

Bearing Remanufacture Services



Process

TIMKEN

The Goal: Improve Customer Success

By helping to provide:

- Predictive Maintenance Programs
- Lower the total cost of ownership
- Increase the reliability of the drive train
- Maximize system performance



Timken Bearing Remanufacture Services

Bearing Remanufacture

- Recertify, reclaim, and remanufacture bearings
- Upgrade with Timken® wear-resistant bearings



Presentation Overview

- A Strong Case For Bearing Remanufacture
- Wind-Energy Application Opportunities
- Range of Services
- Benefits of Timken Remanufacture Services
- Getting Started with Timken Bearing Remanufacture Services
- Common Questions

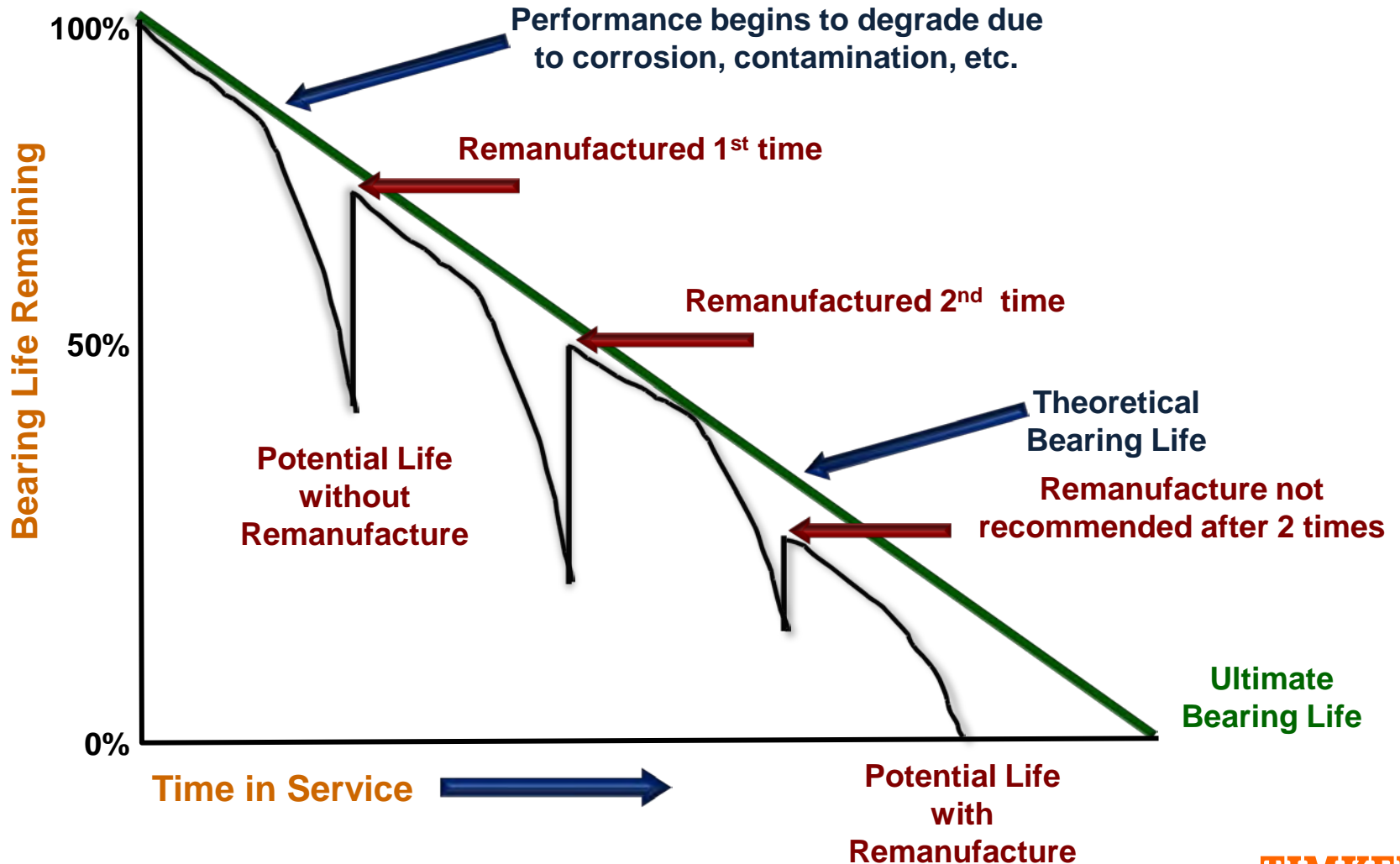
A Strong Case For Bearing Remanufacture

- Recent advancements have greatly improved potential benefits and reduced risks for bearing remanufacture
 - Condition monitoring systems
 - Technology advancements
 - Material improvements
 - Reliability-centered maintenance programs
- These advancements, combined with the economic benefits of bearing remanufacturing, make now a better time than ever to begin your bearing remanufacturing program



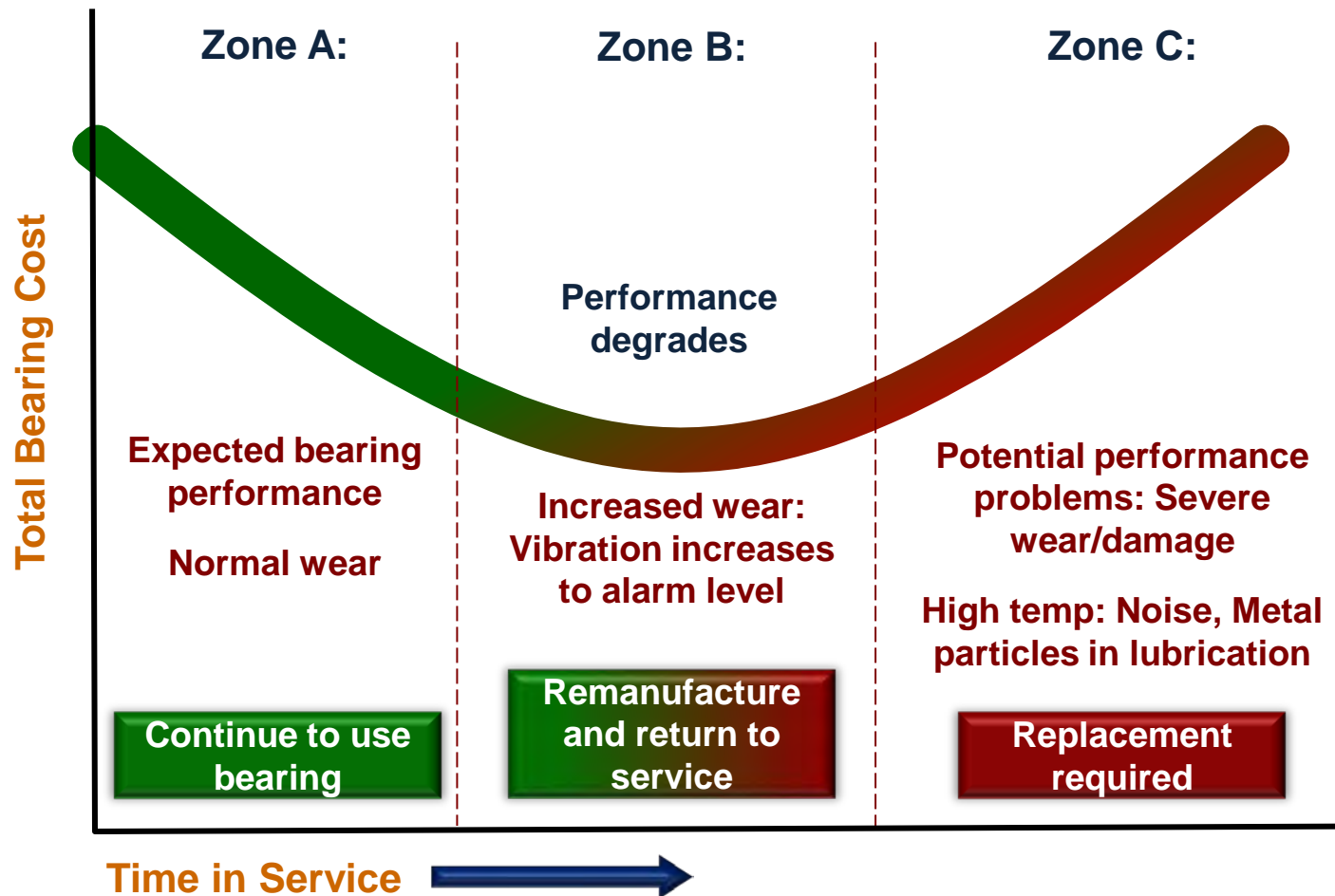
A Remanufactured Bearing Can Last As Long As A New One

Why L10 life does not re-start after manufacturing



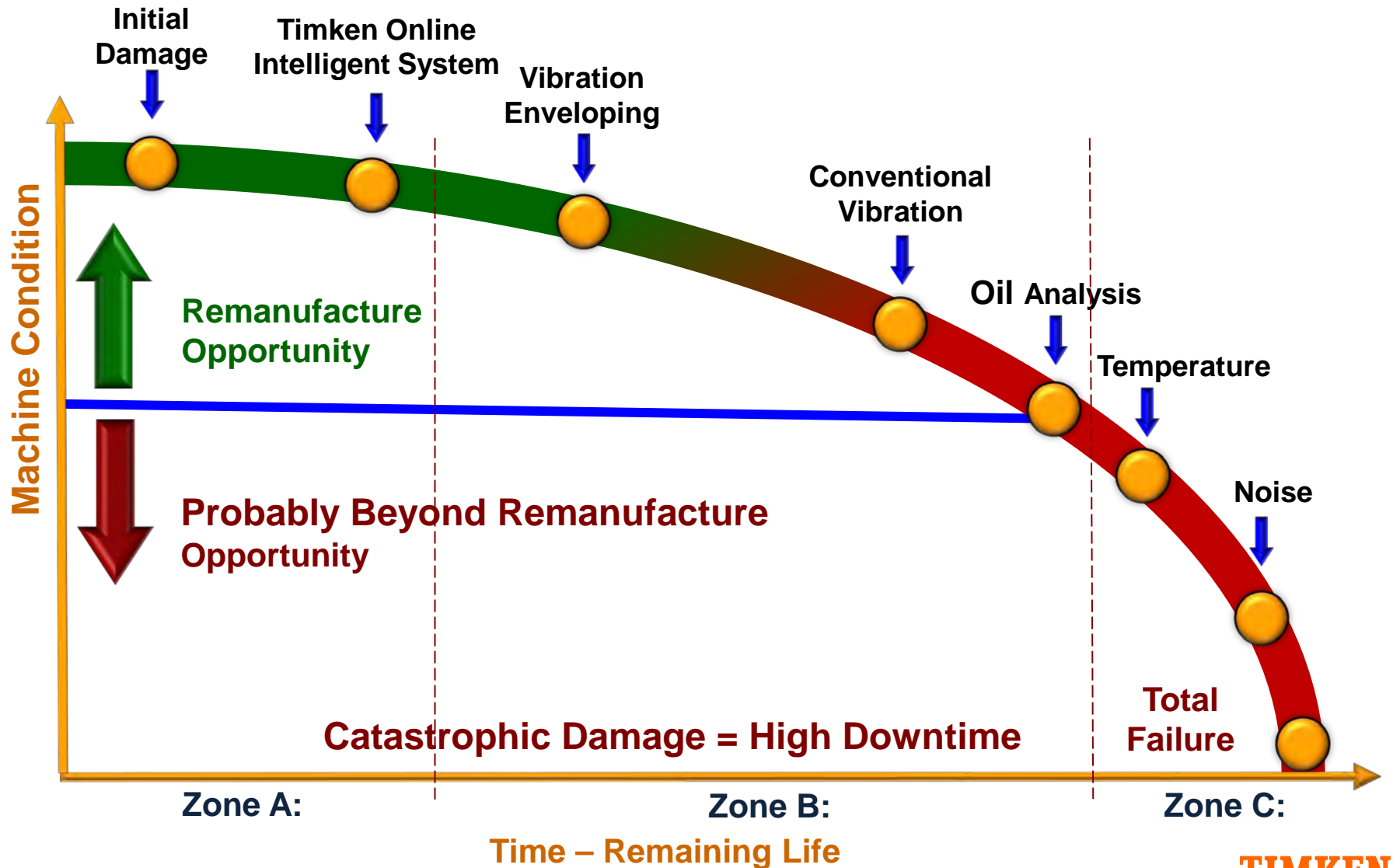
Bearing Remanufacture: There Is An Optimum Cost

Don't remanufacture too soon; don't remanufacture too late



Zones measured via condition monitoring or physical inspection.

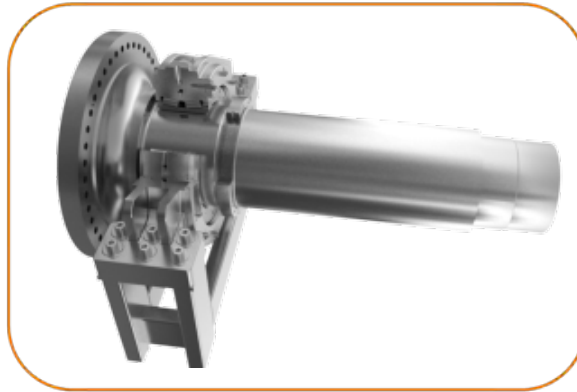
Predictive Maintenance Programs: Improve Bearing Remanufacture Opportunity



Wind-Energy Application Opportunities



Double Row Tapers



Main Shaft



**Spherical
Roller Bearing
Upgraded to
Wear Resistant
SRB**



Cylindrical



Single Row Taper

Upgrade Candidates

Wind-Energy Application Opportunities



Planet Pac



Gearbox

High speed shaft
- HSS
Low speed shaft
- LSS
Low speed int shaft
- LIS

Replace



Planet Carrier-
TRB or CRB



TRB

CRB

Planet Bearings

Remanufacture Candidates

Range Of Services

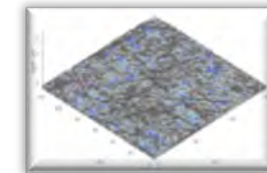
Repair Type	Charge* (minimum)	Description of Service
Recertify:	5-15% (\$250 Min) 2-4 wks	Clean, examine, verify internal clearances, preserve and package
Reclaim:	20-40% (20 pc Min) 4-6 wks	Polish using proprietary vibratory process, preserve and package
Recondition:	25-40% (\$325 Min) 4-6 wks	Combines Recertify and Reclaim services
Remanufacture:	45-70% (\$2,500 Min) 6-18 wks	Clean, examine, grind raceways, new roller sets, replace major components as required, reset internal clearances, reserve and package
Modification:	Quote	Special features may be added to existing or new bearing assemblies to enhance performance, retrofit to special applications or upgrade to our most recent product designs

*Percent of the cost of comparable new bearing

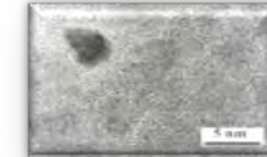
Upgrade Remanufacture: Engineered Surface

Eliminates SRB wear mechanism

Es Technology	Description	Benefits
Roller Texturing	Low Roughness, Low Asperity Slope	Reduced Asperity Contact & Stress
Roller Coating	MC/aC:H Coating 1 μm thick	Increased Wear Resistance, Increased Fatigue Life, Increased Debris Resistance.



Texturing



Coating

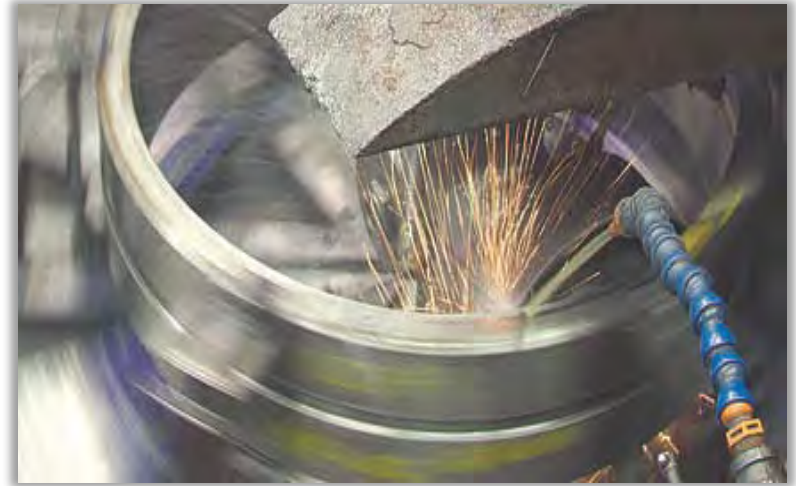


- Timken's Engineered Surface technology is designed to significantly reduce wear and provide:
 - 3.5 X more life in low-lambda conditions
 - 2 X more life under debris conditions
- Which can result in:
 - Improved uptime
 - Improved operational efficiencies
 - Lower total operating and maintenance costs

TIMKEN

Benefits of Timken Bearing Remanufacture Services

- **Versatility:**
Can remanufacture competitors' bearings
- **Cost Savings:**
20 to 90% compared to cost of a new bearing
- **Delivery:**
Half the lead-time compared to new bearing manufacture
- **Workmanship:**
One year warranty
- **Extended life:**
Returns bearing to normal L10 life cycle



Benefits Of Timken Bearing Remanufacture Services

Engineering Support:

- Product, application, service, sales engineers and manufacturing engineers

Quality Assurance:

- Certified to ISO 9001 standard, laser tracing equipment, certified gage rooms capable of measuring within millionths of inches, CMM equipment

Replacement Components:

- Ability to remanufacture competitors' component, all components made at Timken facilities to new product standards, all components made with qualified bearing grade steels

Computer Aided Design

- Timken-developed tools determine appropriate component geometry, provides production prints needed to return competitor product to OEM specifications

Metallurgy

- Timken metallurgical staff support available

Heat Treatment

- Provides OEM material specification, Timken heat treat facilities

Capacity

- Two dedicated U.S. remanufacture facilities with others in Australia, Brazil, India, Romania, South Africa, China and Western Europe

Timken Wind-Energy Remanufacture Footprint

A global company with local reach



Niles, OH, USA
South Bend, IN, USA
Union, SC, USA



Ploiesti, Romania



Chennai, India

Wuxi, China

- Timken is committed to serving your remanufacture needs with regional coverage throughout the world to provide speed and service.

Bearings: Before & After

Spherical Roller Bearing



Before



After

TIMKEN

Bearings: Before & After

Spherical Roller Bearing



Before



After

Bearings: Before & After

Tapered Thrust



Before



After

Packaging

- Special preservative applied to help provide maximum protection
- Wrap with VCI impregnated paper for added protection
- Timken-installed rubber cord to reduce vibration during shipment



Packaging

- Plastic overwrap to lock in the VCI protection
- Bearing chocked to prevent shift
- Internal lid compresses bearing to base and compress rubber cord



Common Questions



How many times can a bearing be remanufactured?

- General rule of thumb – no more than three regrinds
- Timken applies its proprietary roller size / material removal rule

Do vibration frequencies of remanufactured bearings change?

- Essentially no change to original bearing coefficients

Will regrinding case-hardened components soften them?

- No, remanufactured bearings will retain their original hardness
- Because the maximum recommended grind is $+0.025$ in., case levels are generally five-to-10 times their maximum grind amount (except flame-hardened product)

Common Questions



Does material removal from inner affect its hoop stress?

- Very little. Study shows that at maximum material removed, hoop stress is increased only 0.3% to 0.5%

Is it O.K. to only polish a bearing that's been in service?

- Polishing is recommended for removing stains or minor surface defects only
- Not effective for removing debris indentations, etching or wear
- Don't expect new-bearing performance with only a polishing

How do I know if a bearing has been in for service?

- Bearing and box marked with Repair Identifier Serial Number
- Record retention up to 10 years (Timken Industrial Bearings Services)

TIMIKEN