

# IRD – GUIDE PRESENTATION

Robert James – Sr. Rolling Mill Engineer

Richard Adams – Sr. Engineer Technical Sales

**DANIELI CORPORATION**

DANIELI  
PASSION TO INNOVATE  
AND PERFORM  
IN THE METALS INDUSTRY



- History of MH/Dan.
- Importance of Guiding
- Types of Roller Guides
- Roller Selection





## Timeline

- 1856
  - Morgårdshammar (**MH**)
  - Early Machine Shop & Foundry
- 1940 - 1943
  - First Roller Guide Trials
  - First Patent Obtained 1943
- 1945 – 1951
  - First Roller Guides Forged
  - Guides Sold on New **MH** Mills



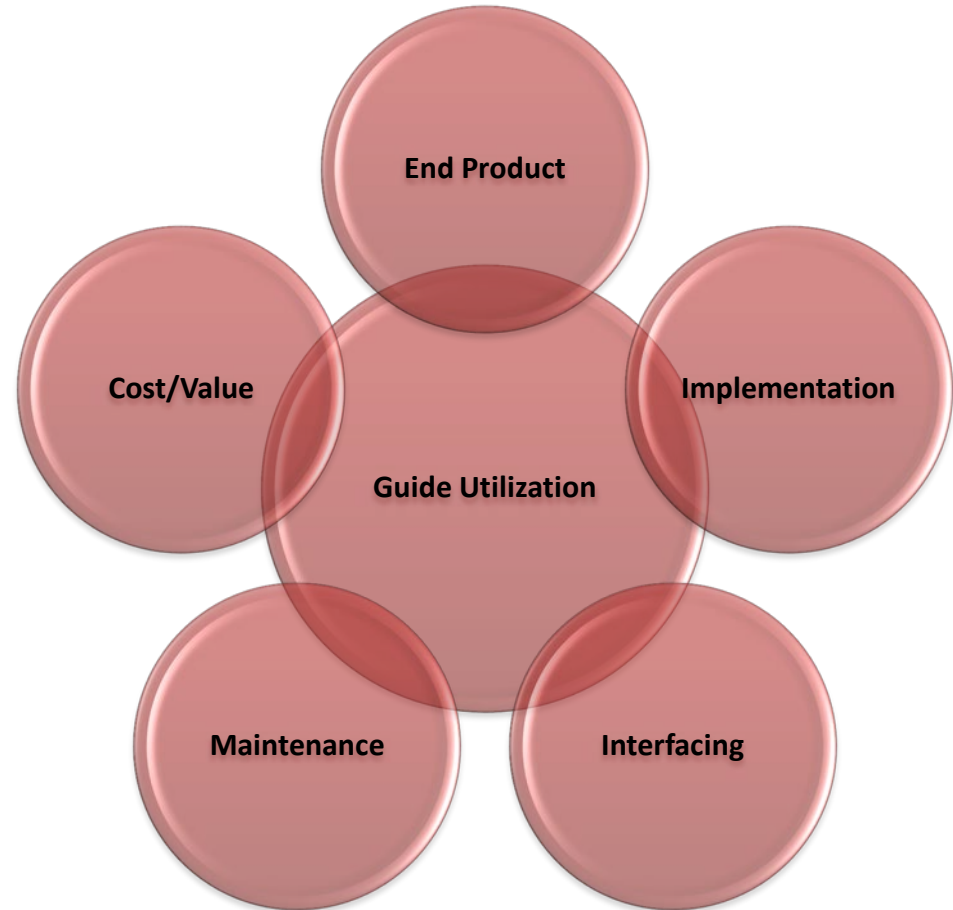


- 1987
  - Morgårdshammar AB  
Purchased By  
Danieli & C SpA



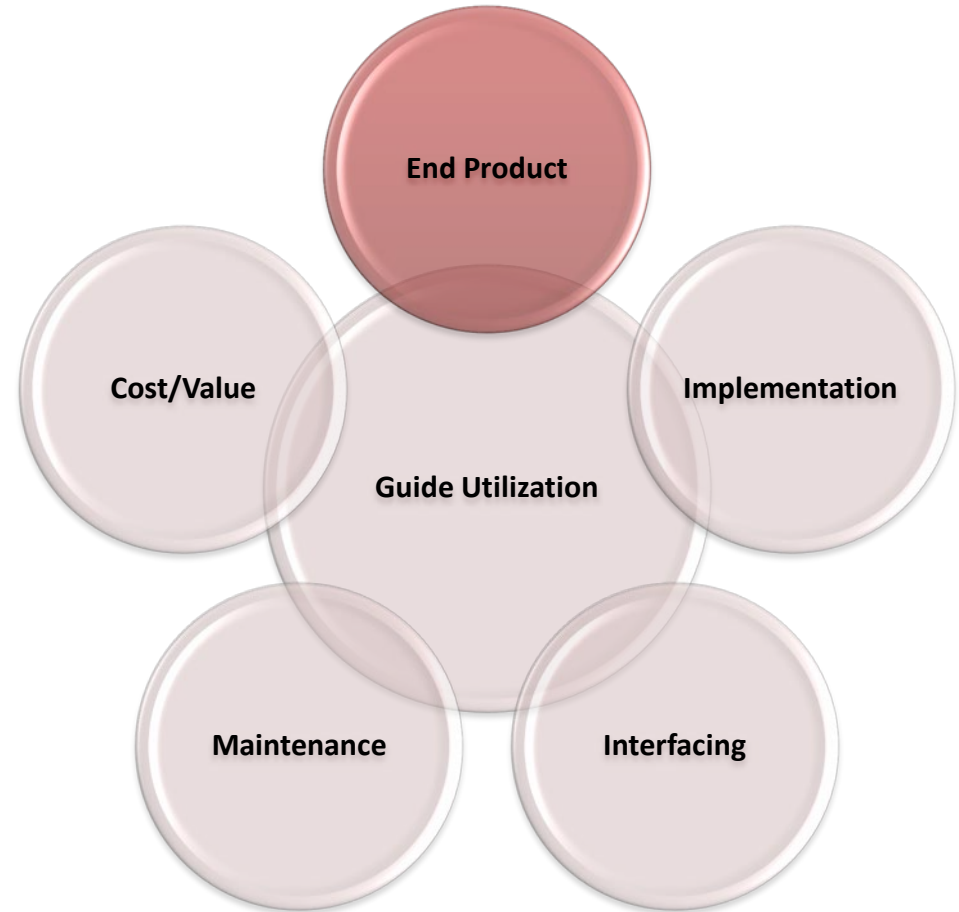
### Points of Consideration:

- End Product
- Implementation
- Interfacing
- Maintenance
- Cost/Value



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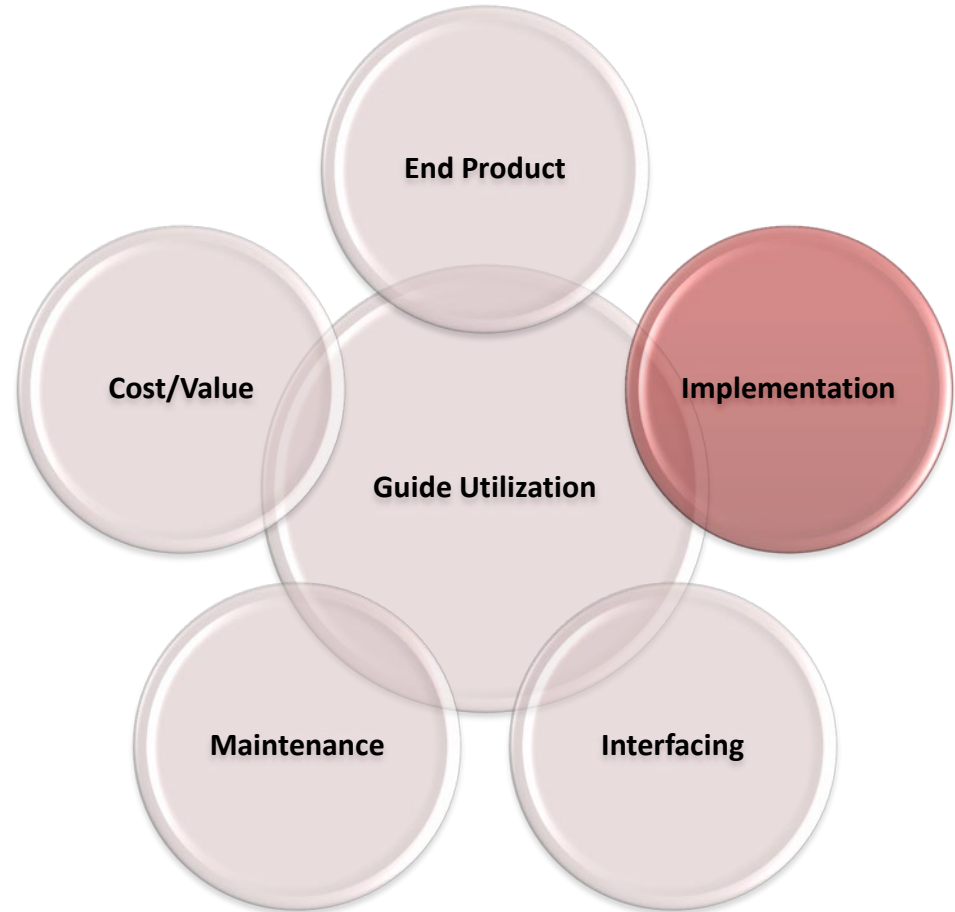


- Profiles
- Shapes
- Rebar
- Cut To Length
- Wire Rod
- Bar In Coil
- Merchant Quality
- SBQ



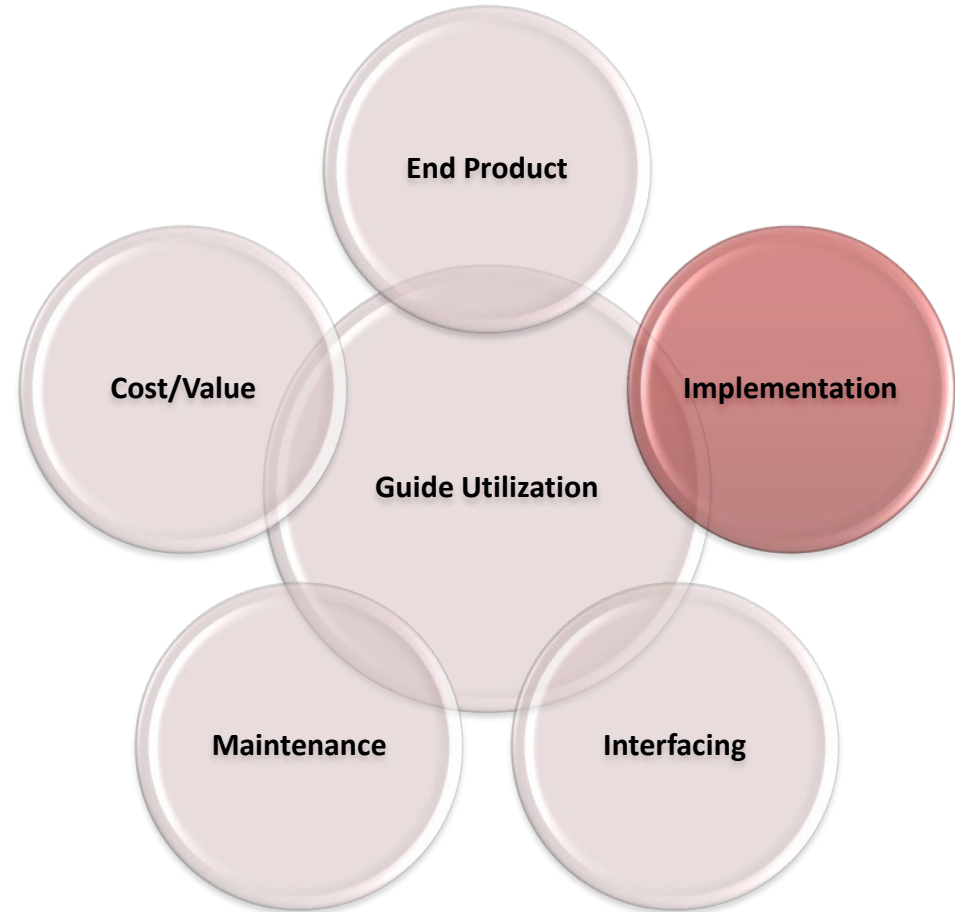
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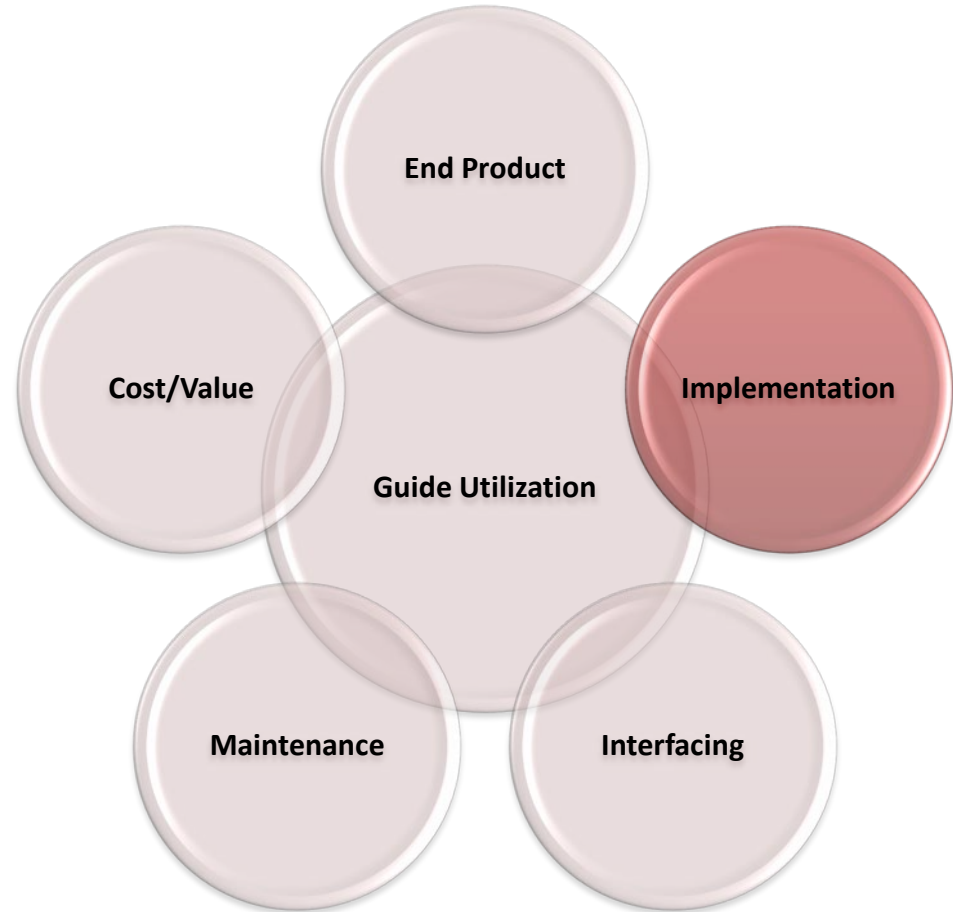
## Implementation:

- Material/Source
- Rolling Sections
- Stand Orientation
- Mill Practices/Culture



## Implementation:

- **Material/Source**
- Rolling Sections
- Stand Orientation
- Mill Practices/Culture



- Carbon Steels
- HSLA Steels
- High Alloy Steels
- Stainless Steels
- Titanium
- Nickel

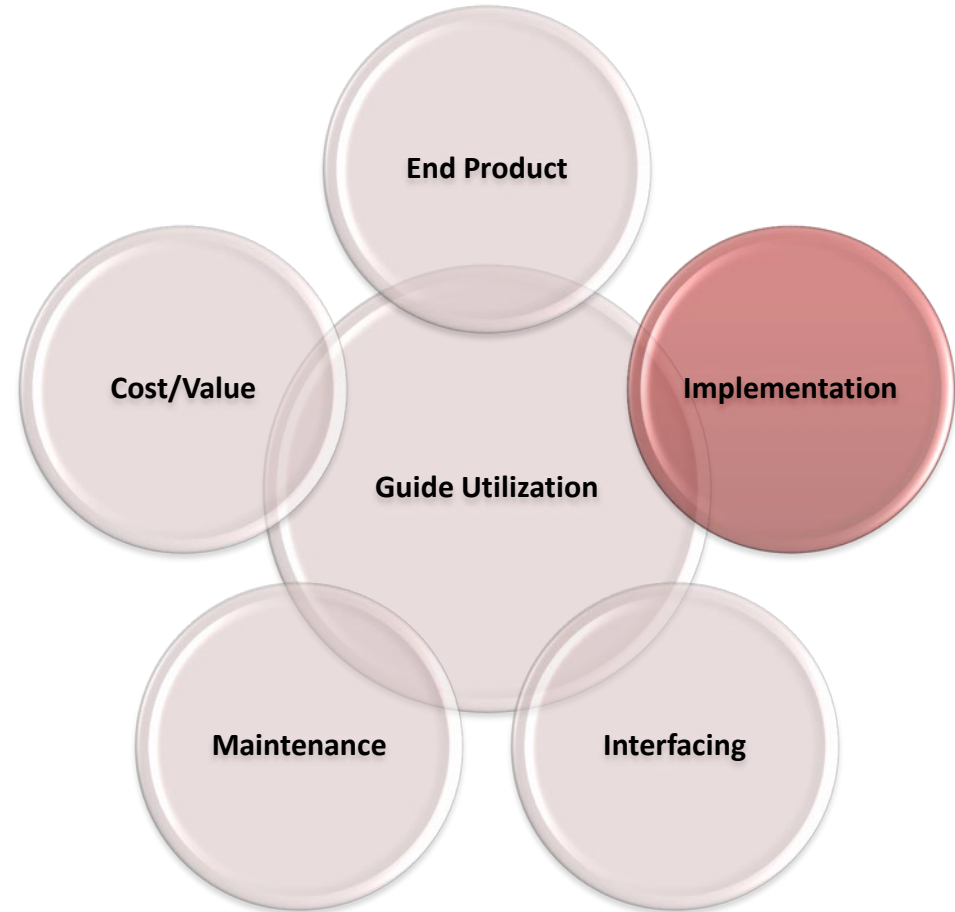


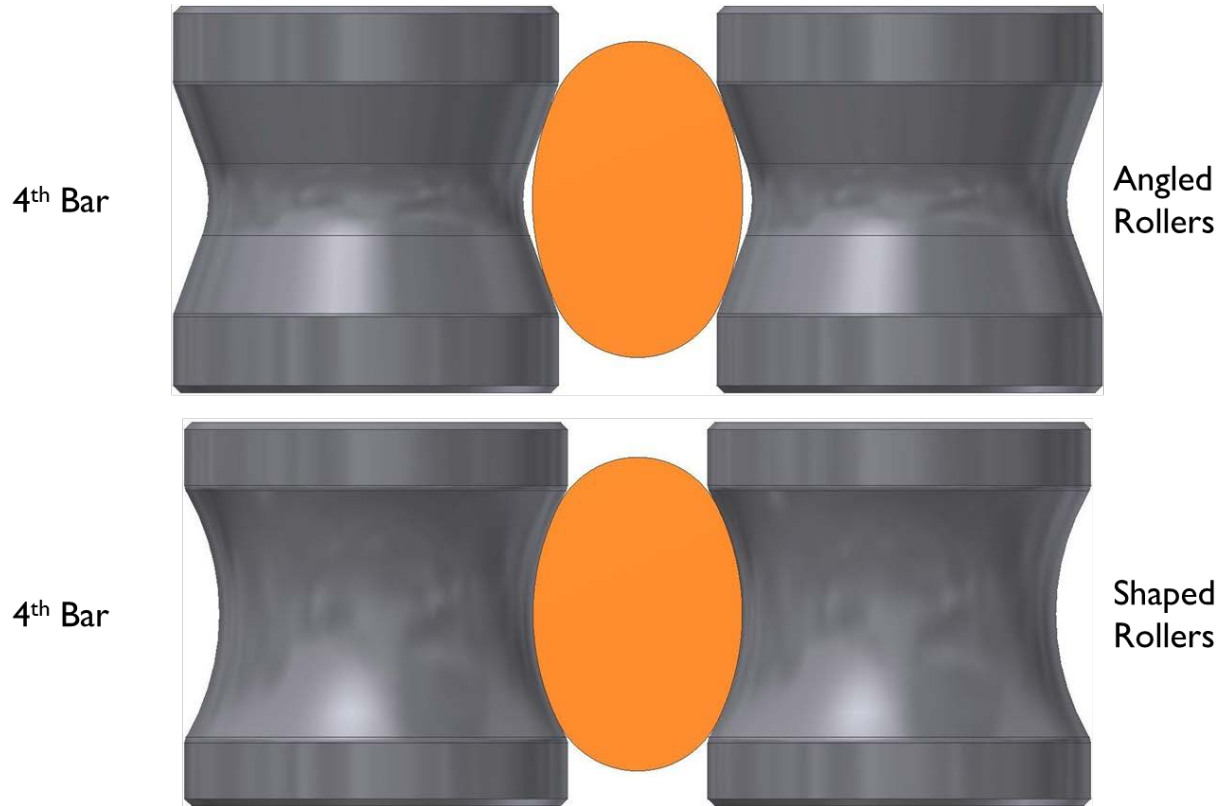
- Ingot
- Bloom
- Billet
- Continuous Caster
- Near-Net-Shape



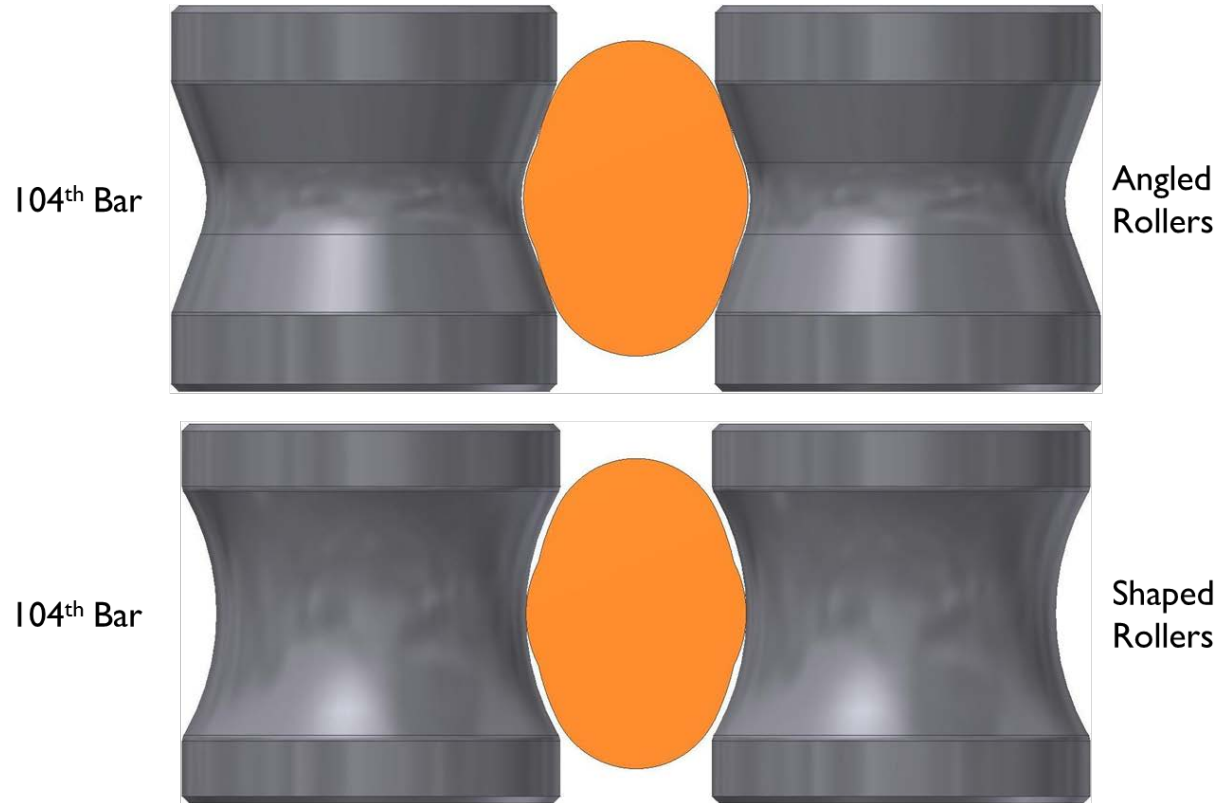
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- Material/Source
- **Rolling Sections**
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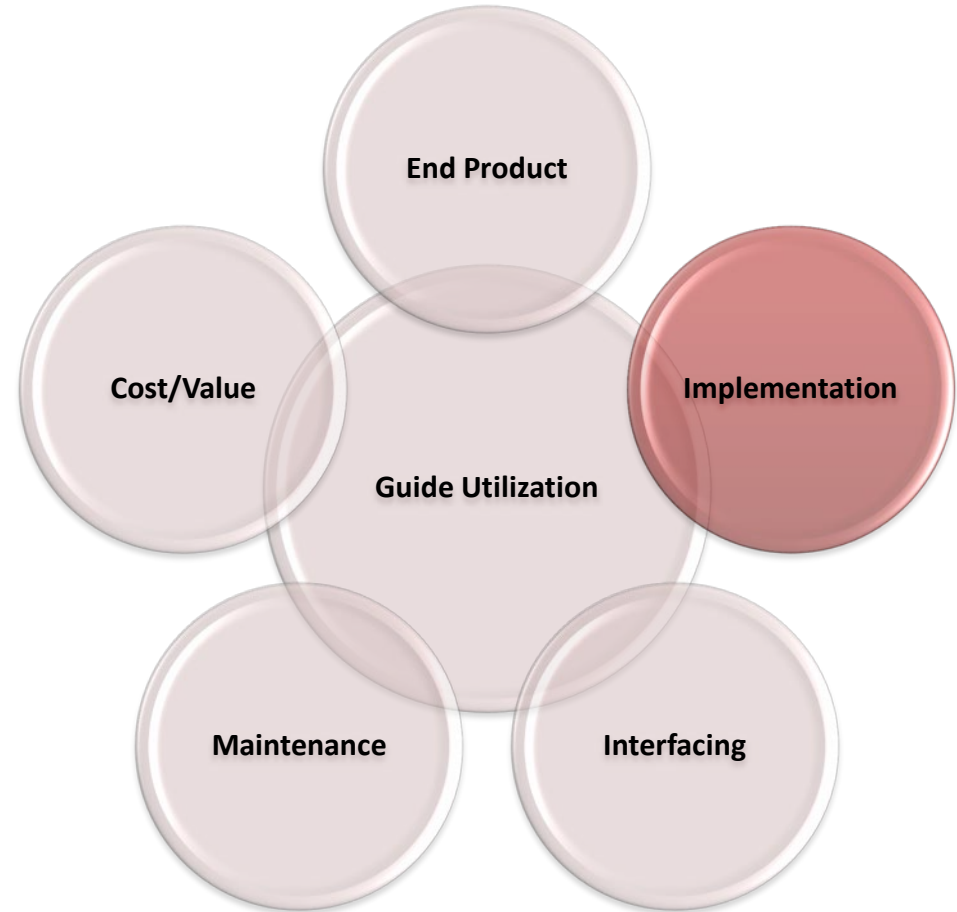


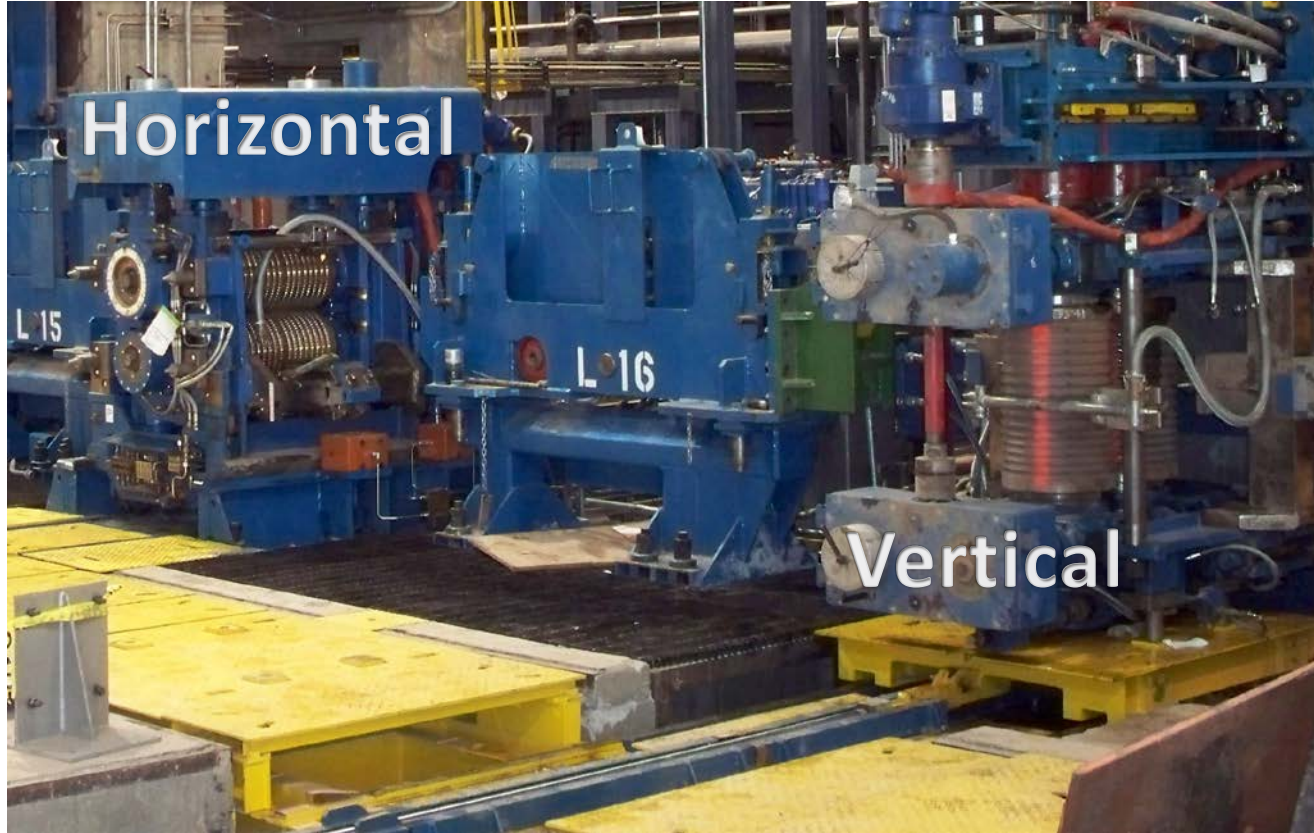
Material	Hardness (HRc)	Impact Toughness (Charpy - ft-lb)	Abrasion Resistance (Mohs)	Specific Gravity (lb/in <sup>3</sup> )	Applications	Drawbacks
H11 Tool Steel	56	20.7	4.5	0.2820	Low cost; disposable; long contact with hot steel; inadequate cooling; low rolling speeds	Easily abradable material causes shortened lifespan
D2 Tool Steel	61	13.3	5.5	0.2780	Lower cost; able to redress; consistent cooling; moderate rolling speeds; high impact loads	Fairly brittle, difficult to machine after hardened
WC	70	18.3	9.5	0.5708	Moderate cost; long contact with hot steel; highly abrasive product; long campaigns	High inertia; rapid heat transfer makes grease lubrication impractical
TiC	70	19.4	9.5	0.1781	High cost; highly abrasive product, long campaigns, extremely high rolling speeds	Excellent, consistent flow of coolant required

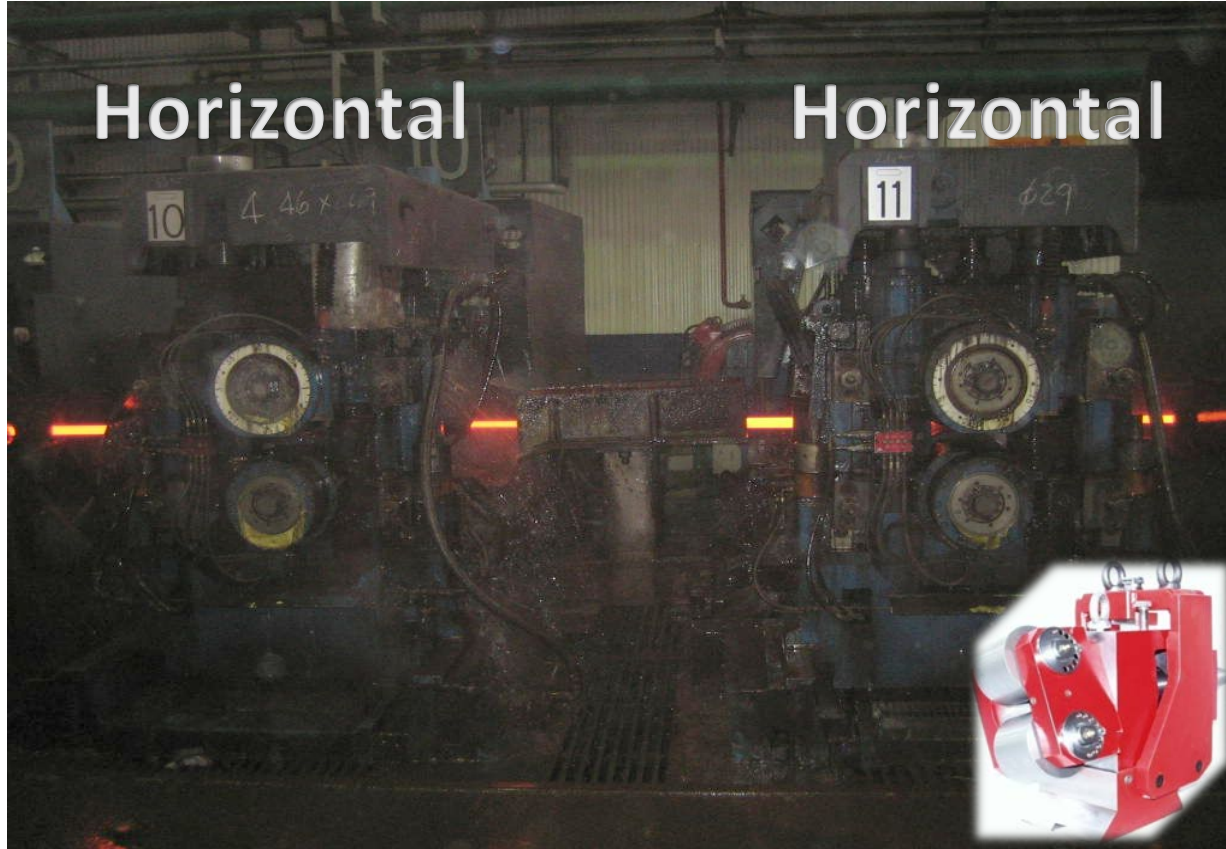


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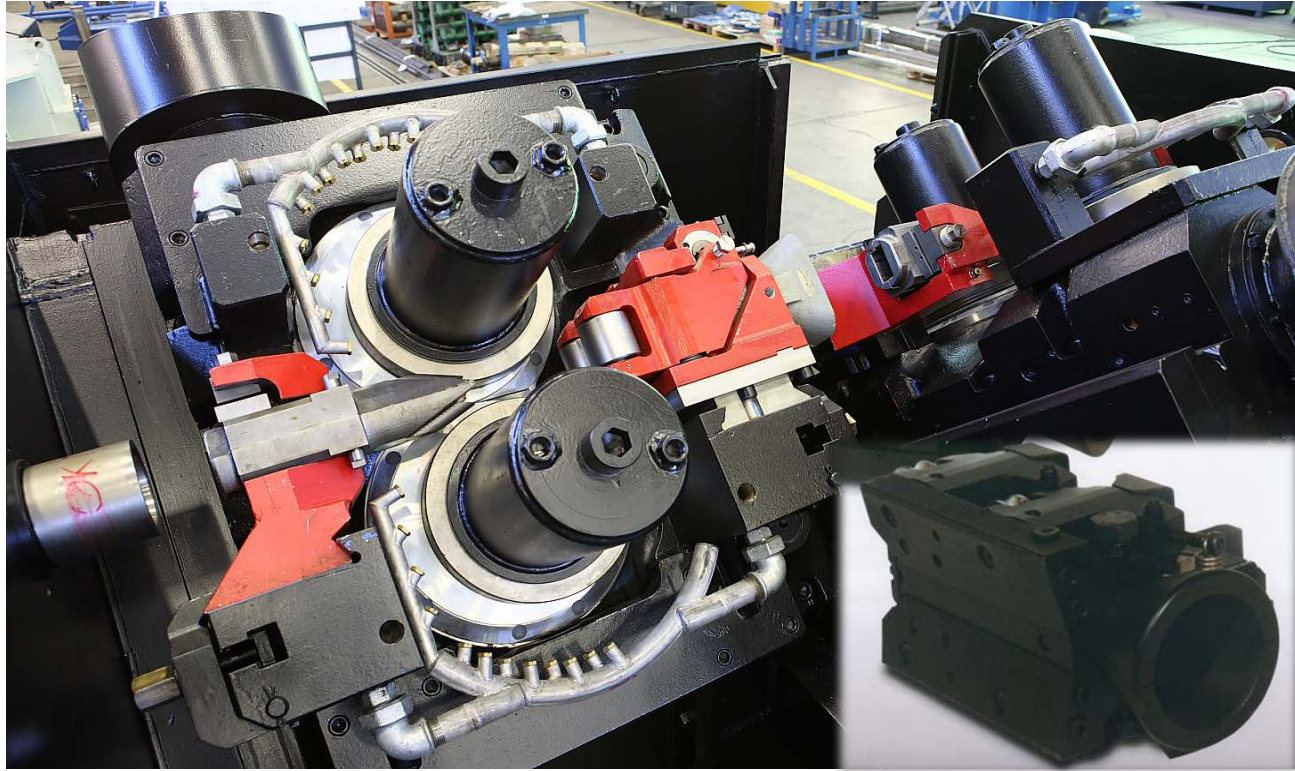
- Material/Source
- Rolling Sections
- **Stand Orientation**
- Mill Practices/Culture









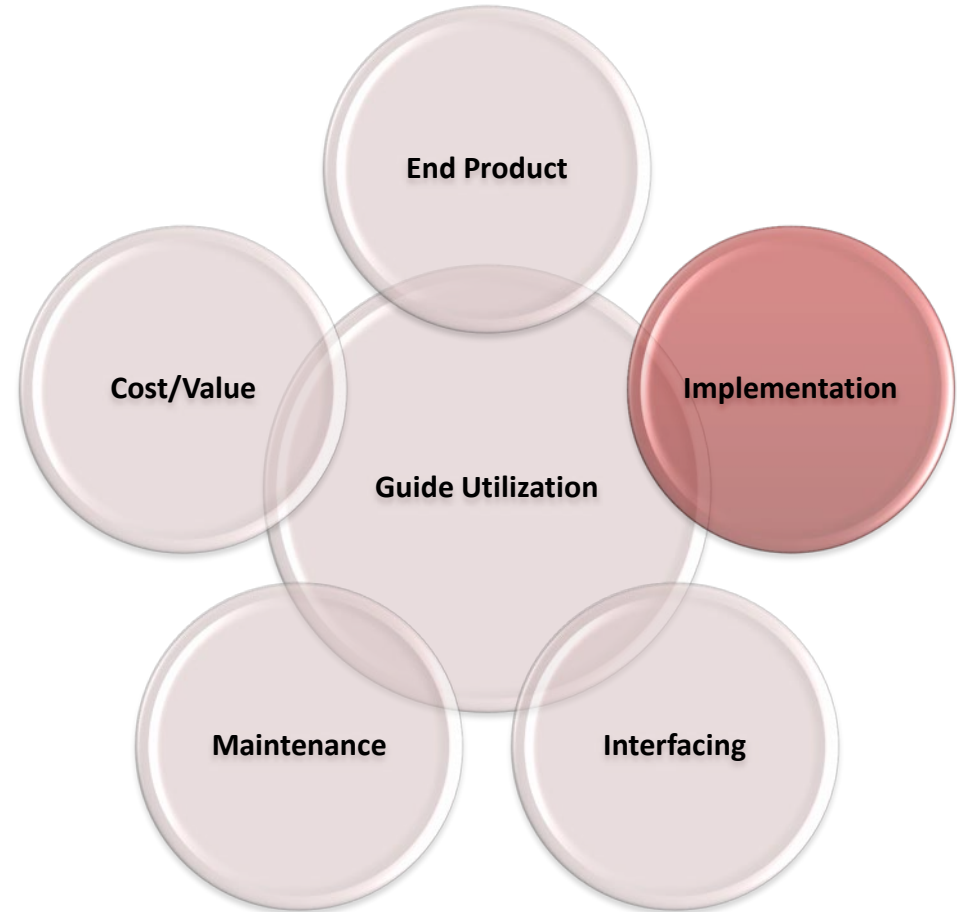


**Rod Block (Fast Finishing Block)**



## Implementation:

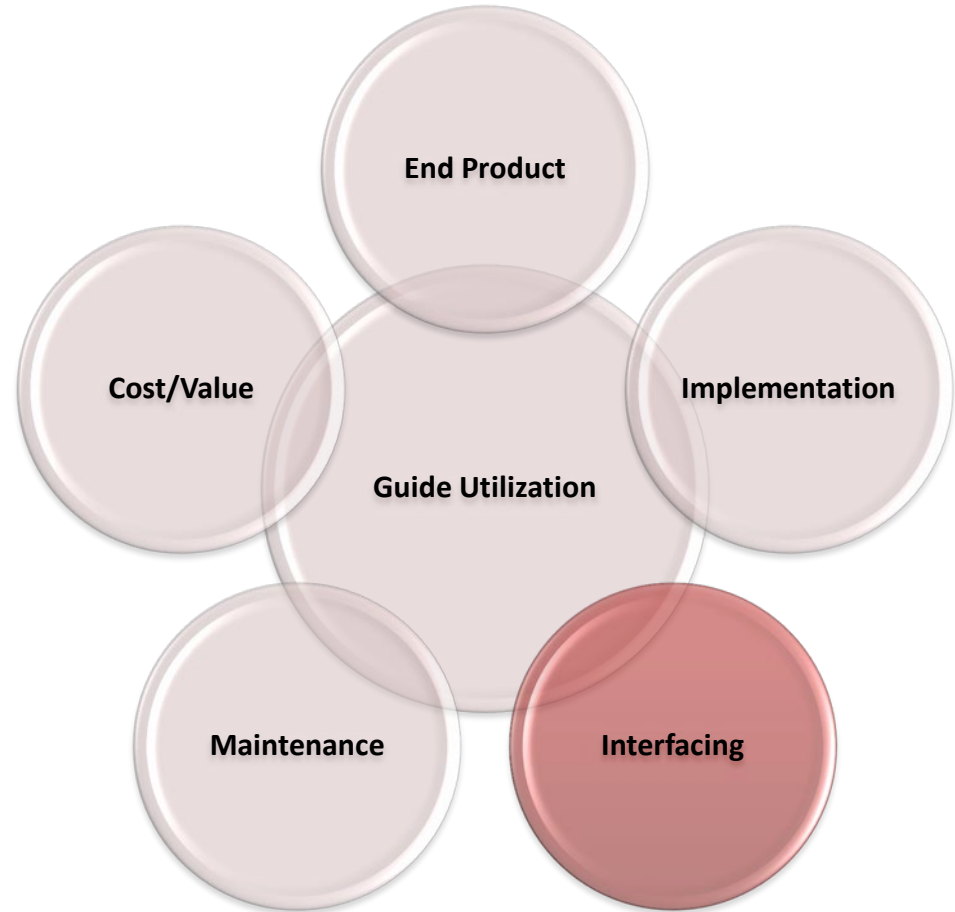
- Material/Source
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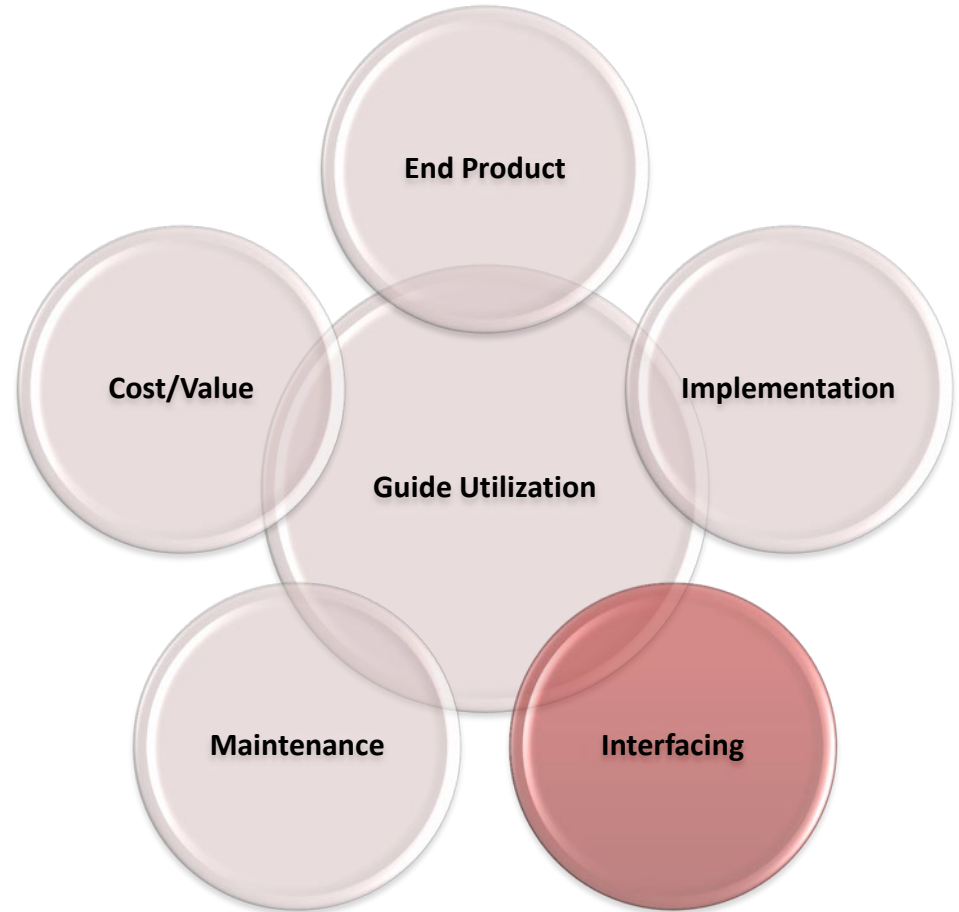
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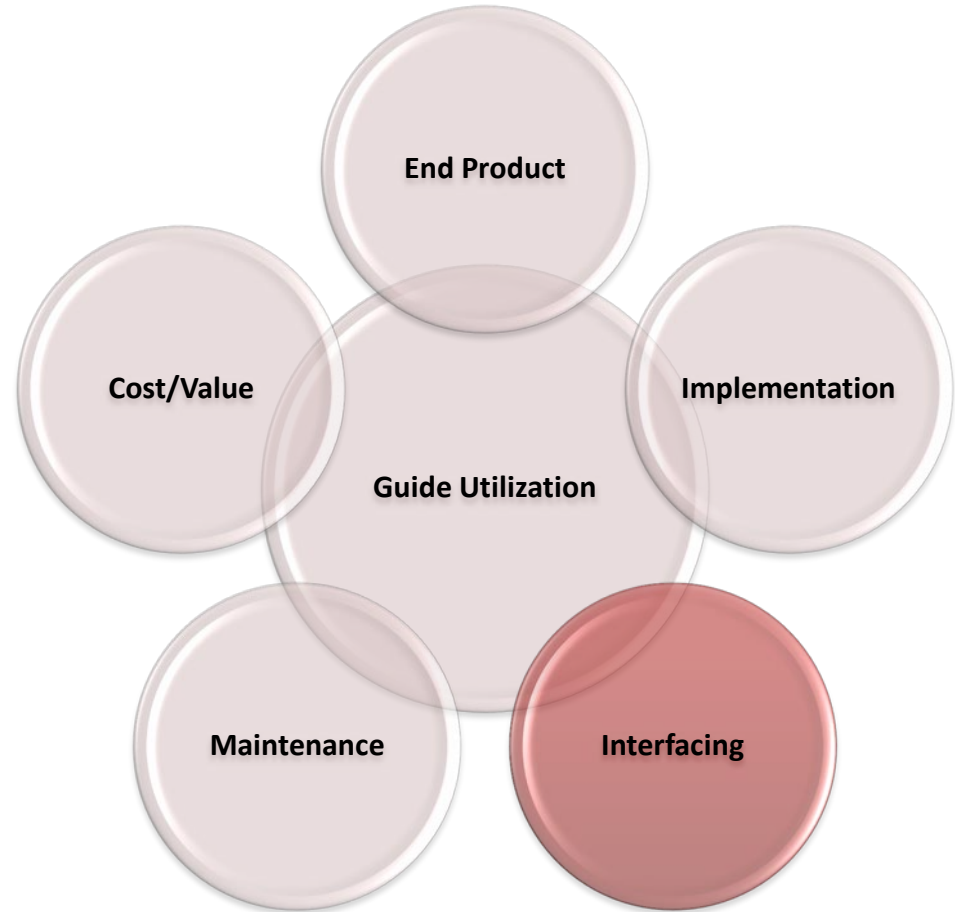
## Interfacing:

- What is “Interfacing”?
- Interfacing With The Mill
- Interfacing With The Crew



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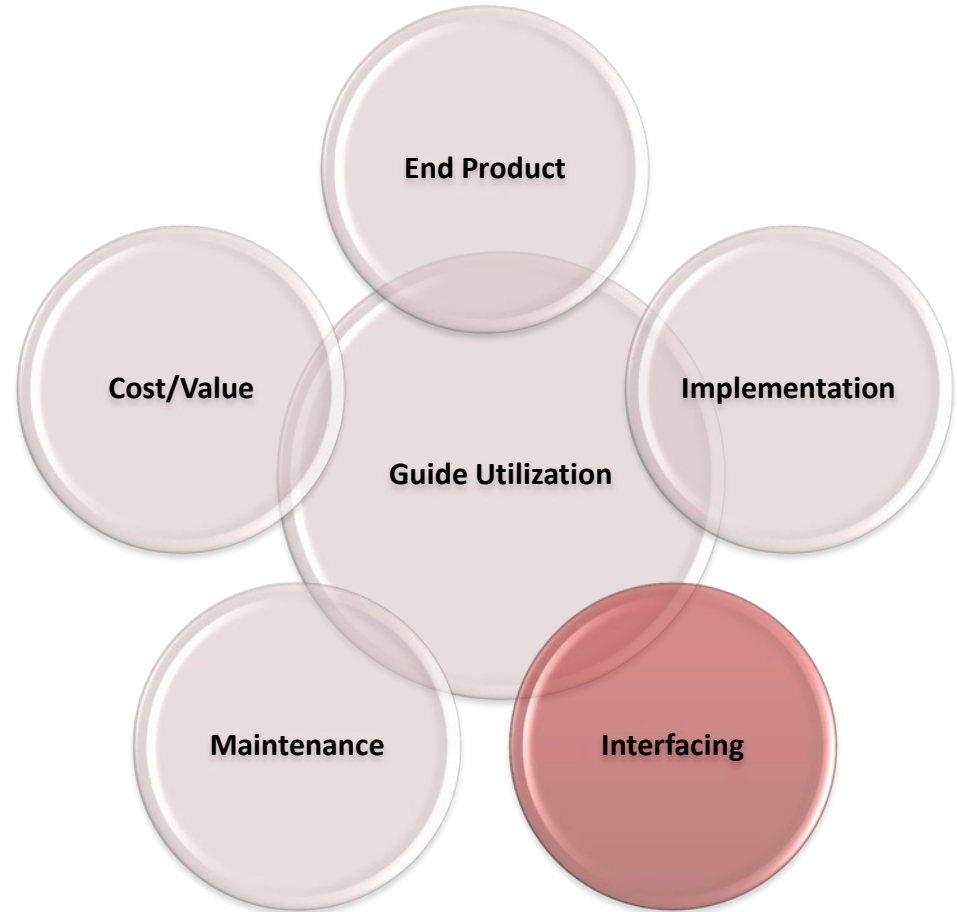
## What is “Interfacing”?

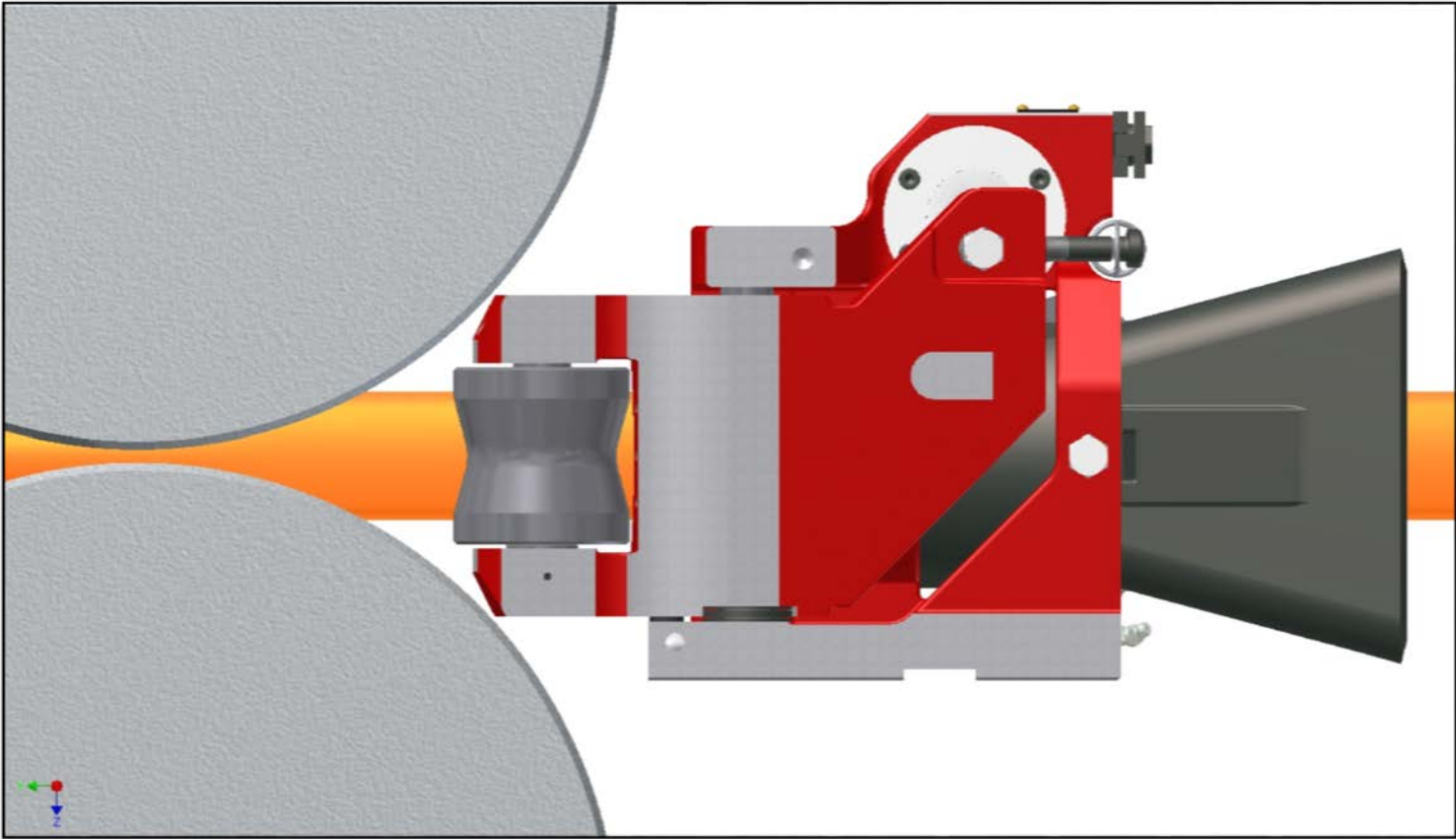
- A thing or circumstance that enables separate and sometimes incompatible elements to coordinate effectively
- A common boundary or interconnection between systems, equipment, concepts, or human beings



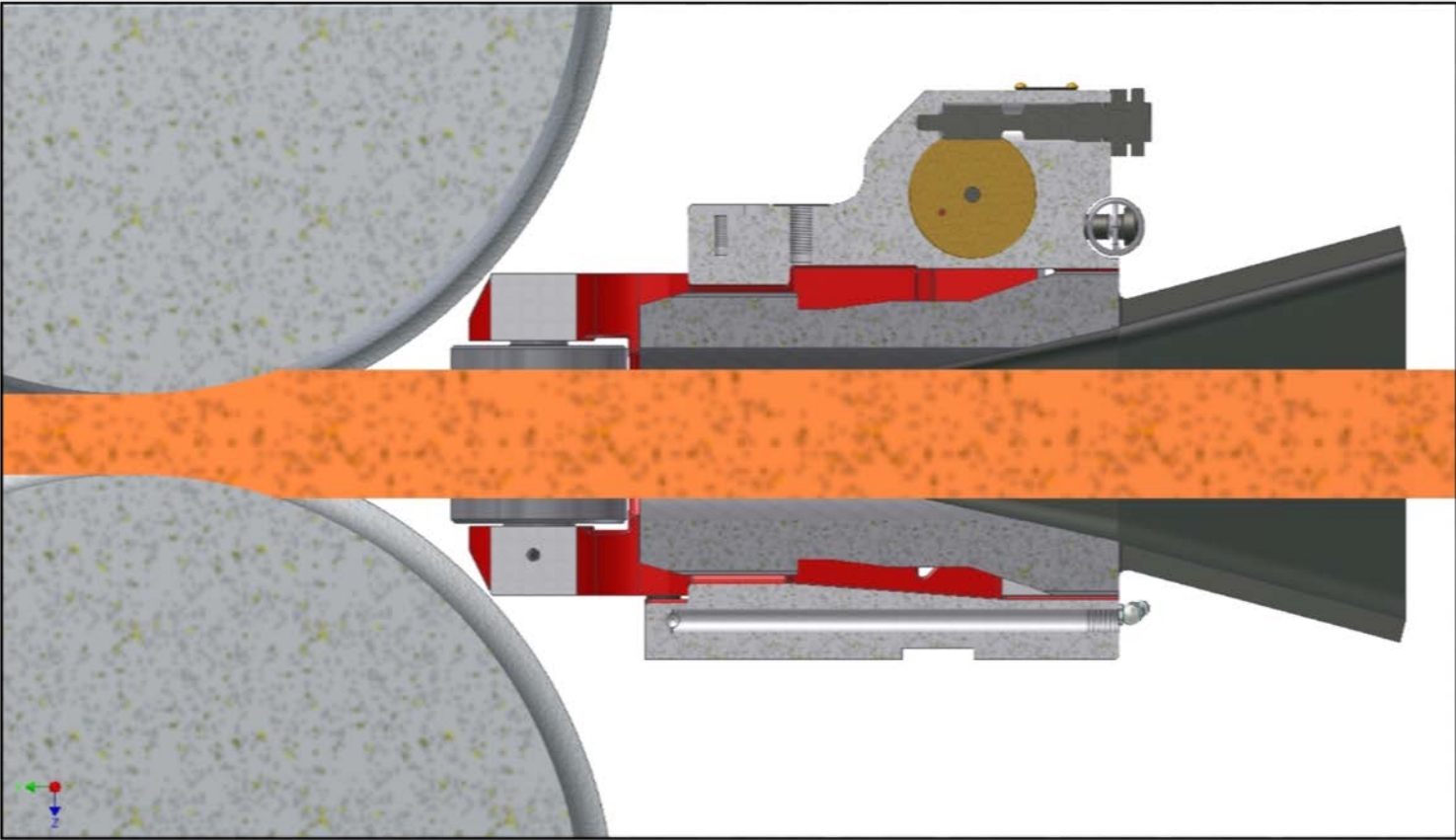
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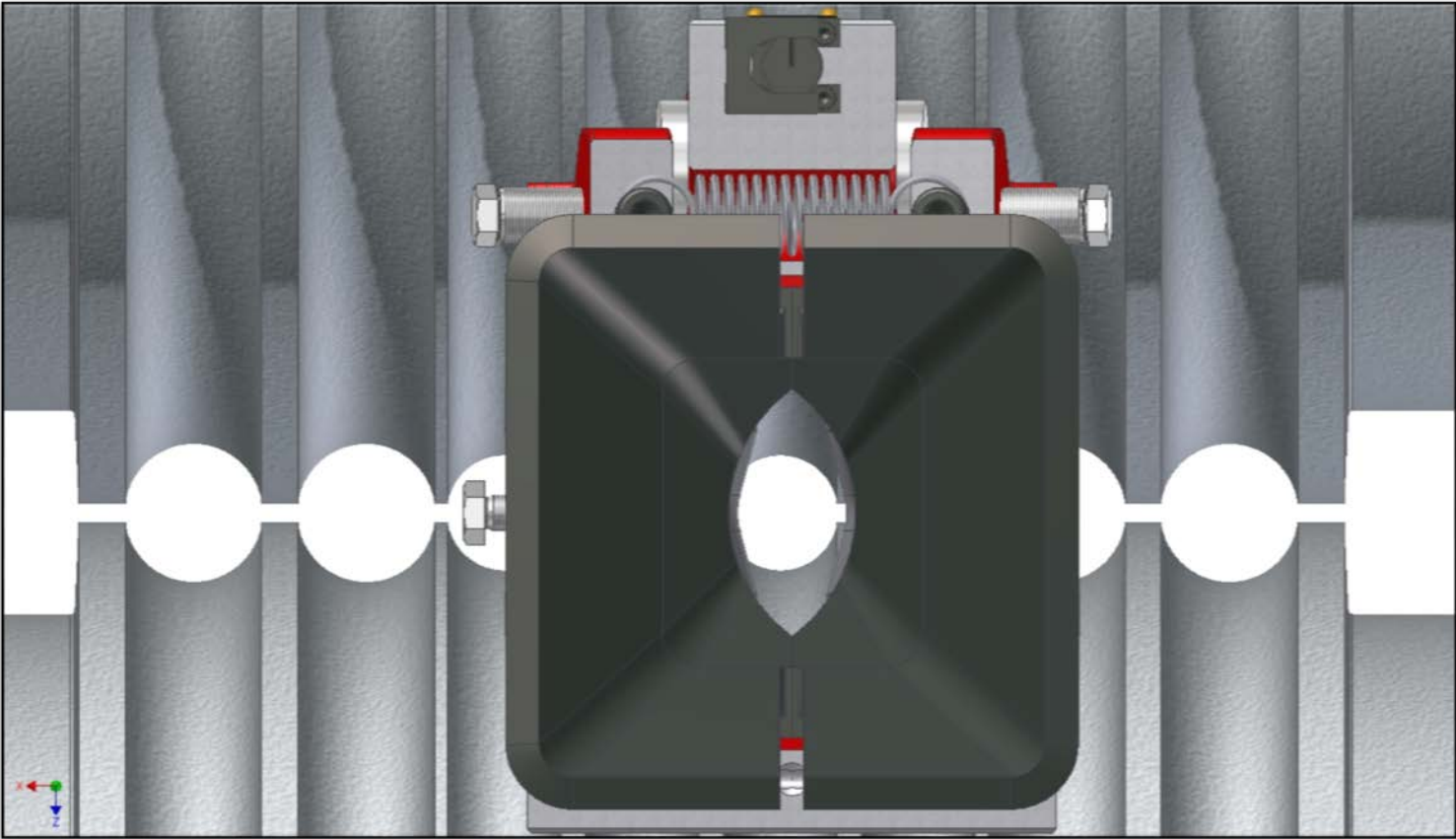
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- **Interfacing With The Mill**
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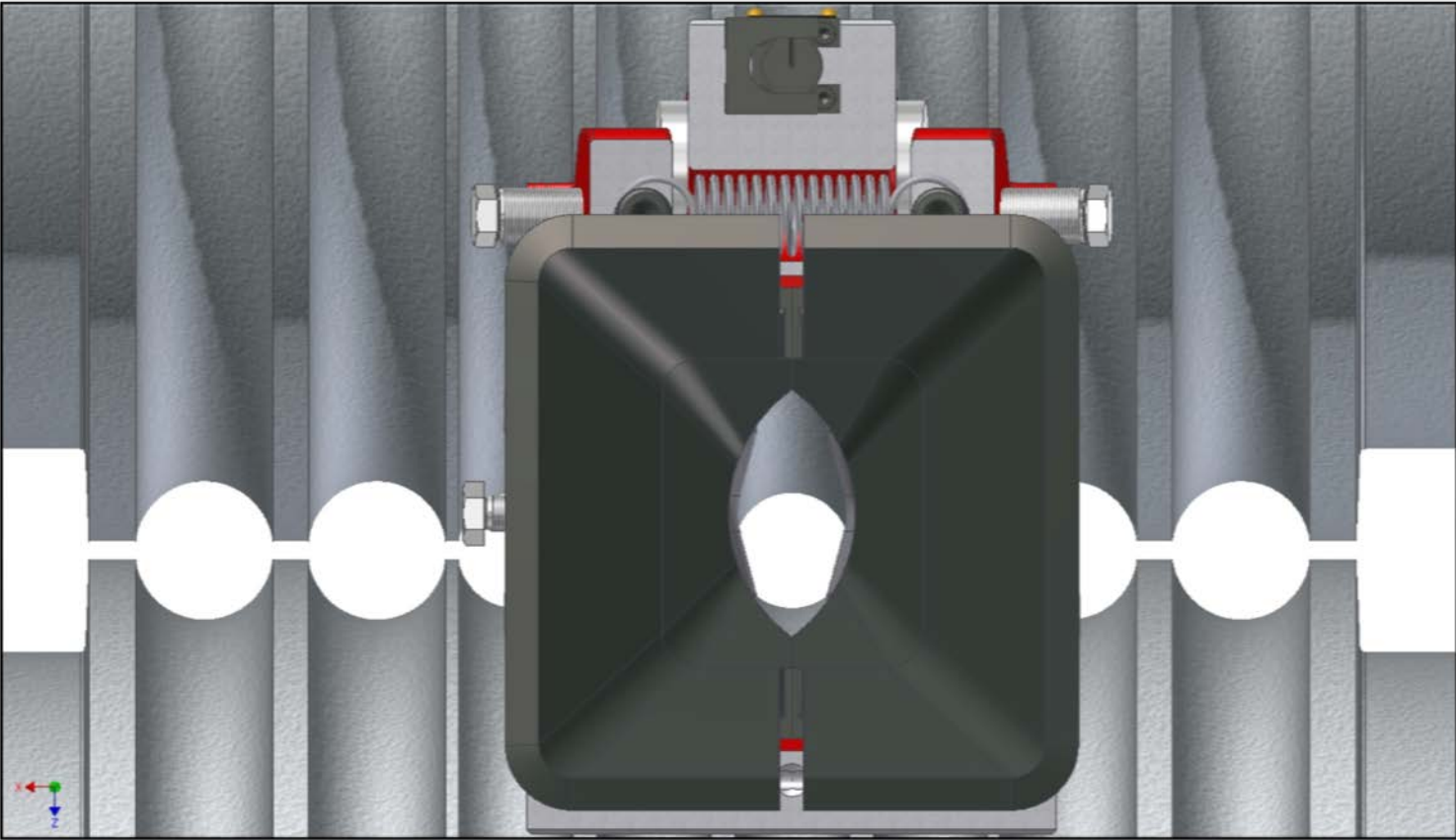


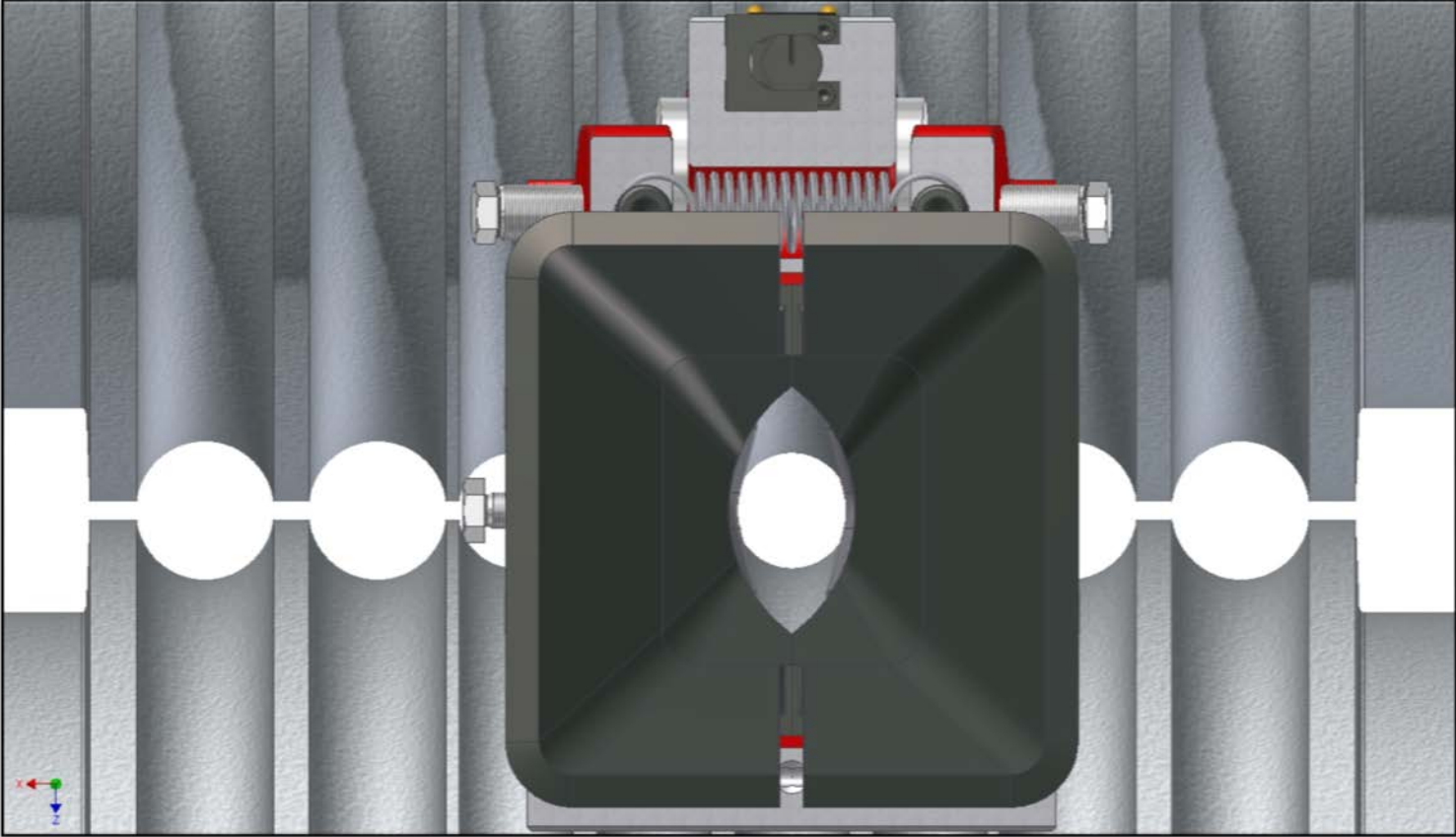




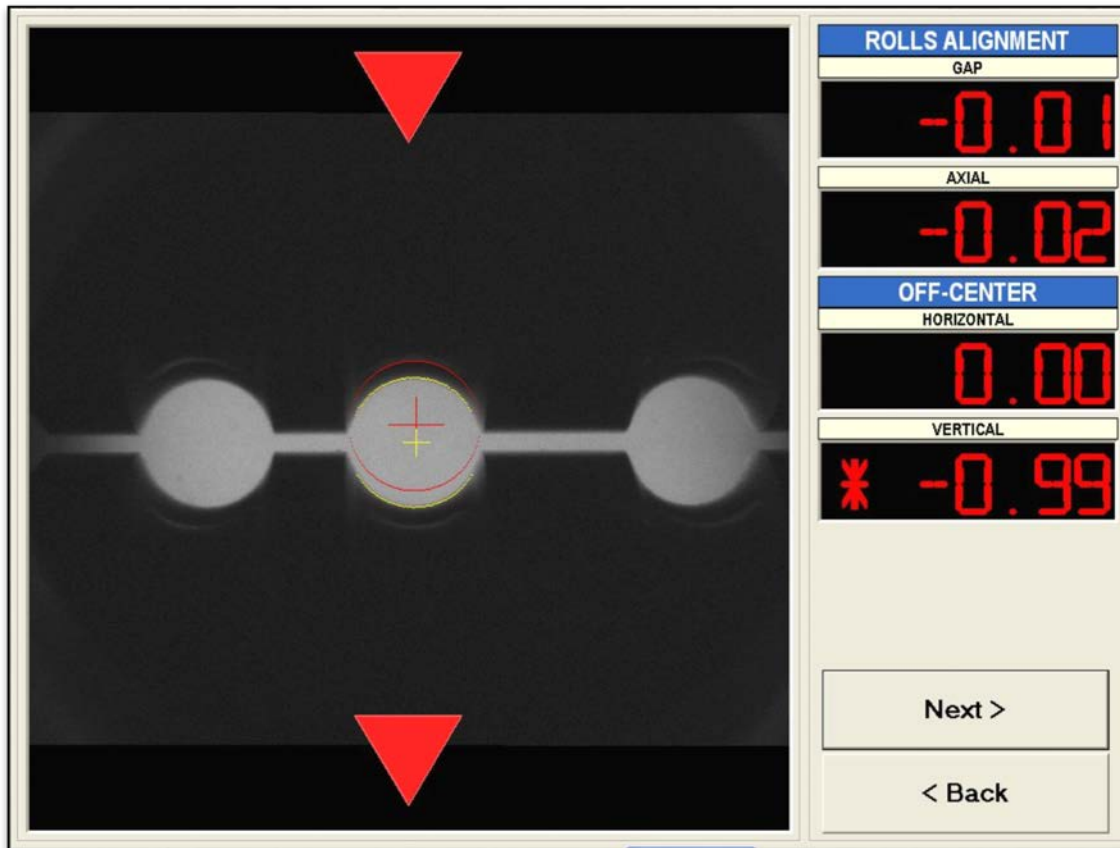






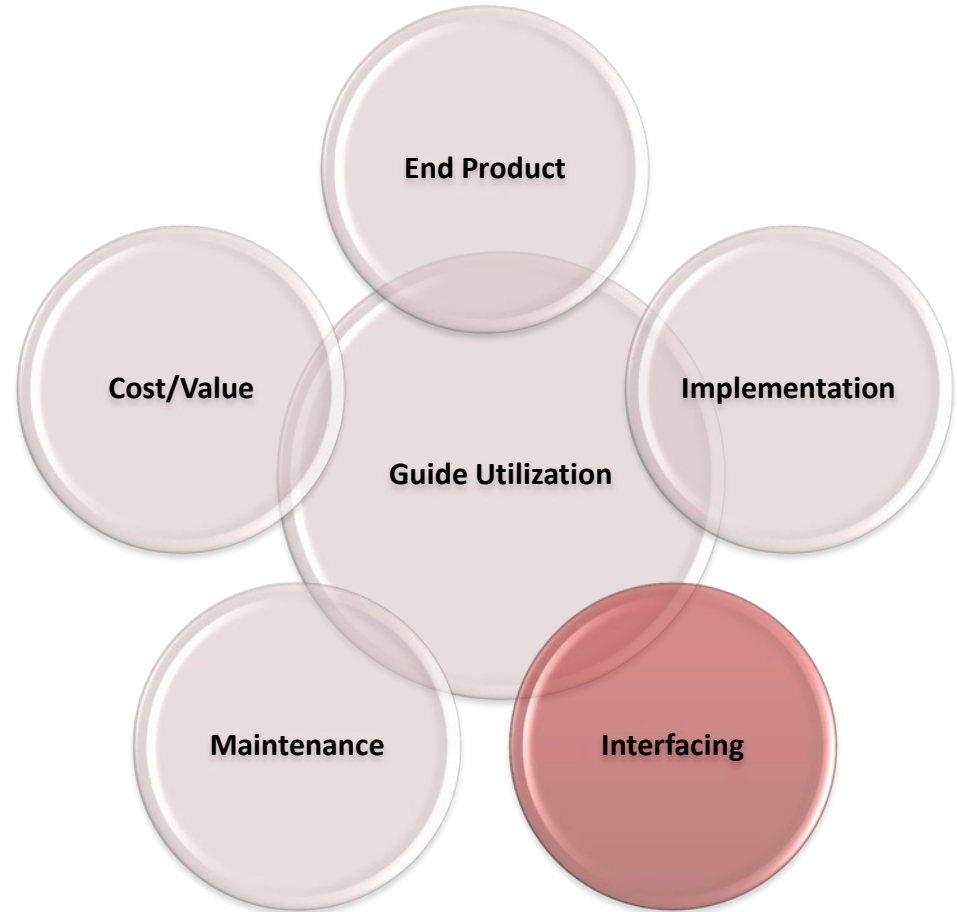






## Interfacing:

- What is “Interfacing”?
- Interfacing With The Mill
- **Interfacing With The Crew**





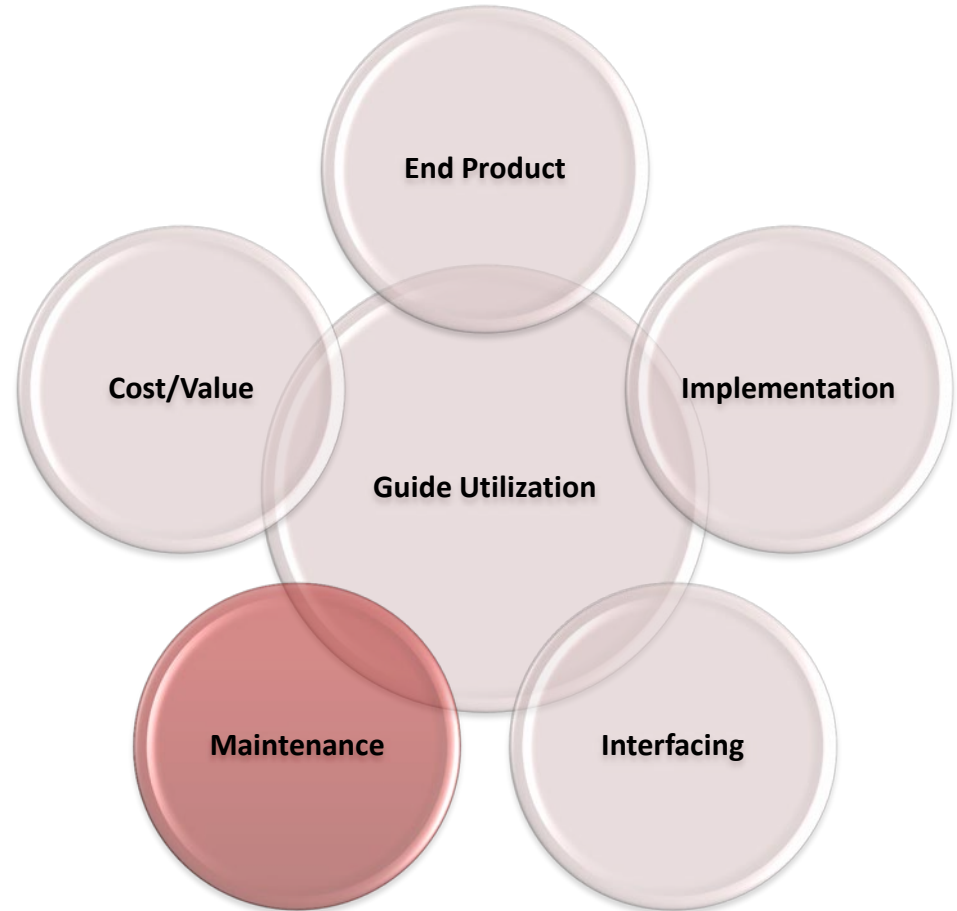
**Guide Shop Personnel**





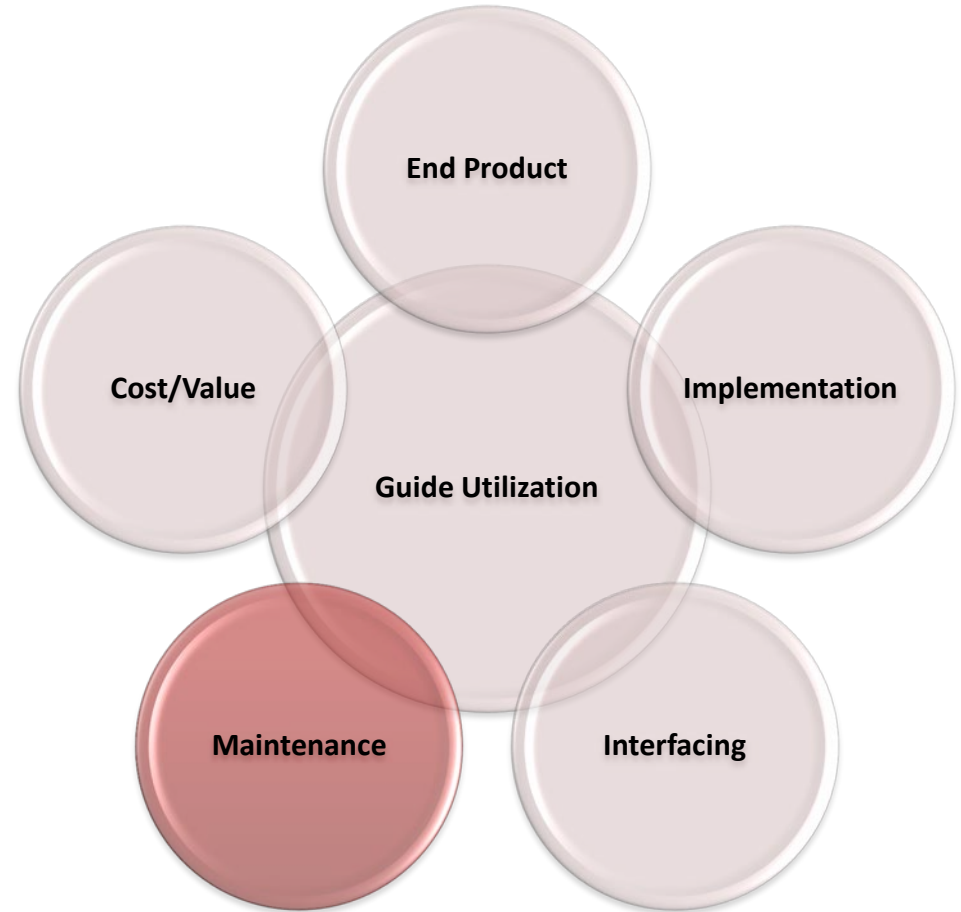
## Points of Consideration:

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- Implementation
- Interfacing
- **Maintenance**
- Cost/Value

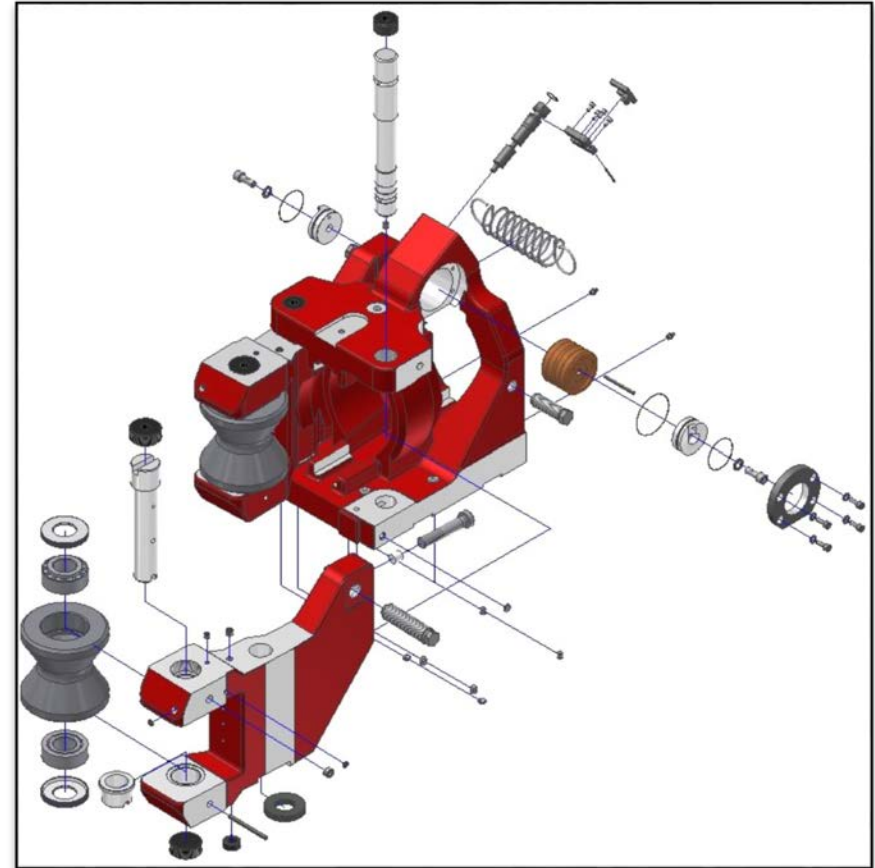


### **Maintenance:**

- **Planned**
- **Impromptu**

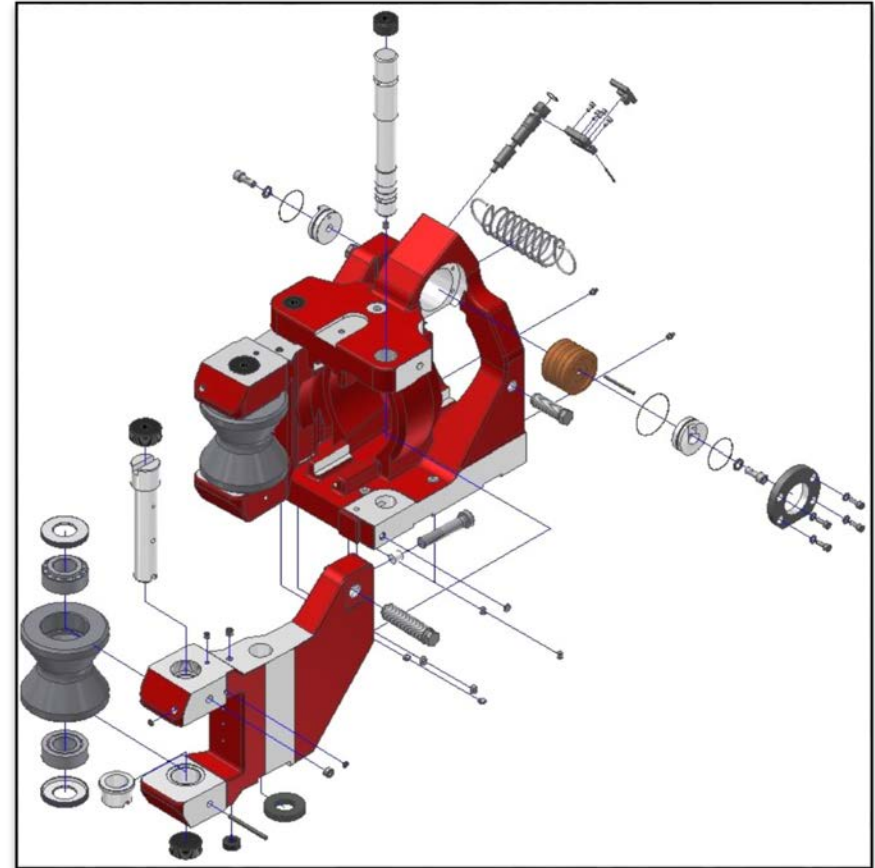


- Disassemble and inspect:
  - Seals
  - Bearings
  - Pins
  - O-Rings, etc.
- Replace worn components
- Clean components of debris
- Re-apply grease/oil
- Re-assemble components
- Set guide according to specs.



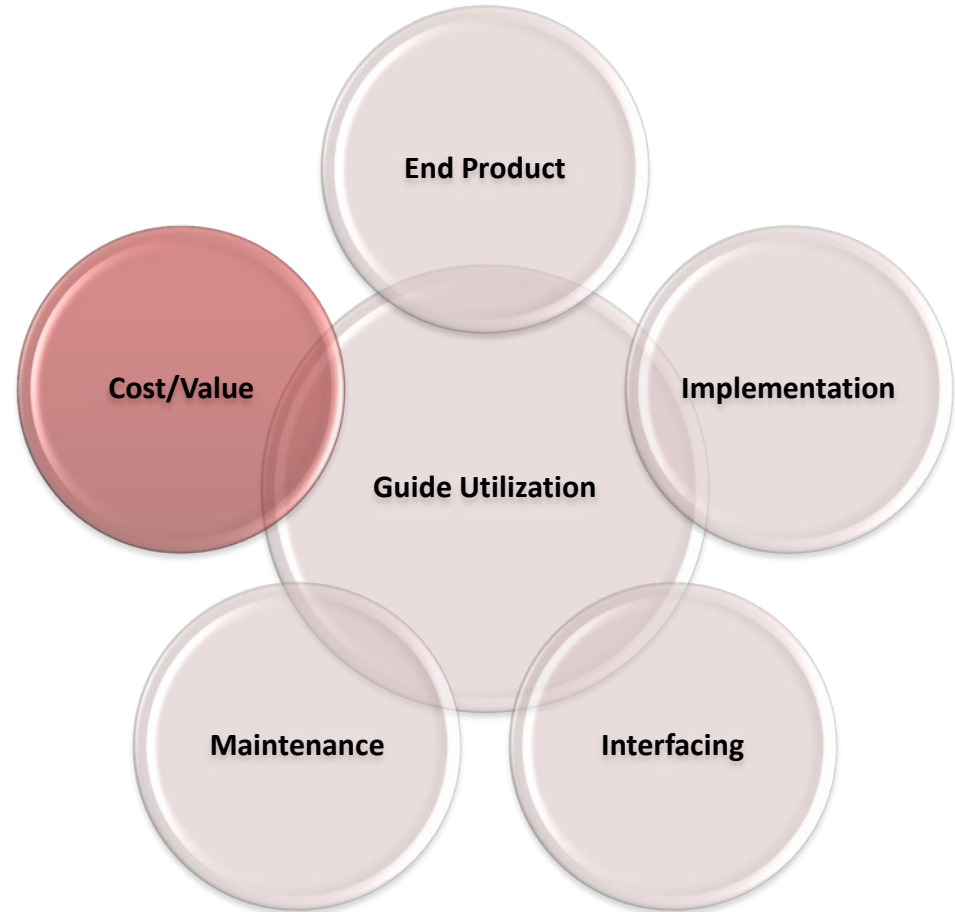


- Assess damage to guide
- Disassemble and inspect:
  - Seals
  - Bearings
  - Pins
  - O-Rings
- Replace worn/damaged comp.
- Clean components of debris
- Re-apply grease/oil
- Re-assemble components
- Set guide according to specs.

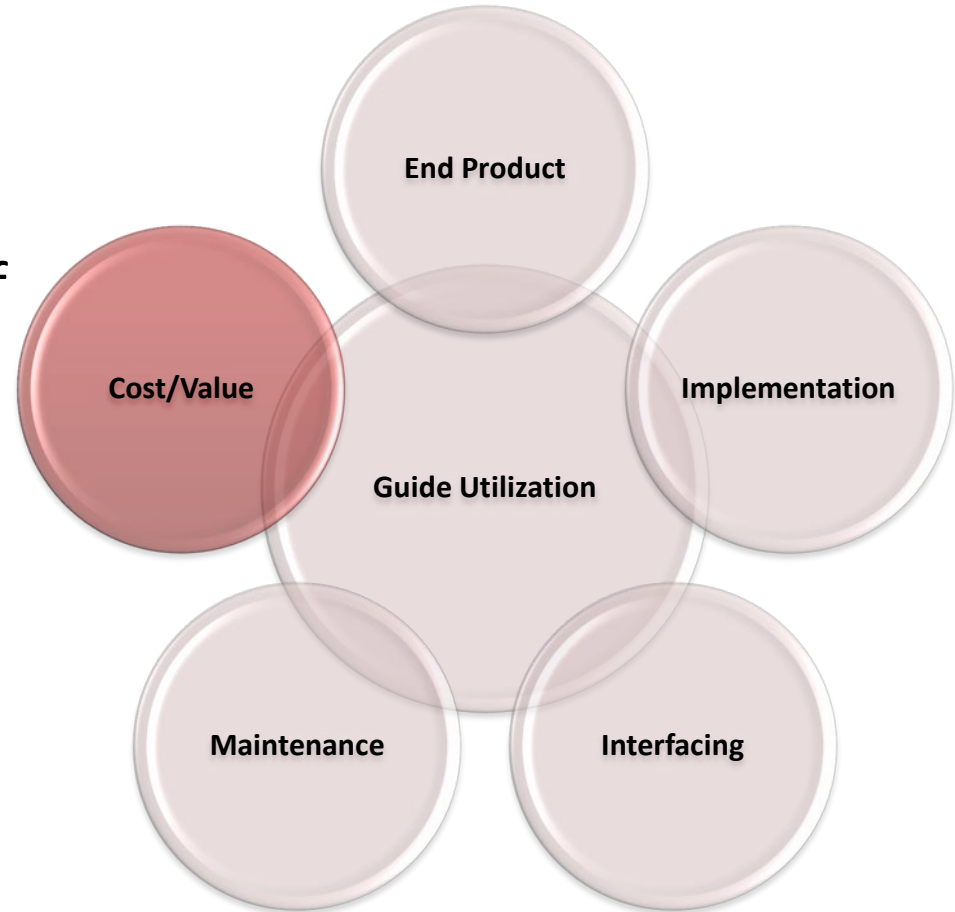


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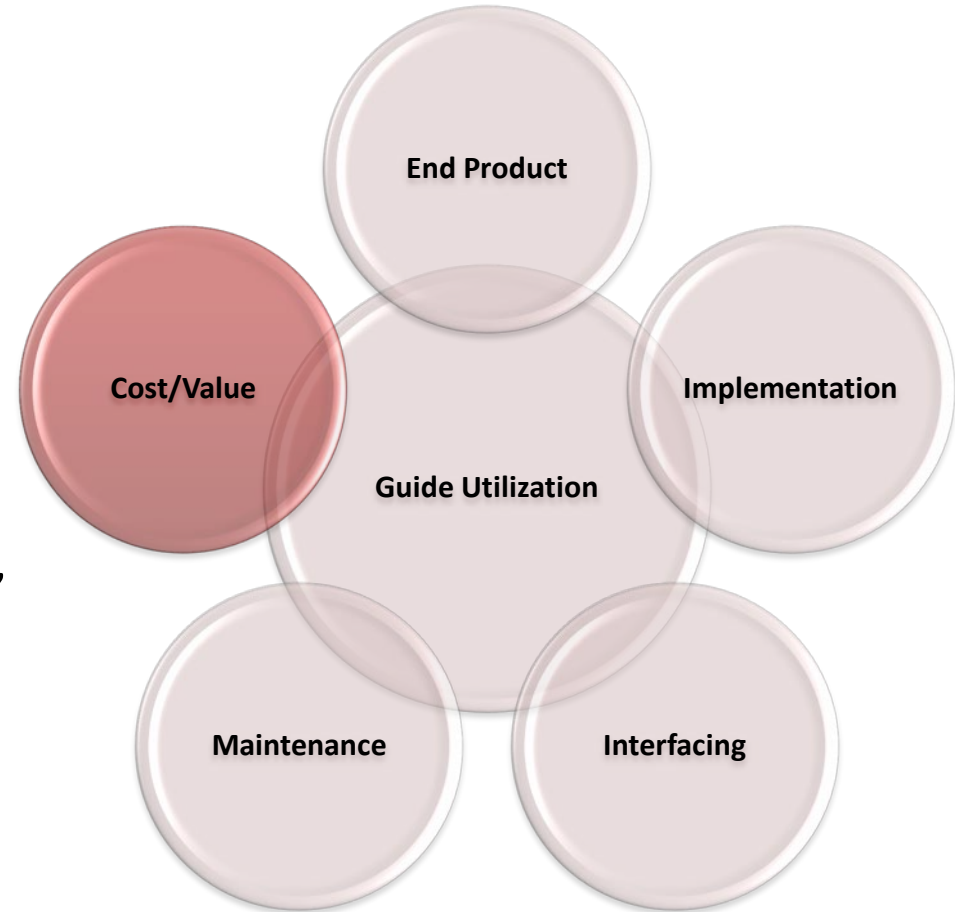


- Cost per value is a measure of how efficiently your guiding equipment is used in your specific application, the measure is based on the following criteria:

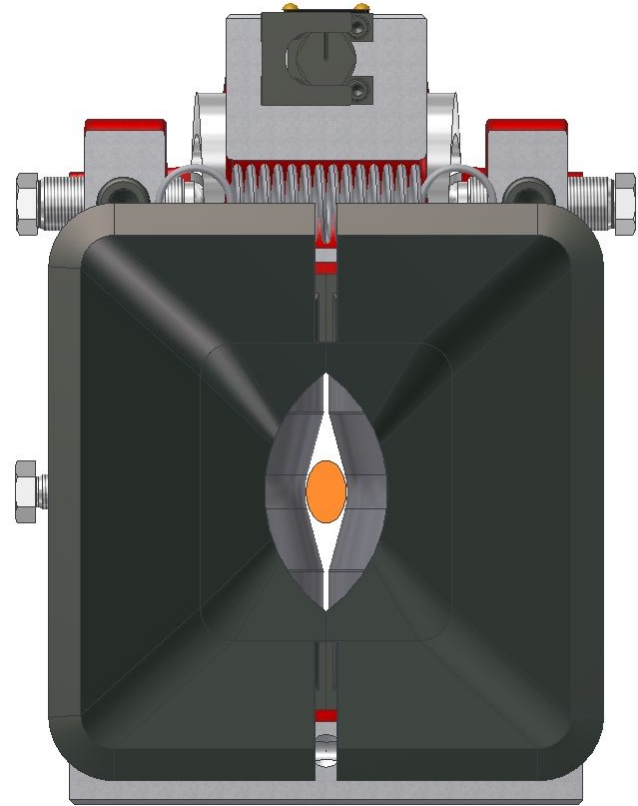




- Match profile to guide type/size
- Select guide materials to withstand operating conditions
- Interface guiding with mill stands, fluid systems, and mill personnel
- Adequate training for personnel, optimizing guide utilization
- Provisional tooling and equipment for proper setting and maintenance



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### Stainless Steel

Structural Results	
Name	Minimum
Equivalent Stress	0.2754 MPa
Maximum Principal Stress	-60.75 MPa
Minimum Principal Stress	-358.4 MPa
Deformation	0. mm
Safety Factor	1.57

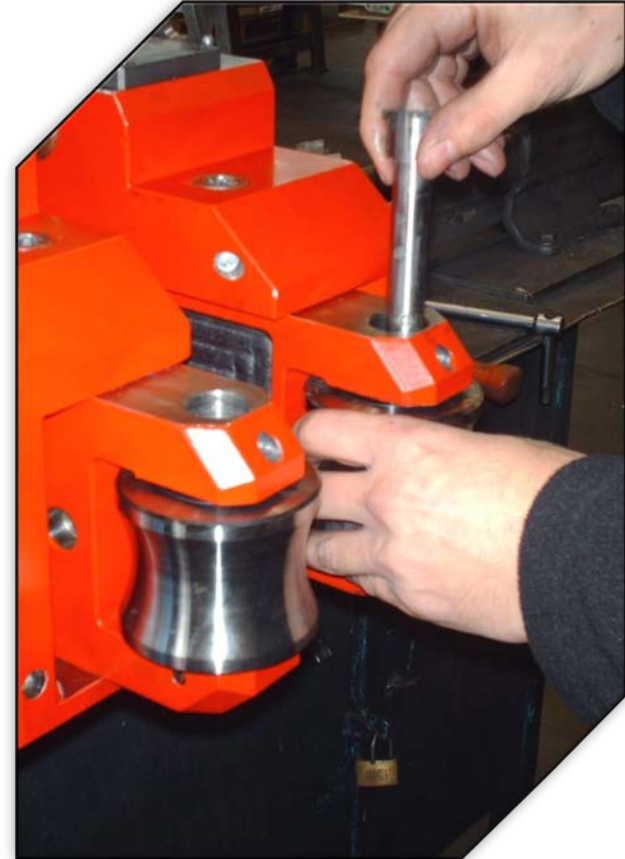
### Morgårdshammar Steel

Structural Results	
Name	Minimum
Equivalent Stress	0.2754 MPa
Maximum Principal Stress	-60.75 MPa
Minimum Principal Stress	-358.4 MPa
Deformation	0. mm
Safety Factor	3.071

- Match profile to guide type/size
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Importance  
of Guiding



Types of  
Guides

### Three Basic Types:

- Static
- Roller
- Specialized
- Smart





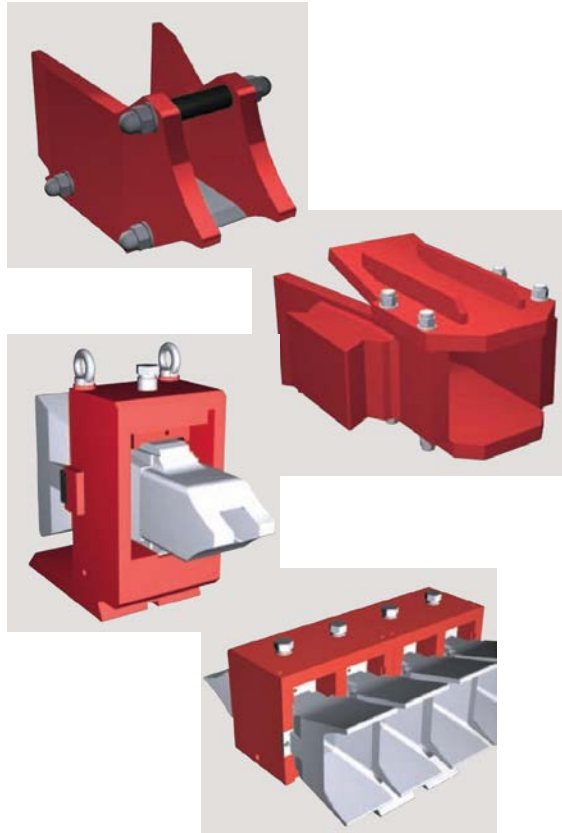
- Entry

- AEC

- AEV

- AEL

- AEM



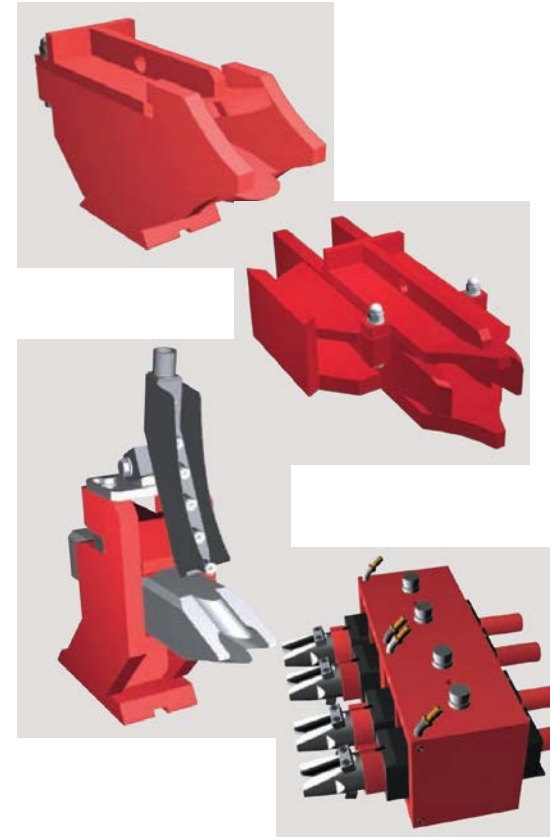
- Exit

- AUC

- AUV

- AUT

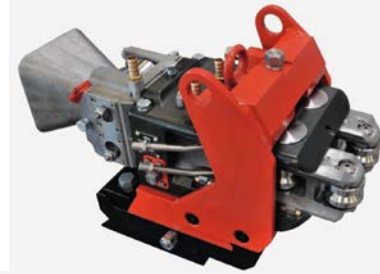
- AUM



- 2 Roller
  - FRS
  - SR/SRW



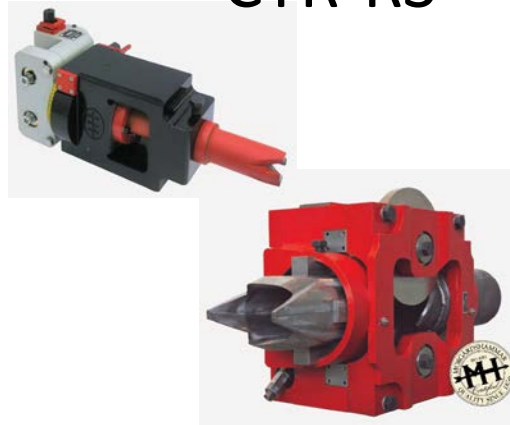
- 4 Roller
  - PRD
  - MDR
  - DR/DRW



- Edging
  - WEG



- Twisting
  - RTC-RS
  - CTR-RS



- Slitting
  - CTD-RS
  - MSL



- Channel
  - CSG



- Profile
  - PRG
  - PRDS



- Sizing
  - RSB
  - FRSB



- **Rx**
  - Provides feedback on the dimension of the stock
  - Arms adapt to continuous change in the dimension
  - Automatically change dimensions in-between billets allowing for stock variation



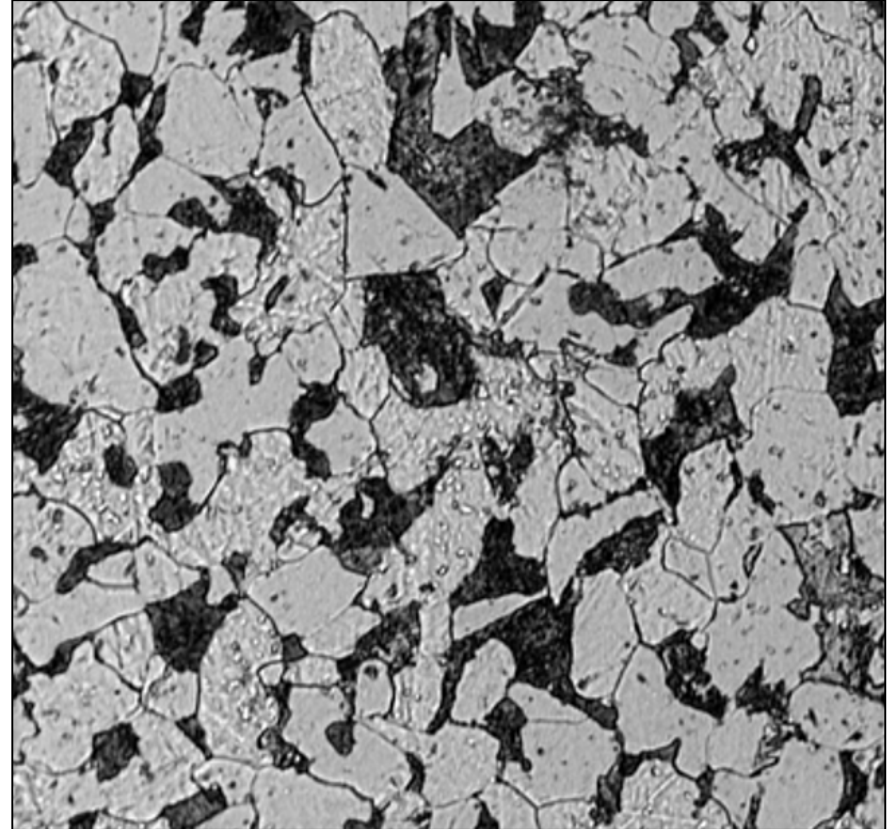
Types of  
Guides



Roller  
Metallurgy

## What is Metallurgy?

- The branch of science and technology concerned with the properties of metals and their production and purification

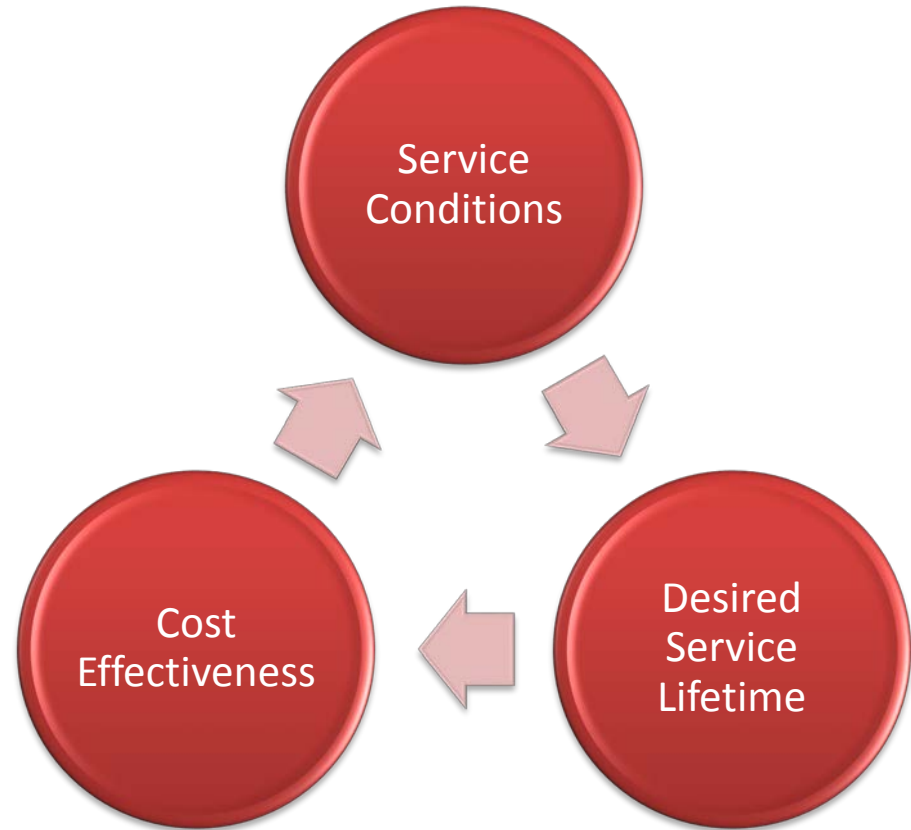


## Service Conditions

- Contacting Materials
- Type of Motion, Speed, & Frequency
- Type of Loading
- Thermal Cycling
- Ambient Conditions

## Desired Service Lifetime

## Cost Effectiveness





## Service Conditions: Contacting Materials

**Mohs Hardness Scale** - A scale used to measure the relative hardness of a mineral by its resistance to scratching

### Mohs Hardness of Commonly Rolled Materials

Talc	Mohs 1.0
Graphite, Lead, Tin	Mohs 1.5
Aluminum, Gold, Magnesium, Silver, Zinc	Mohs 2.5
Copper	Mohs 3.5
Iron, Nickel	Mohs 4.5
Beryllium, Cobalt, Molybdenum	Mohs 5.5
Manganese, Silicon, Titanium	Mohs 6.5
Tungsten, Vanadium	Mohs 7.5
Chromium	Mohs 8.5
Silicon Carbide, Titanium Carbide, Tungsten Carbide	Mohs 9.5
Diamond	Mohs 10.0

## Service Conditions: Contacting Materials

Force to bring roller to speed in one second:

Rolling Speed            **390 Feet/Second**

### Ferrodur™ Titanium Carbide

Roller Mass (Weight)            0.4739 lb

Torque Required                    320 ft-lb

Tangential Linear Force Required   30 lb

### H-13 Tool Steel

Roller Mass (Weight)            0.7518 lb

Torque Required                    500 ft-lb

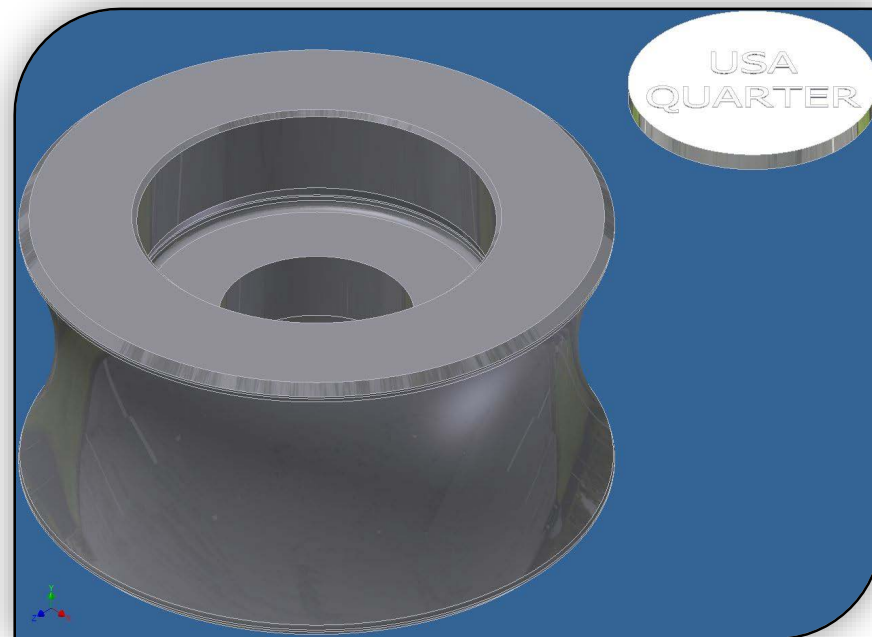
Tangential Linear Force Required   48 lb

### Tungsten Carbide

Roller Mass (Weight)            1.437 lb

Torque Required                    960 ft-lb

Tangential Linear Force Required   92 lb



## Service Conditions: Type of Loading

### Loading Types & Severities:

#### Radial Loading

Uniform Radial Loading

Asymmetrical Radial Loading

Uniform Radial Shock Loading

Asymmetrical Radial Shock Loading

#### Axial Loading

Uniform Axial Loading

Asymmetrical Axial Loading

Uniform Axial Shock Loading

Asymmetrical Axial Shock Loading

Least Severe

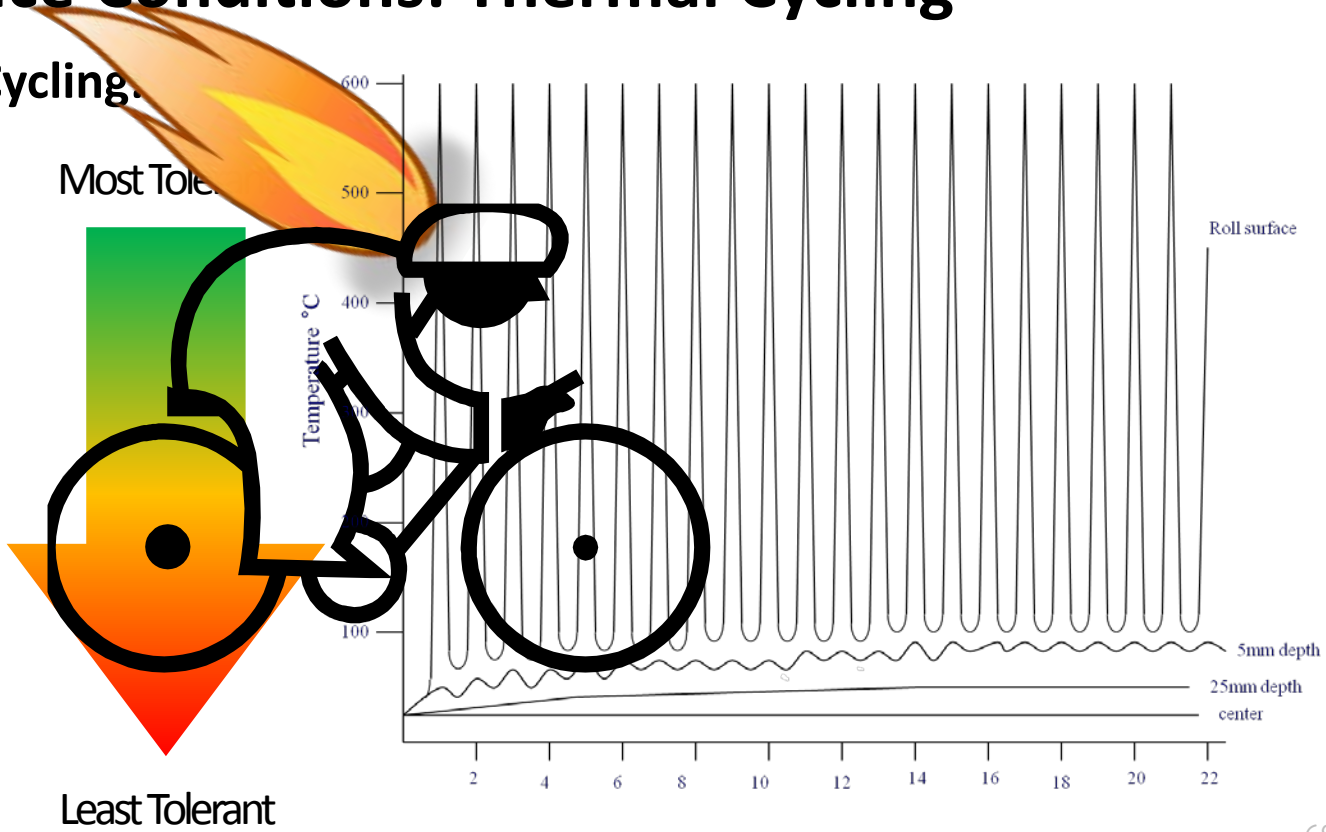


Most Severe

# Service Conditions: Thermal Cycling

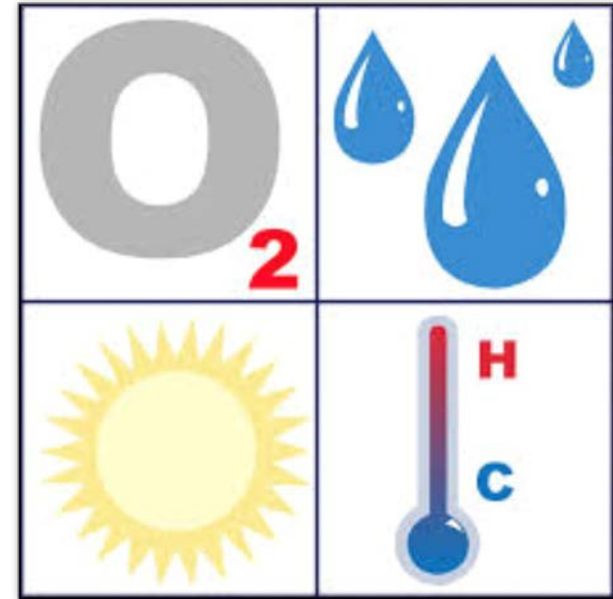
## Tolerance to Thermal Cycling.

- M-Series Tool Steels
- H-Series Tool Steels
- D-Series Tool Steels
- Tungsten Carbide
- Titanium Carbide
- Ceramics

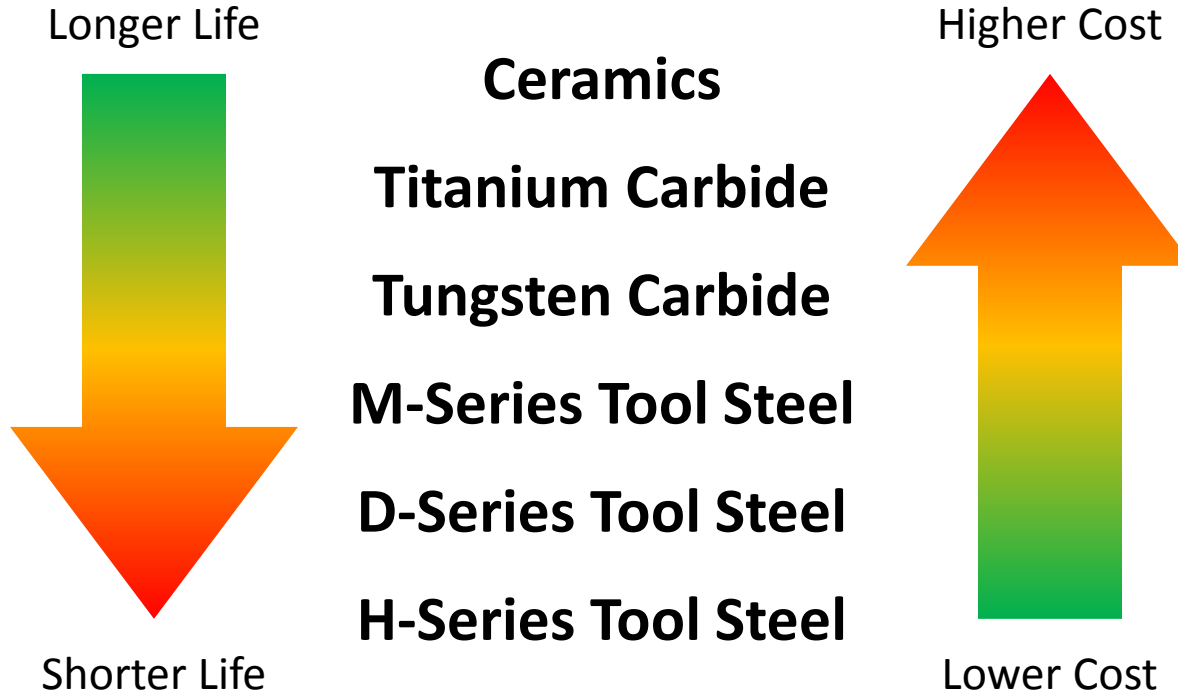


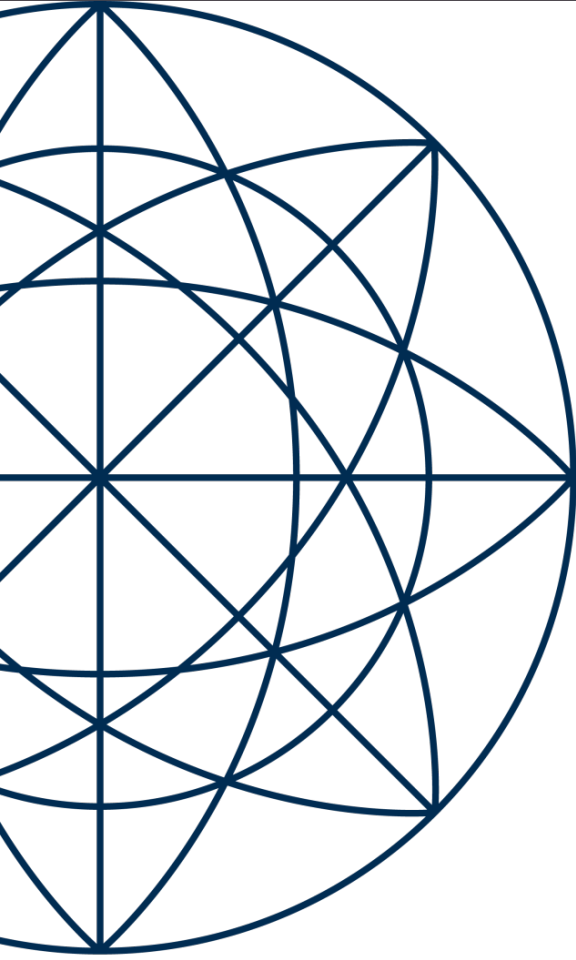
## Service Conditions: Ambient Conditions

- Water Quality
- Lubrication Type & Frequency
- Storage Conditions
- Maintenance Culture
- Atmospheric Fluctuations



### Desired Service Lifetime & Cost Effectiveness





THANKS FOR YOUR ATTENTION!

QUESTIONS?

Robert James  
Richard Adams