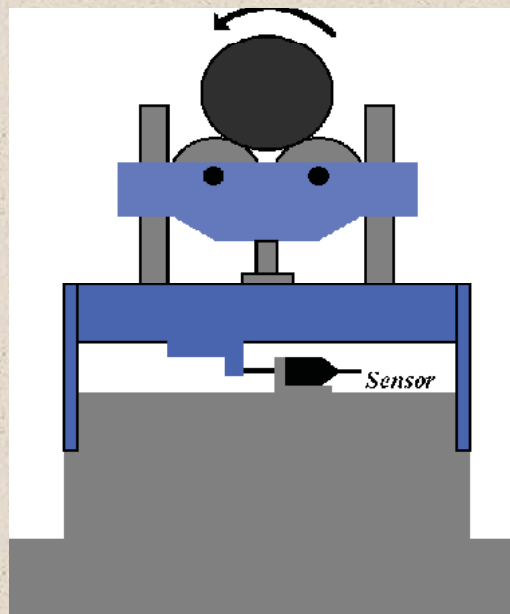


- ◆ "Soft" bearing machines are made in Columbus and the UK.
- ◆ "Hard" bearing machines are made in Italy by our partner CEMB.

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- ◆ On "Hard" machines the instrument is built-in and dedicated.
(ZE digital display or ZC color display)
- ◆ On "Soft" machines the instrument is separate and can be any type that has balancing capability.
(data collector, Model 246 portable balancer, Model 290 balancer.)

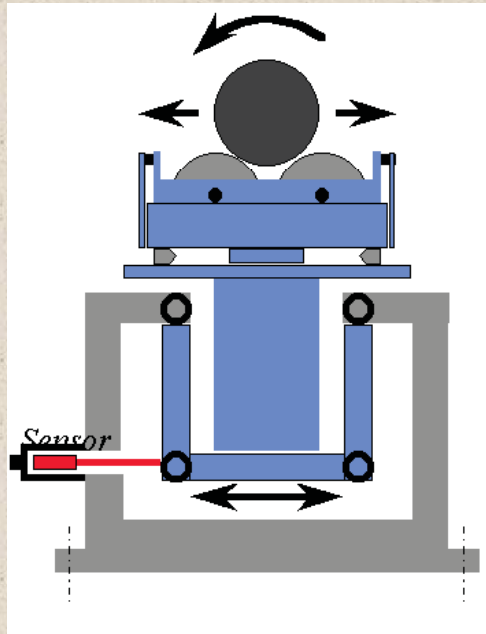
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"Hard" Bearing

Rigid suspension.
Force measurement

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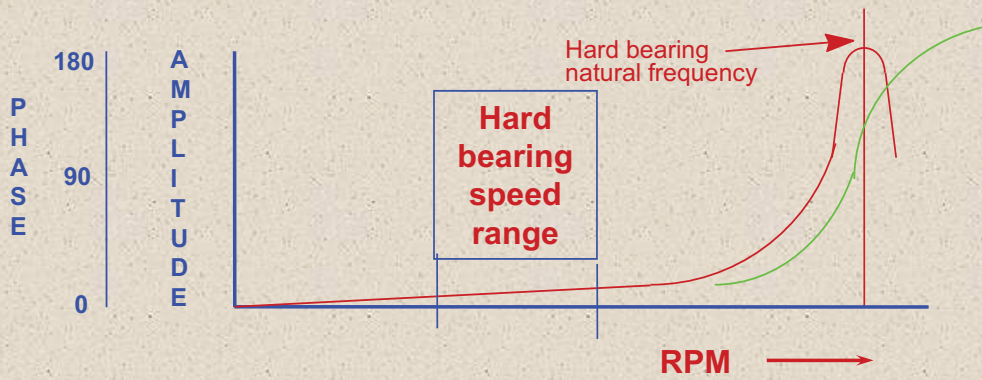
"Soft" Bearing

Free moving, pendulum suspension.
Displacement measurement

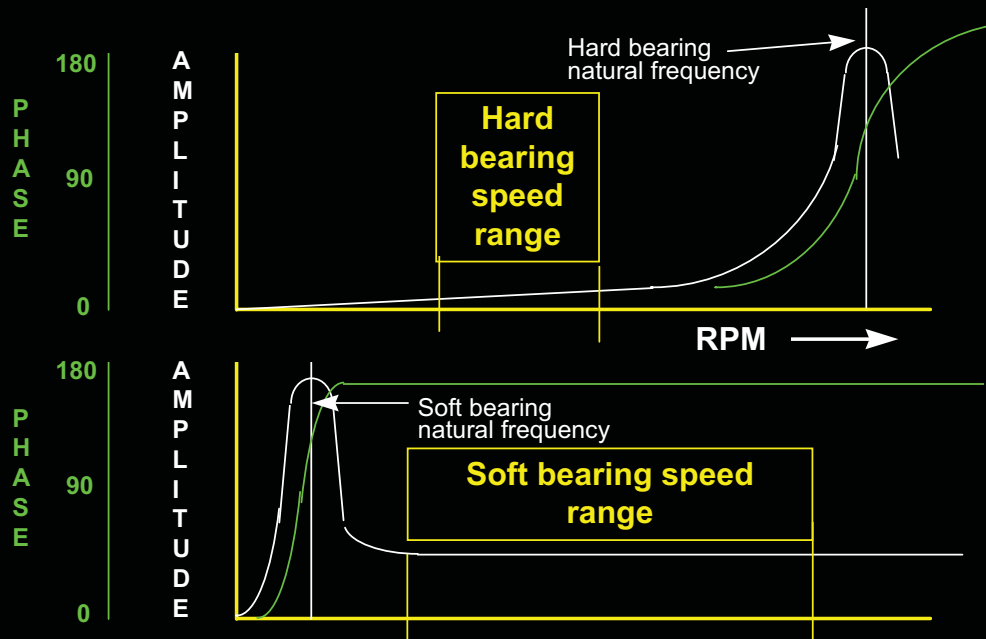
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"Hard" bearing machines operate below the natural frequency of the rotor support.

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“Soft” bearing machines operate above the natural frequency of the rotor support.



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Facts to consider:

◆ "Hard" Bearing:

Performance is dependent on a constant high mass/high stiffness rotor supporting structure.

- suspension and base must be rigid.
- force measurement.

◆ "Soft" bearing:

Performance is NOT influenced by mass/stiffness of supporting structure.

- free moving, pendulum suspension.
- vibration displacement measurement.

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Facts to consider:

◆ "Hard" Bearing:

System sensitivity is speed dependent.

- force increases by the square of the speed.

$$F=1.77 \times W \times R \times (\text{RPM}/1000)^2$$

F=force in pounds

W=weight in ounces

R=radius in inches

- requires high balance speed for rated sensitivity.
- has upper speed limit based on rotor weight ($W \times n^2$)

◆ "Soft" bearing:

System sensitivity NOT influenced by speed.

- operates above the natural frequency.
- constant high sensitivity to unbalance at all speeds.

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Facts to consider:

◆ "Hard" Bearing:

Linearity changes with speed.

Poor sensitivity for low speed balancing.

◆ "Soft" bearing:

Linear throughout speed range.

Optimum accuracy at low speed.

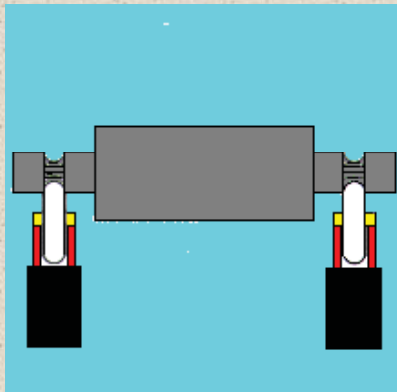
Low speed = SAFETY. (for operators and rotor/machine)

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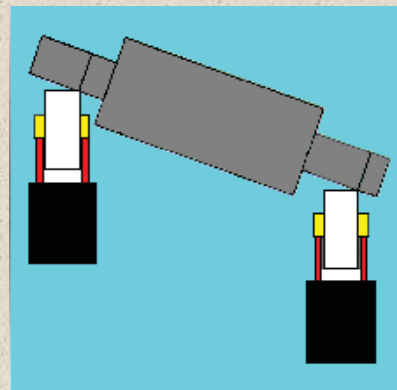
Facts to consider:

- ◆ "Hard" Bearing:
 - Uses "crowned" rollers and/or sleeve bearings.
 - "Crowning" needed to allow pivoting action of rotor.
 - Rollers have point contact, can damage journals.
 - Or - new sleeve bearings for EVERY rotor - very expensive.
- ◆ "Soft" bearing:
 - Uses gimbal action, anti-friction roller bearings.
 - Rollers have FLAT, wide, surface.
 - Rollers are "self-aligning" - complete journal contact.
 - Roller assemblies for full weight range of the machine.

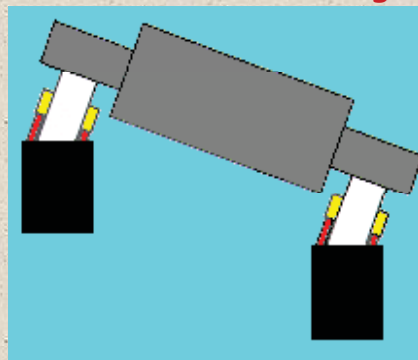
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Crown - point contact.



Ridged flat - edge loading.



Gimbal - self aligning.

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Facts to consider:

◆ "Hard" Bearing:

Not suitable for transportable system.

- large, heavy base required.
- sensitivity affected by supporting floor at site.
- expensive to ship to different sites.

◆ "Soft" bearing:

Ideally suited for transportable system.

- NO base required - attaches to standard floor or track.
- only three modules to ship.

Facts to consider:

◆ "Hard" Bearing:

System must be aligned precisely - very time consuming.

Set-up time ... up to one week !

◆ "Soft" bearing:

NO special alignment required.

Set-up time ... approximately 4 hours !!

Facts to consider:

◆ "Hard" Bearing:

Instrument is integral component of machine.

- malfunctioning instrument means machine cannot be used.
- instrument must be calibrated to the machine.
- instrument/machine must be re-calibrated after every move.

◆ "Soft" bearing:

Any balancing instrument can be used.

- instrument easily exchanged if malfunctioning.
- trial weight calibration ensures balancing success.
- does not rely on special test rotor calibration.

Facts to consider:

◆ "Hard" Bearing:

Balance accuracy of instrument and machine can only be verified by ISO test.

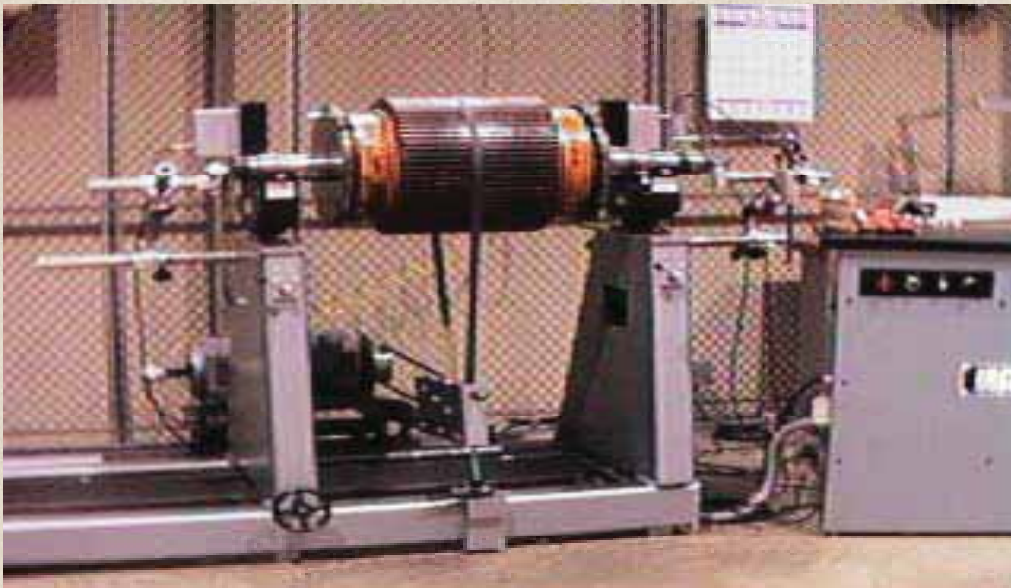
◆ "Soft" bearing:

Balance accuracy can be corroborated by vibration readings in addition to unbalance readings.

Our Balancing Machines

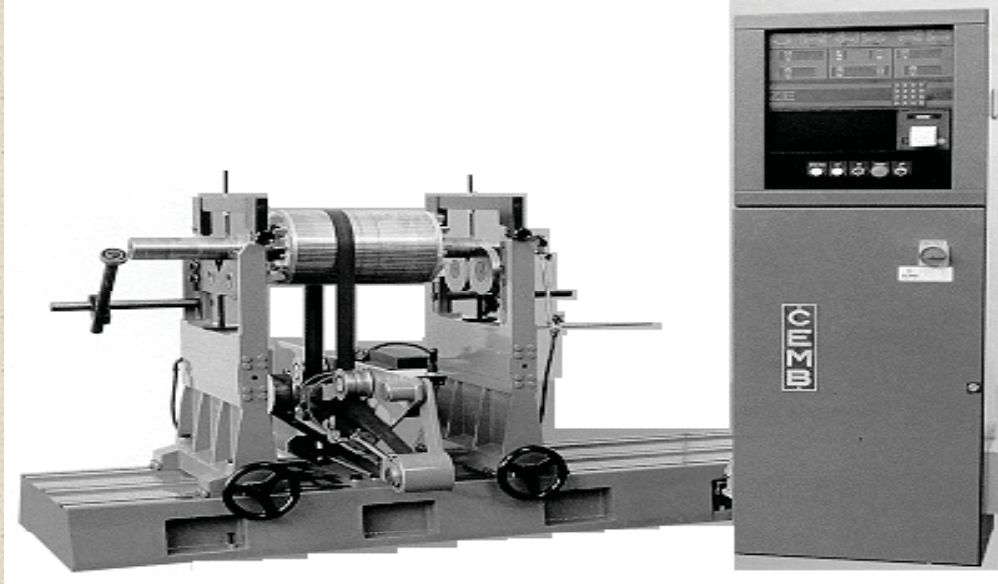
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"Soft" Horizontal Machine (ENTEK IRD)



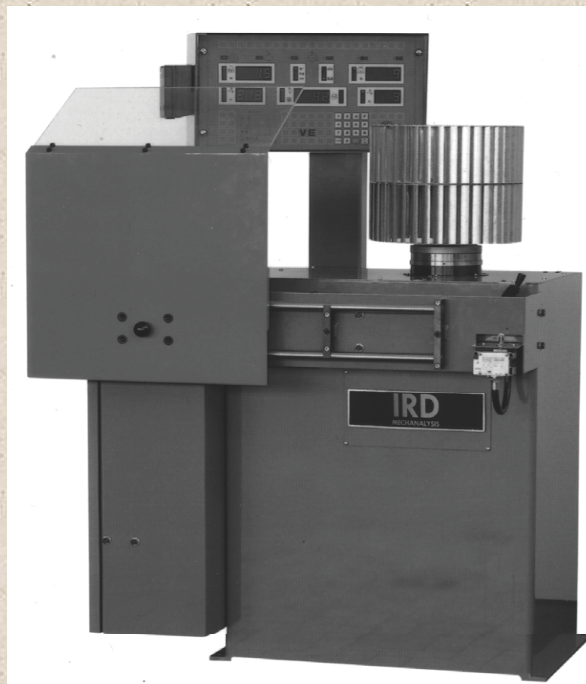
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"Hard" Horizontal Machine (CEMB)



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"Hard"
Vertical
Machine
(CEMB)



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Self contained and lightweight.
Easily transported to any jobsite by truck, sea or air.
Only 3 modules - no crate required.

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No special foundation required.
Bolts directly to a concrete floor, sole plates or to
existing or fabricated rail track.

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Unit set up in a Power Station
on existing track.

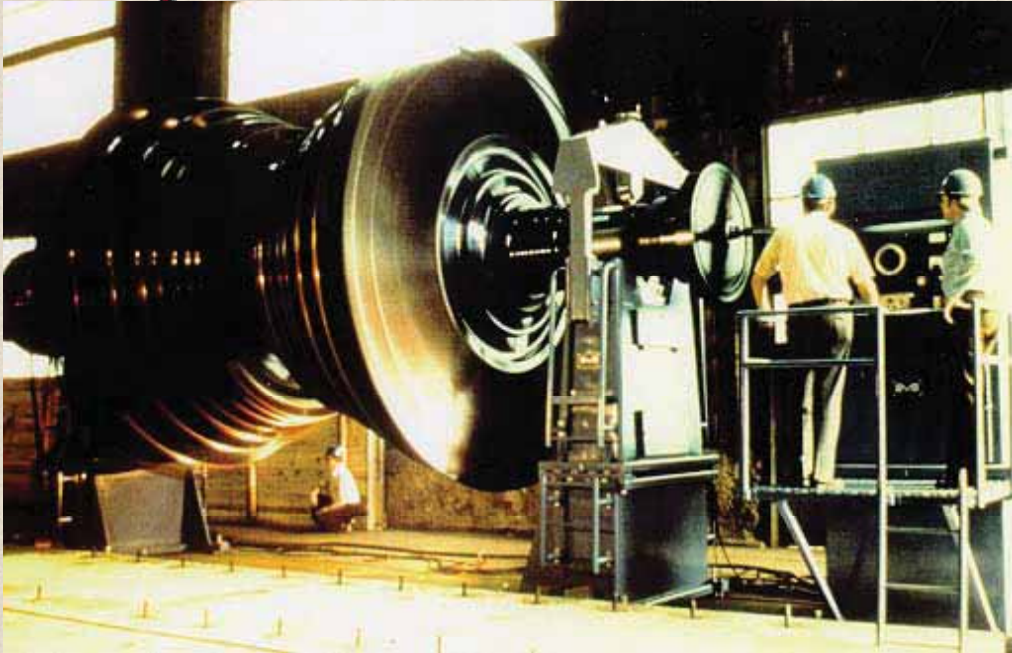
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Adaptable and Versatile.

Generator being balanced in a temporary
workshop adjacent to a Power Station.

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Adaptable and Versatile.

Addition of risers to accommodate large diameters.

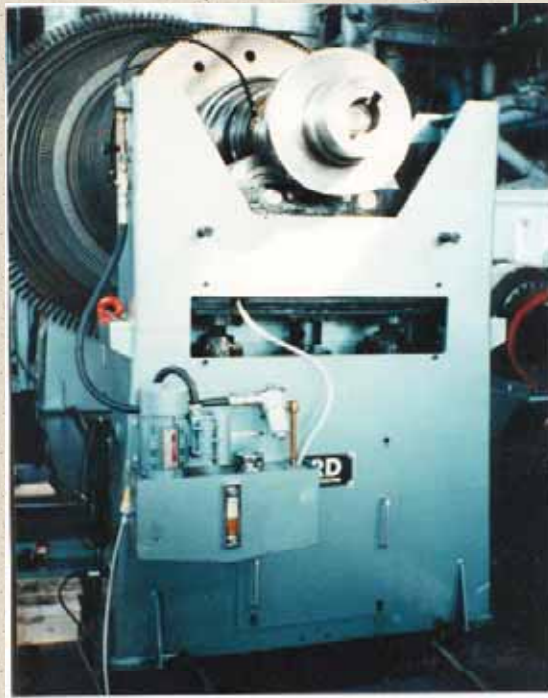
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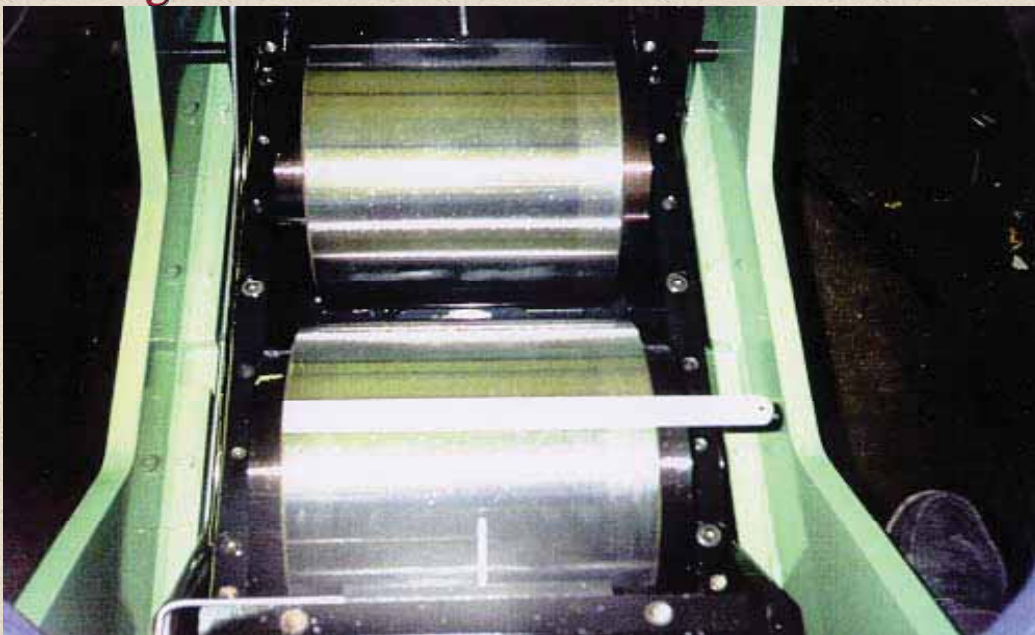
Adaptable and Versatile.

Gap cut in temporary rail line to accommodate large diameters.

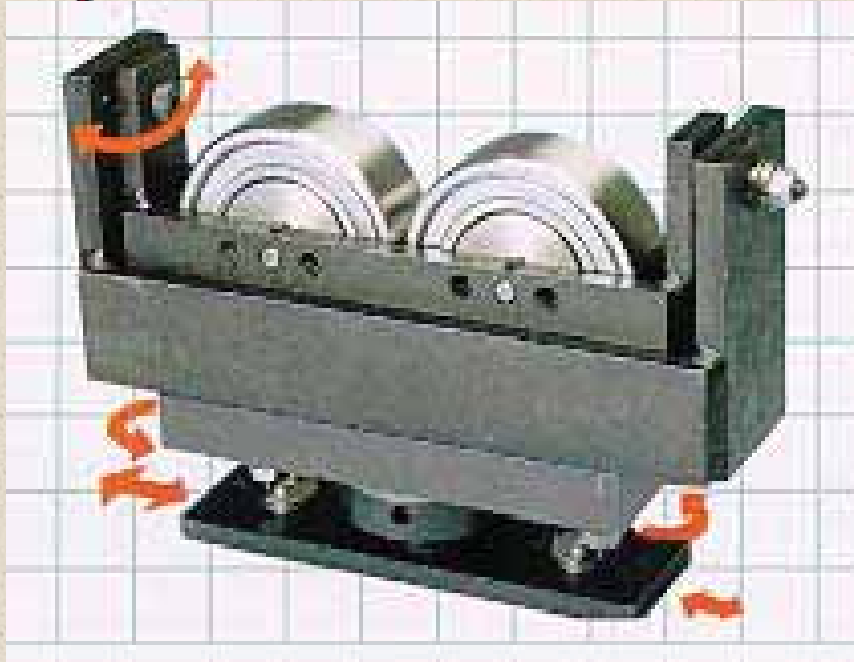
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Rotor support pedestals with
"self aligning" bearing assemblies and lubrication system.



FLAT, wide-contact, rollers provide high
balancing accuracy at low speeds without
journal damage.

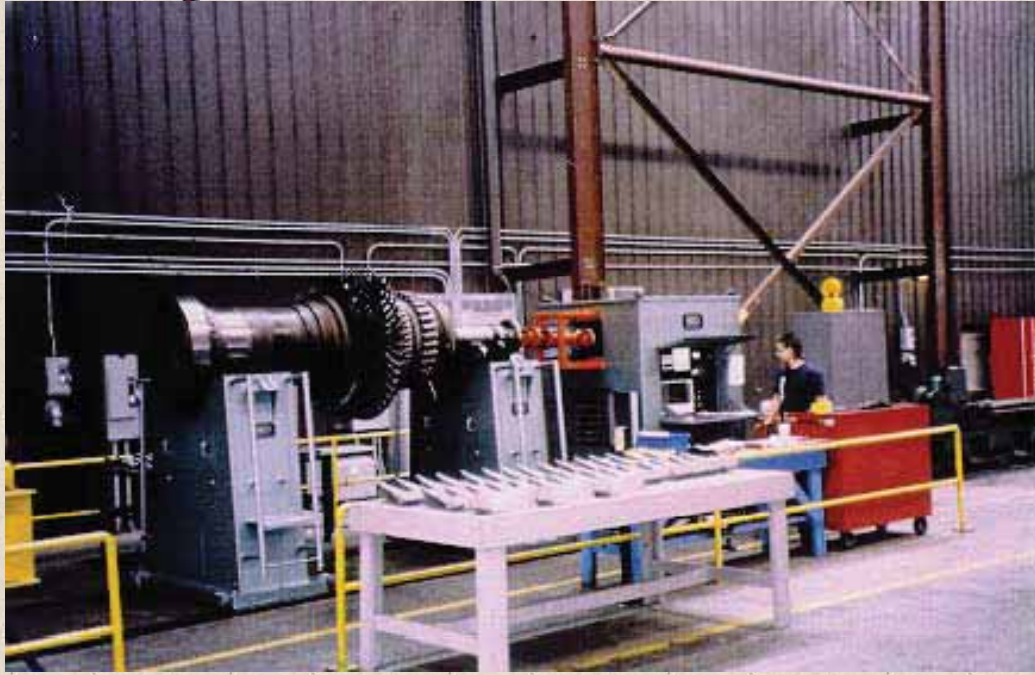


Unique gimbal action eliminates time-consuming alignment procedures.

Aug 2003 Height adjustment for different journal diameters.



Rollers and carriages are easily interchanged.



Roller Assemblies allow unit to be used as a work station for blade replacement.

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Controls and Instruments

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Simple operator controls and instruments.

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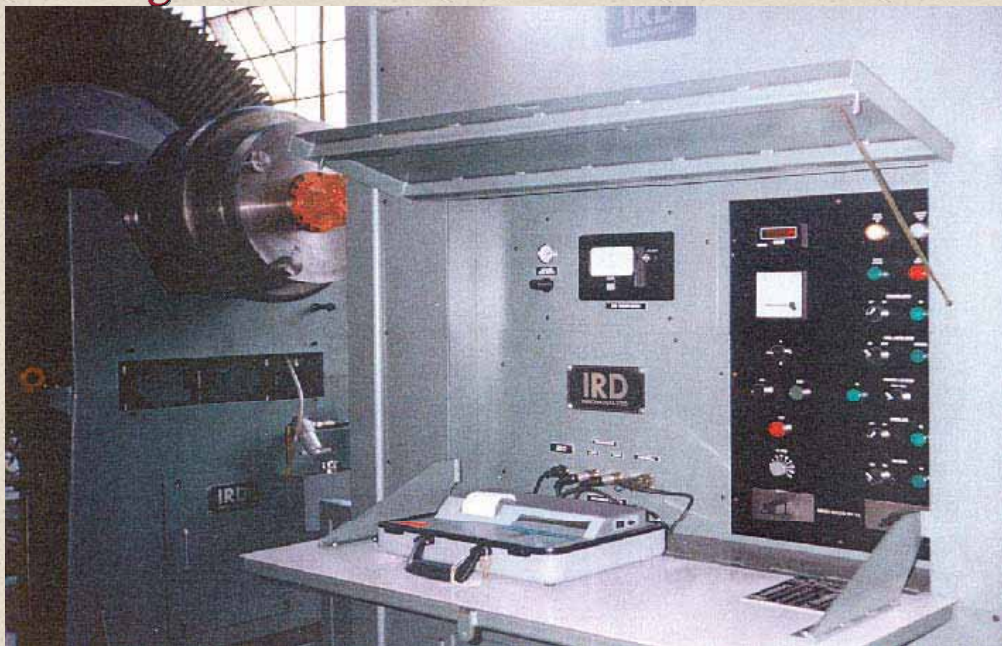
Series 290 - the "brain" of the B140.
Precision low speed balancer.

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Series 290 with "touch screen" operator interface.
Patented filtering ensures precision at low speed.

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Instrument not part of the machine.
ANY balancing instrument can be used.

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Model 246 Portable Balancer.

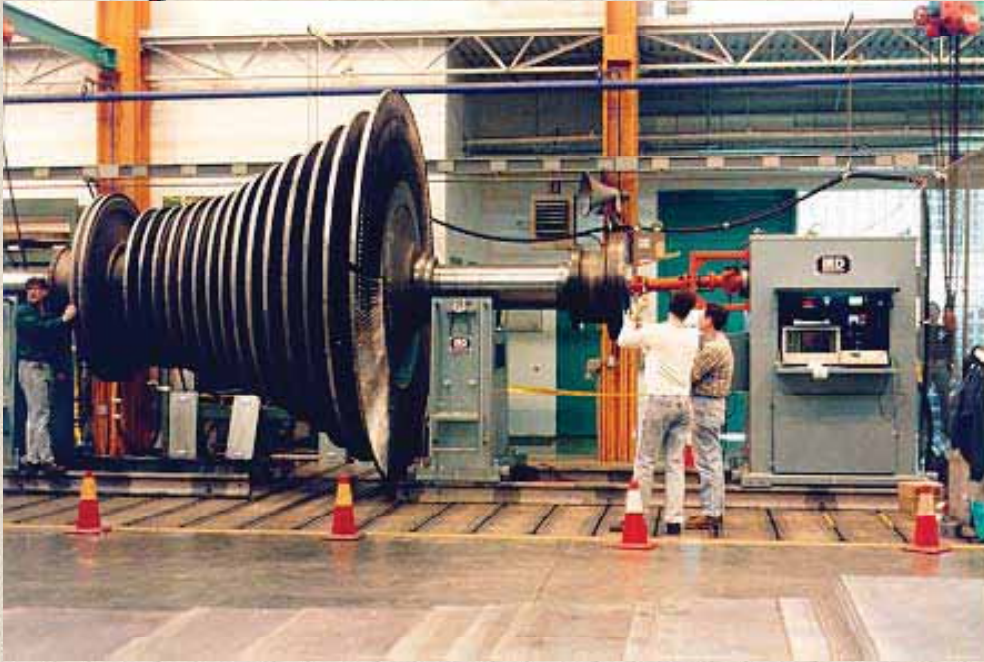
Dual shaft-synchronous tracking filters.

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Generator rotor - service work at site included re-grinding of collector rings with machining attachment and low-speed trim balance.

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The B140 Series.
"Transportability with Precision"

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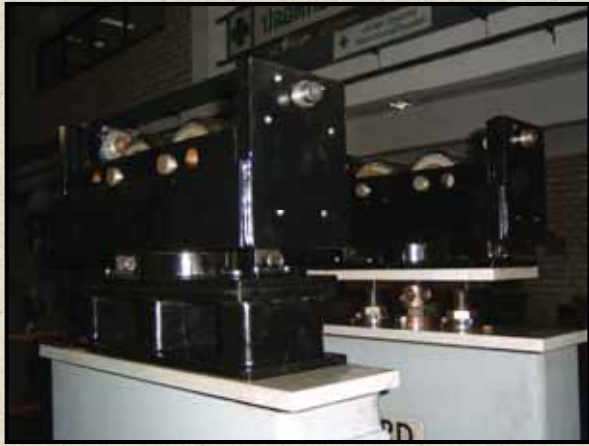
The B140 Series.
Over 50 units in use in more than
20 Countries Worldwide

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Our EGAT Reference

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Our
Chevron,
Unocal
Reference

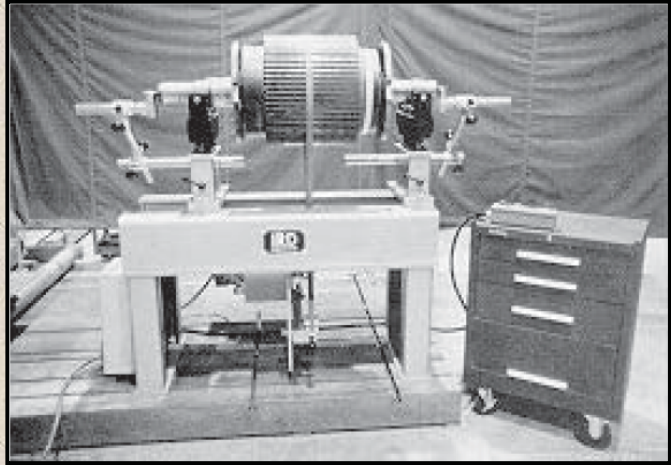
Our Naval Dock
Yard Reference



HORIZONTAL BALANCING MACHINE

General Specifications:

- ◆ Weight Capacity - 908 Kg (2000 LB)
- ◆ Max. Rotor Dia. - 1143 mm (45 inches)
- ◆ Minimum Achievable Residual Unbalance -
0.000 127 mm (0.000 005 inches) mass
center displacement
4.5 g-mm (0.006 oz-in) - typical per plane
- ◆ Standard Bed Length -
1397 mm (55 inches)
- ◆ Journal Diameter Range -
19 - 330 mm (0.75 - 13 inches)
- ◆ Work Support Roller Bearing Diameter
76 mm (3 inches)
- ◆ Journal-to-Journal Separation -
152 - 1257 mm (6 - 49.5 inches)
- ◆ Drive Type -
DC 2.2 kW (3 HP) Variable Speed Motor
240 Volt 50/60 Hz 1 Phase
- ◆ Balancing Speed -
Variable, depends on driven diameter



Standard Accessories:

- 1) Model 290T/C Touch Screen Instrument
- 2) AC Motor
- 3) Inverter
- 4) 2 sets of Roller Bearing Support
- 5) 2 sets of Modular Suspension Work Support
- 6) 0.875" bore, 6"OD drive pulley, (3) idler pulleys, (4) flat drive belts,
(2) end thrust assemblies and misc hardware.
- 7) Photoelectric speed sensor
- 8) Reflective tape for use with speed sensor, 45.7m long x 6mm wide (150'x0.25") qty. 1 roll
- 9) Universal mounting arm for speed sensor
- 10) Cable for use with P/N 21000 photoelectric speed sensor, 7.6m/25'
- 11) 546DP Vibration sensor with magnetic tip, mounting bracket and hardware, qty. 2 included.
- 12) Cable for use with 544/546DP vibration sensor, 7.6m/25', qty. 2 included.

B20



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IRD General Brochure



290 INSTRUMENT

290 Instrument



B5F DRAWING

B5F Drawing



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B5F Full Specification



SPEED SENSORS

Speed Sensors



VIBRATION
SENSORS

Vibration Sensors



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Customer List



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Soft and Hard Balancing Machines full detail



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ISO 1940 Balancing Standard

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