HYPERION MATERIALS & TECHNOLOGIES

HENRIQUE COSTA

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CONVERTING YOUR MILL FROM CONVENTIONAL ROLLS TO TUNGSTEN CARBIDE

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INCREASING PRODUCTIVITY

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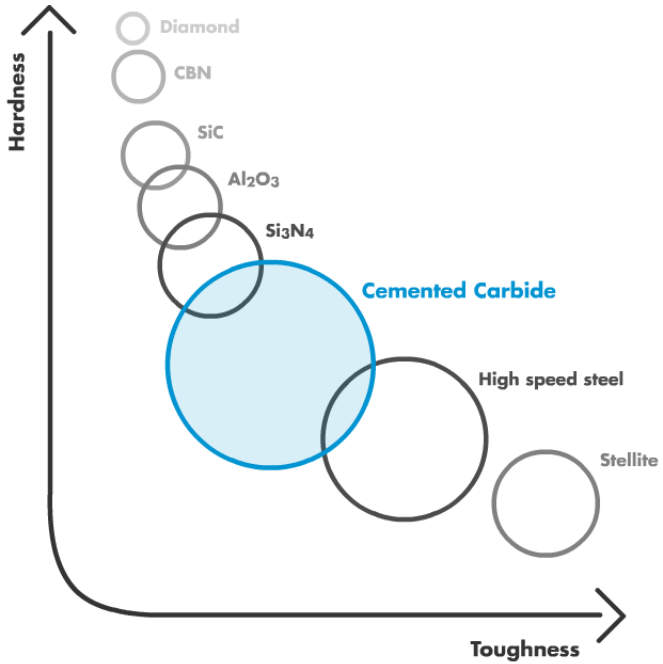
WHY TUNGSTEN CARBIDE IS THE ANSWER?



There is a constant pressure for higher efficiency in the rolling mills

Tungsten carbide will bring:

- More tons per pass
- Improved rolled material surface finishing and tolerances

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BEYOND THE HIGHER PASSFORM TONNAGE

- Significant **reduction of line stops** to change passforms and rolls

- **Reduces human interventions** in the mill
  - Safer environment
  - Lowers the chance of a handling and/or adjustment mistake

- **Higher rolling mill stability**
  - Fewer cobbles / Lower scrap rate
  - Higher mill output

Results : Increased mill efficiency
Lower operational costs

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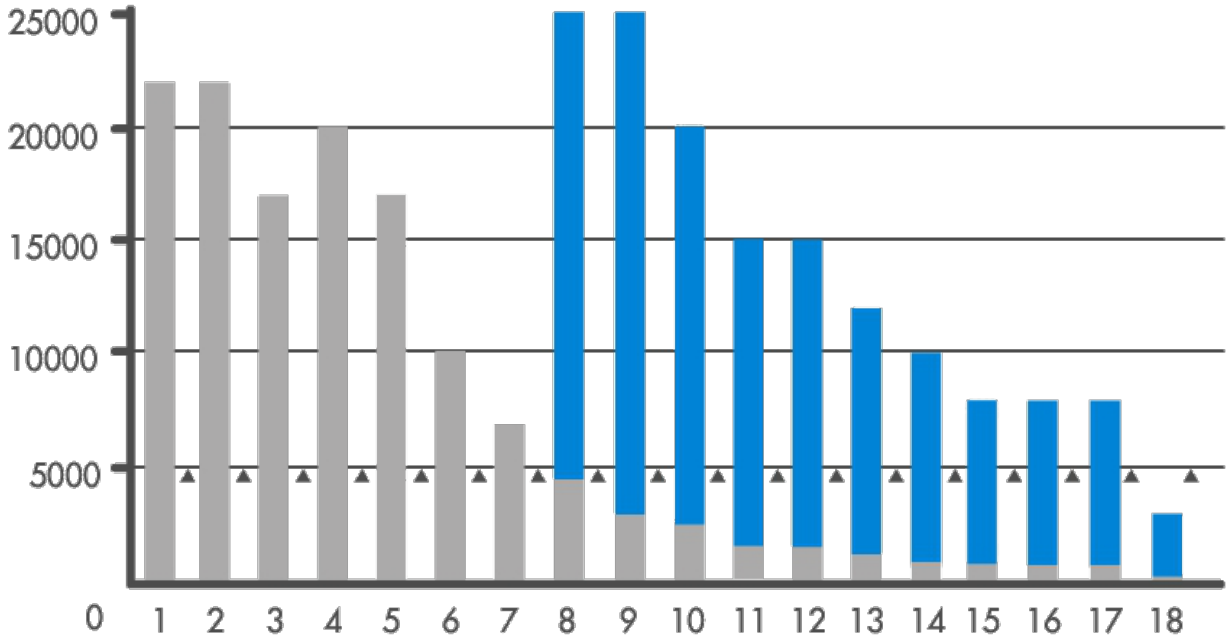
PRODUCTIVITY INCREASE



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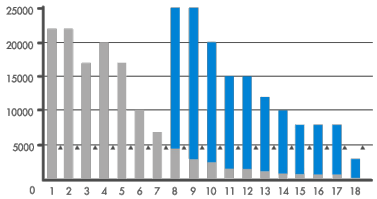
PRODUCTIVITY INCREASE

Campaign size: 5000 ton

Stand	8	9	10	11	12	13	14	15	16	17	18
Conventional rolls	4.500	3.000	2.500	1.500	1.500	1.200	1.000	800	800	800	240
CIC Rolls	25.000	25.000	20.000	15.000	15.000	12.000	10.000	8.000	8.000	8.000	3.000

Minutes/pass changes	15	15	10	15	10	15	10	15	15	3	5
Reduced nº of pass changes	1	1	2	3	3	4	5	6	6	6	20
Reduced downtime/stand	15	15	20	45	30	60	50	90	90	18	100



Total reduced downtime:

533 min
9 hours

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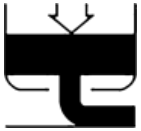
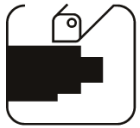
HOW IS IT MADE?

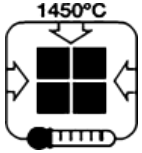
TUNGSTEN CARBIDE



PRESSING



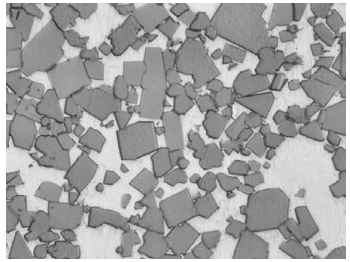
GREEN SHAPING



SINTERING

CASTING

FINAL MACHINING



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HOW IS IT USED?

CIC Integral
- Shaft casted into the carbide rings

CIC Ring
- Carbide ring with cast iron interior

Block / Sizing Rings
- 100% Carbide ring

Talus Rolls
- Solid Rings assembled into a shaft
- Hydraulic or mechanic locknut

CIC Combi Rolls
- CIC rings assembled into a shaft

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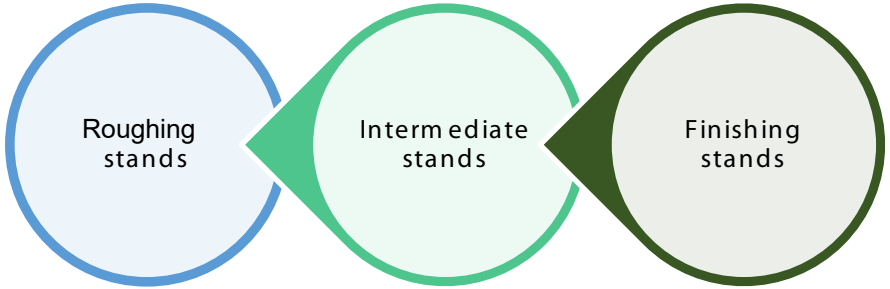
WHERE CAN THEY BE USED?



		Roughing stands	Intermediate stands	Finishing stands
Talus			✓	✓
CIC Combi			✓	✓
CIC Integral		!	✓	✓
CIC Cantilever		✓	✓	✓

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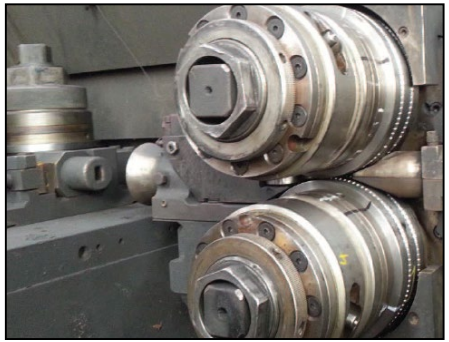
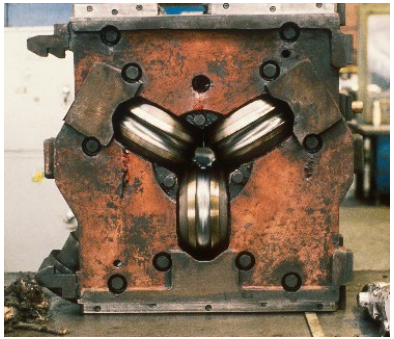
WHERE CAN THEY BE USED?





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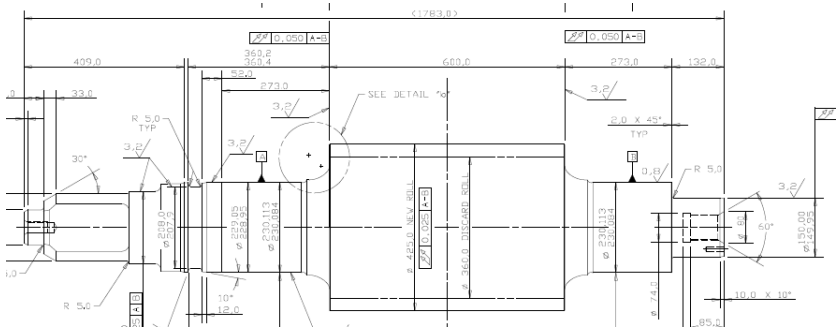
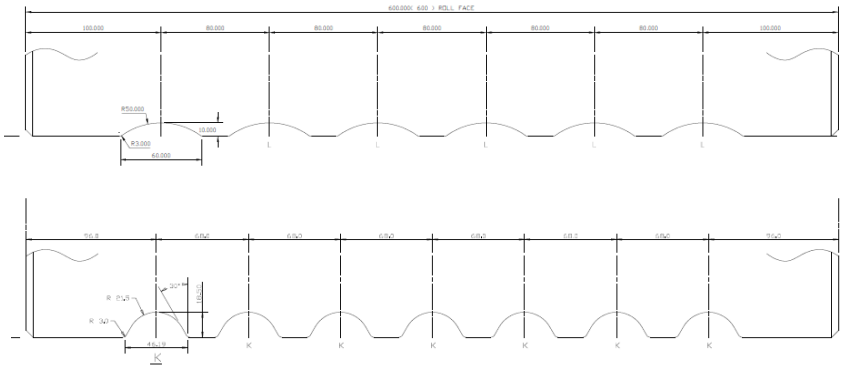
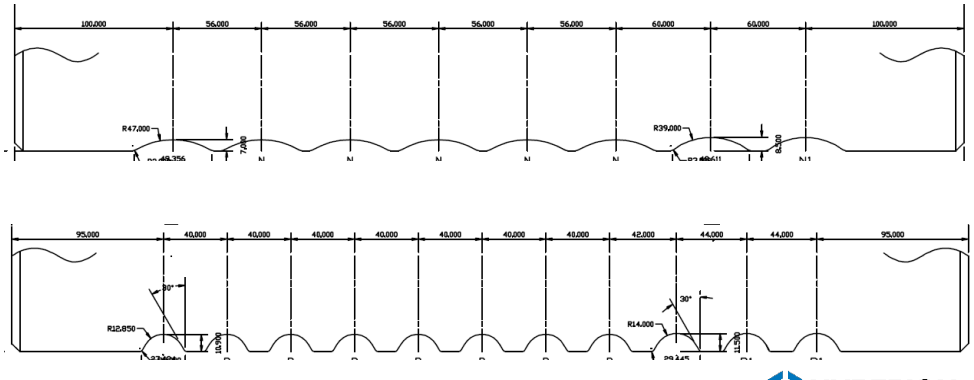
CONVENTIONAL ROLLS



One piece – no assembly
One size fits all
Dimensioned by OEM





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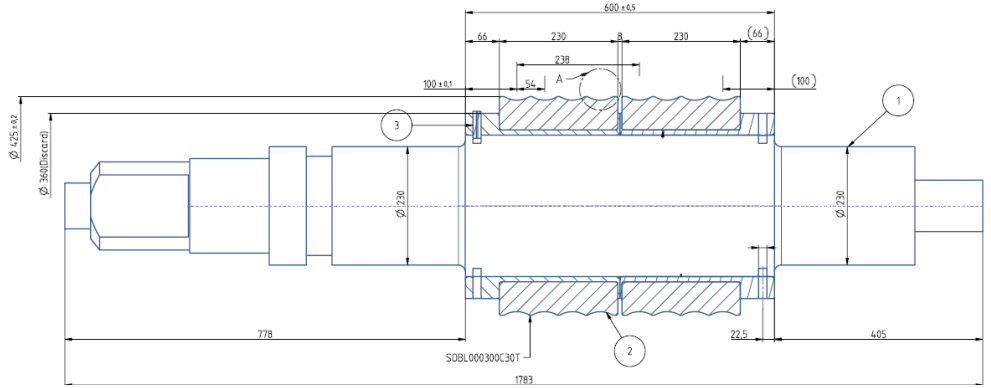
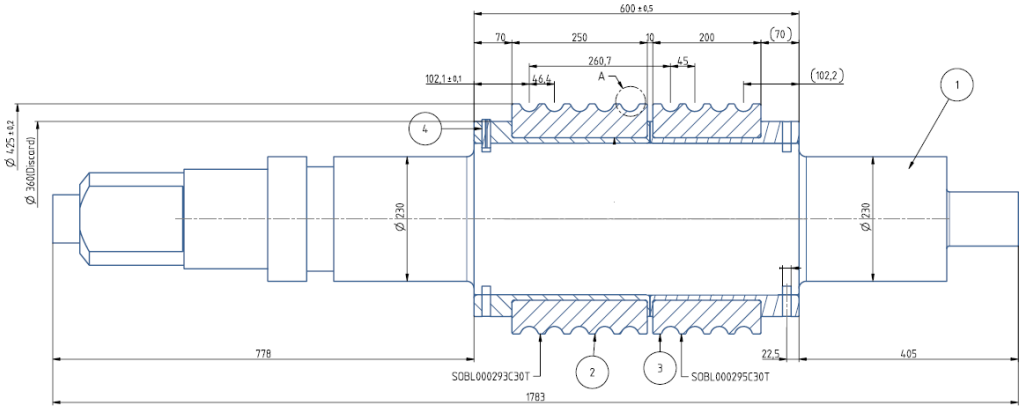
TAILOR-MADE PROJECTS

Different loads on each application

Introduced:

- Geometries – Rings
- Assemblies
- Need to transfer torque between parts
- Different materials
- Different productive constraints





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TAILOR-MADE PROJECTS

More passforms

Lower acquisition cost

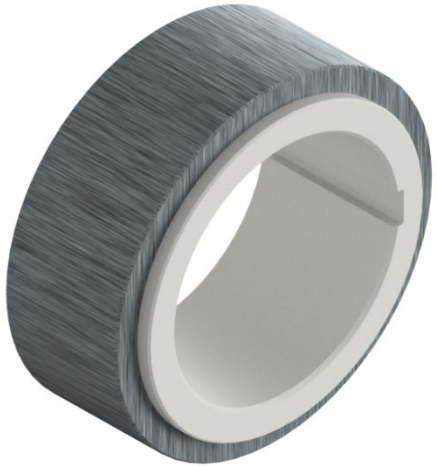
Exchangeable rings

Barrel size

Same design for many stands

Tougher application

CIC RINGS – CAST IN CARBIDE

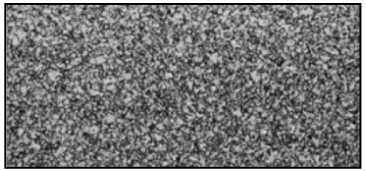


WHY CIC?

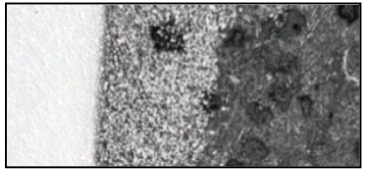
Carbide for wear resistance

Cast iron for torque transmission

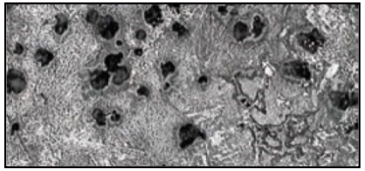
No separation risk



Tungsten carbide

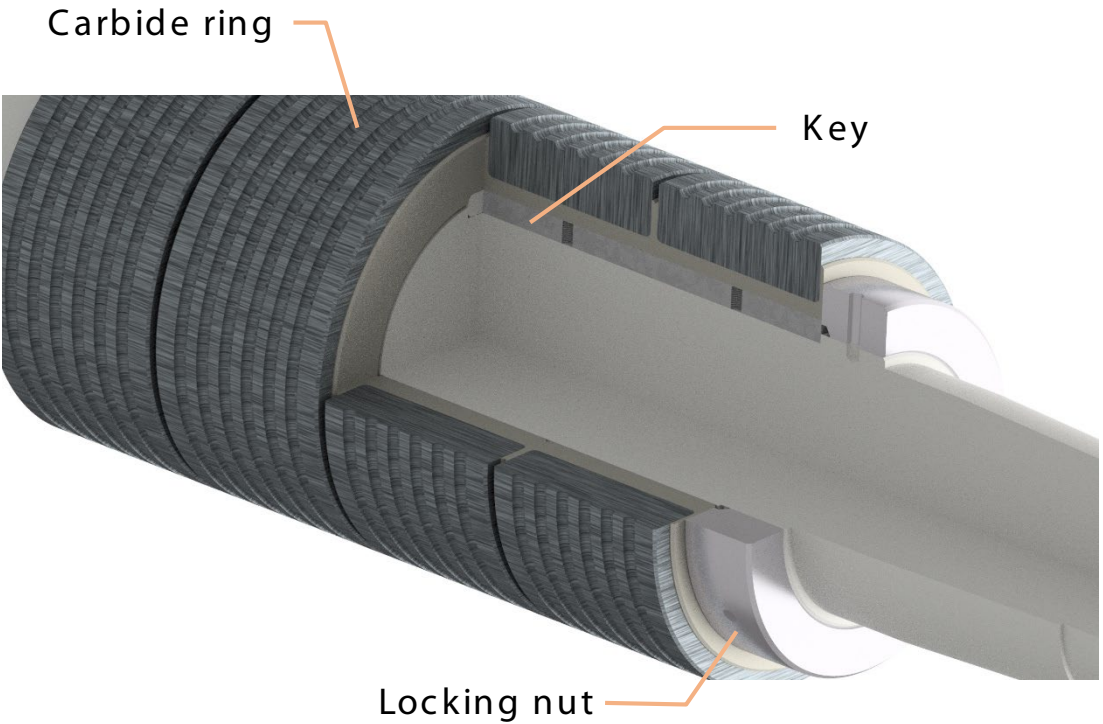


Metallurgical bond



Cast Iron

CIC COMBI



AXIAL KEYWAY

- Mostly used in finishing stands
- Combines keyways and interference for torque transmission
- Allows a higher usage of the working table

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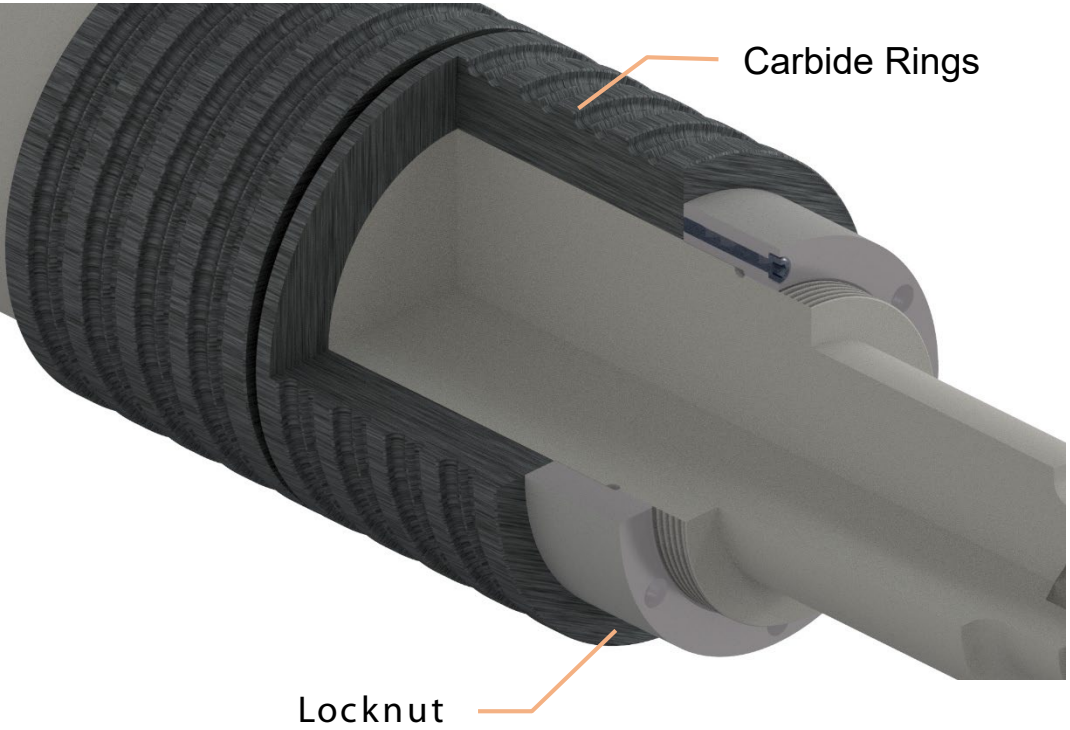
TALUS



HYDRAULIC or MECHANIC

- Doesn't use interference
- Easy to assemble and disassemble
- Loses working table space for the locknuts

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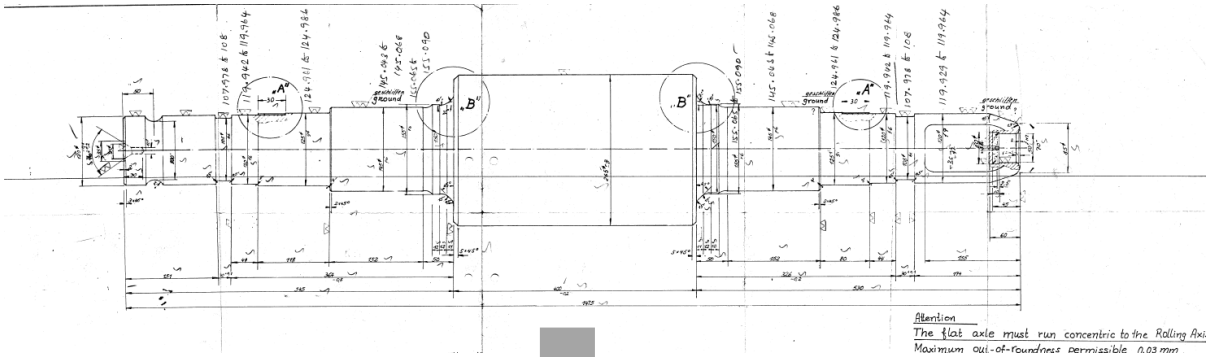
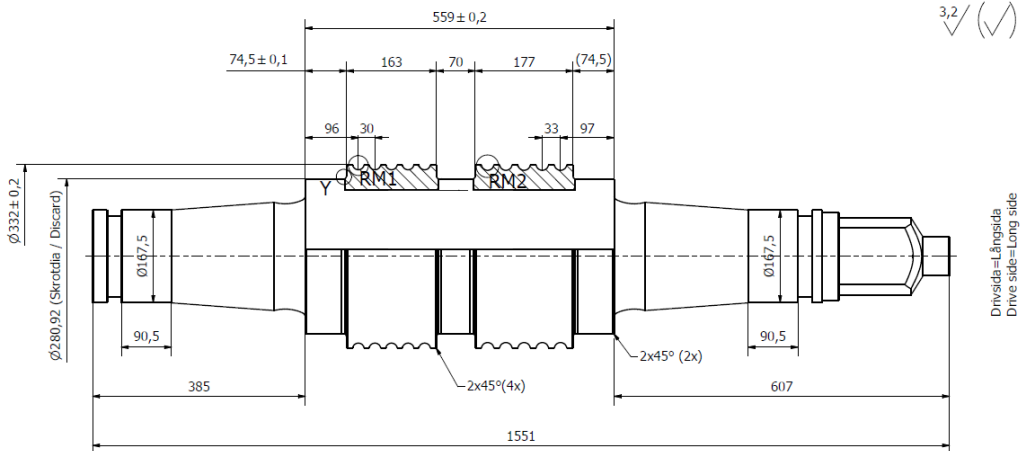
CIC INTEGRAL

CIC INTEGRAL

- Arbor casted inside the carbide rings
- Used in heavier applications
- No external torque transmission system
- As tough as it gets

ROLL DESIGN





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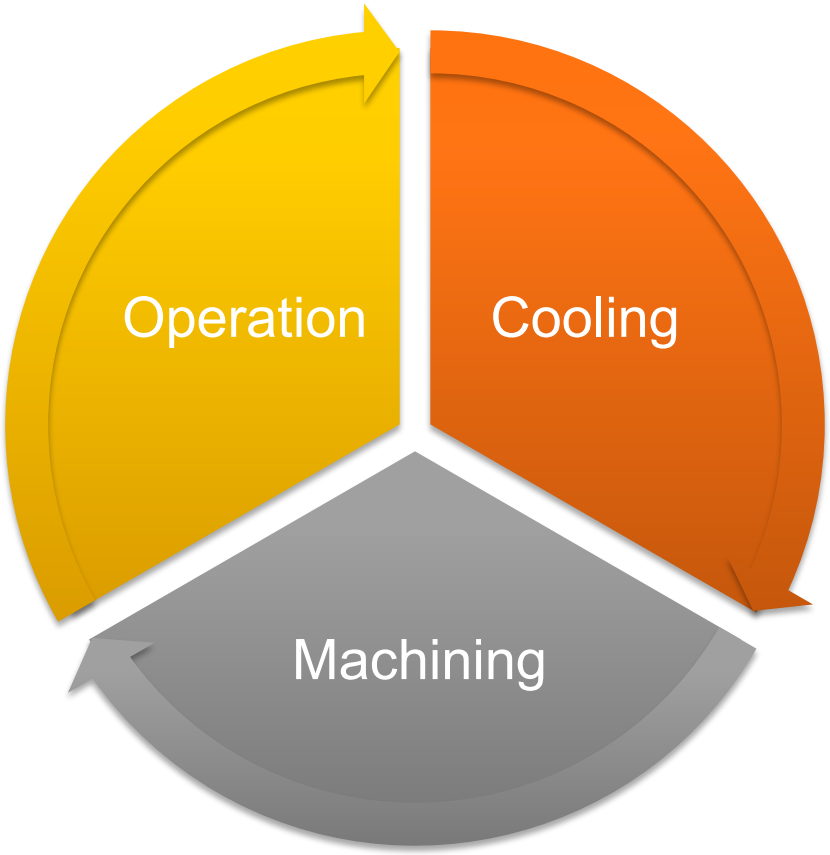
ROLLS DESIGN

Better information = Better project

- Mill layout
- Stand design
- Type of rolled materials
- Bar temperature
- Cooling system conditions
- Rolling speeds
- Forces, loads, torque, reduction
- Current roll / arbor drawing
- Passform drawings

CRITICAL POINTS FOR GOOD PERFORMANCE



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WHY COOLING IS IMPORTANT?

- Cooling must be applied on the rolls with the objective of preventing:
  - **Overheating** causing excessive differential expansion and thus breakages
  - To combat **thermal fatigue** cracks by prolonging the nucleation time and minimizing their propagation

WHY COOLING IS IMPORTANT?

Hot bar 1600 F + Deformation heat generation + Irradiation − Cooling system ~85 F = Carbide roll ~100 F

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Recommended design for water cooling

Intermediate stands and finishing bar mills stands

Water pressure 4 -6 bar.
Min water quantity 250 – 300 l/min per passform .

Whole passform surface must be filled by cooling water.

Flat spray self -aligning spray tips with even spray are recommended

New roll diam.

Discard roll diam.

The water quantity through this nozzle should be about 30% of the total water flow per passform
It is important that the jet from this nozzle hits the roll as soon as possible when the hot stock leaves the roll.

The header should preferably be attached to the exit guide

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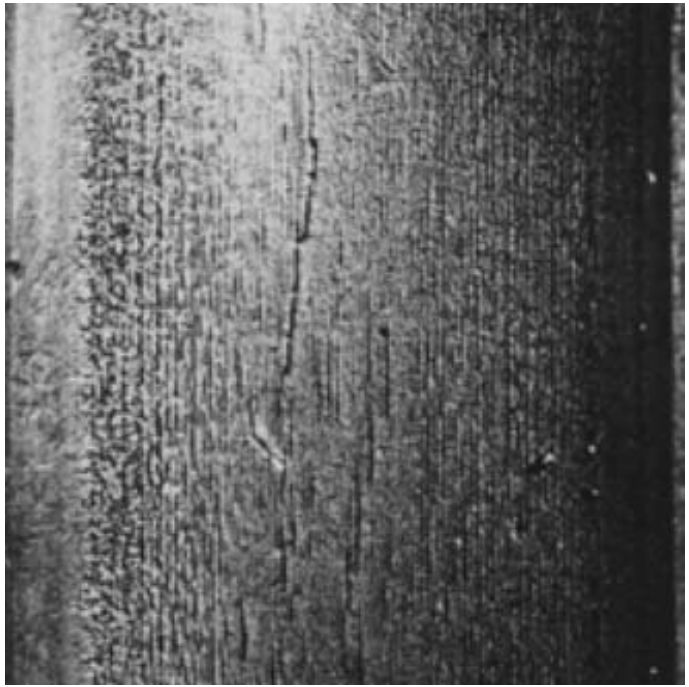
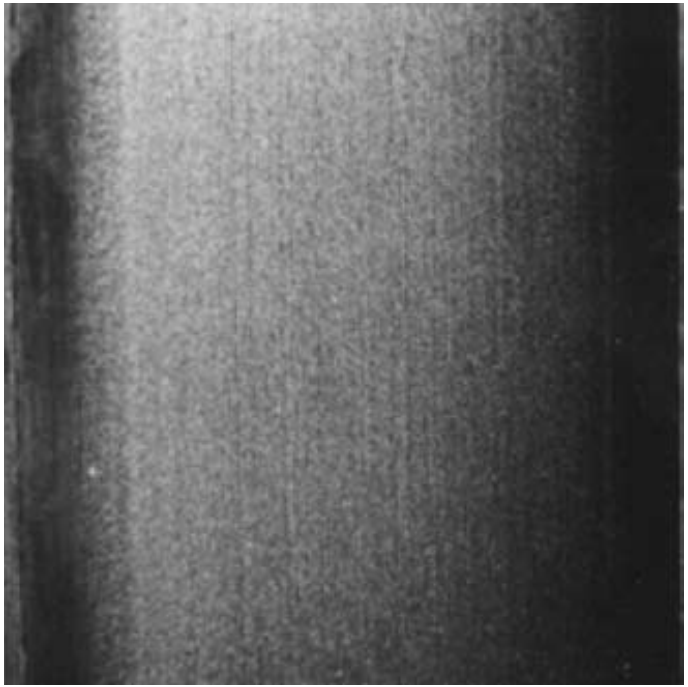
WHY COOLING IS IMPORTANT?



Bad cooling



Good cooling

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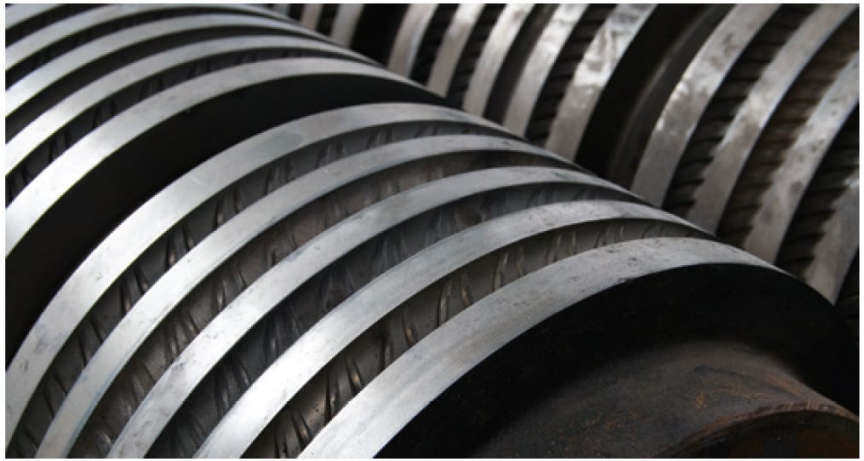
MACHINING RECOMMENDATIONS

Bad machining can be as harmful as bad cooling

Factors that will affect machining quality:

- Lathe/milling cutter/grinder vibration
- Tool holder
- Insert type
- Insert material
- Depth of cut
- Cutting speed
- Feed
- Cooling (when needed)



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OPERATION

Operator training

- Tough but not unbreakable
- Learn how to get the most out of the rolls

Close technical Support

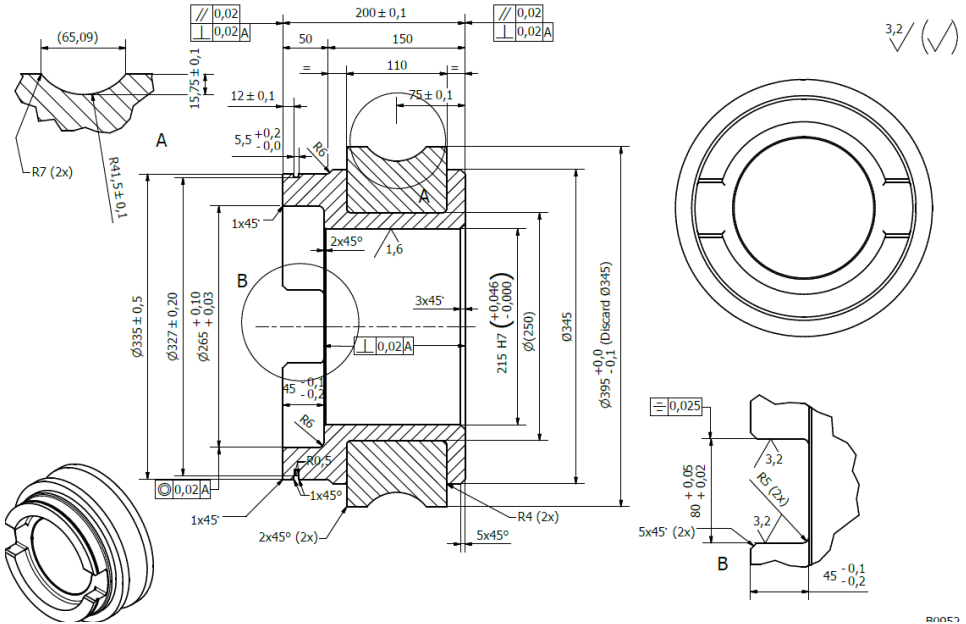
- Performance follow ups

Access to local maintenance

- No need to send overseas
- Ring replacements and assembly

CIC CANTILEVER ST 9 AND 10

- Initial values:
  - Cast iron performance: **12.5 kton**
  - Machining removal: 10mm
- Project estimated performance
  - Performance: (3x) 37.5 kton
  - Material removal: (1/3) 3mm



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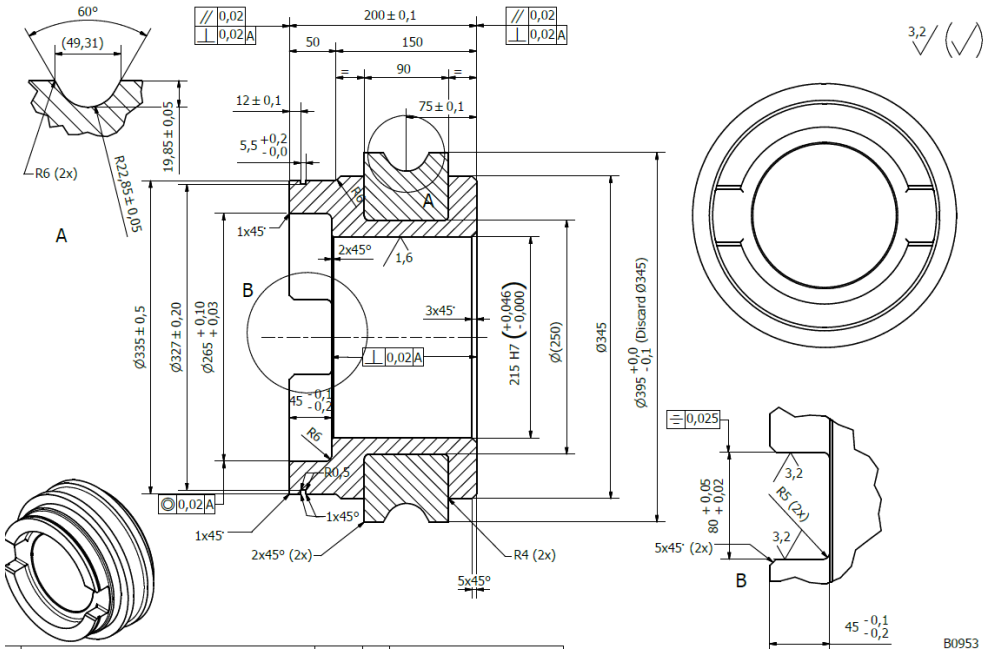

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CIC CANTILEVER ST 9 AND 10

- Initial values:
  - Cast iron performance: **12,500 ton**
  - Machining removal: 10mm

- Project estimated performance
  - Performance: (3x) 37,500 kton
  - Material removal: (1/3) 3mm

Measured results:
Performance: **50,000 ton (4x)**
Material Removal: 4mm

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CIC CANTILEVER ST 9 AND 10

Measured results:
Performance: **50 kton (4x)**
Material Removal: 4mm

- Before: 1h stop per week
- After: 1h stop per month

- 70 ton/h output

- **Over 3k ton extra per year!**

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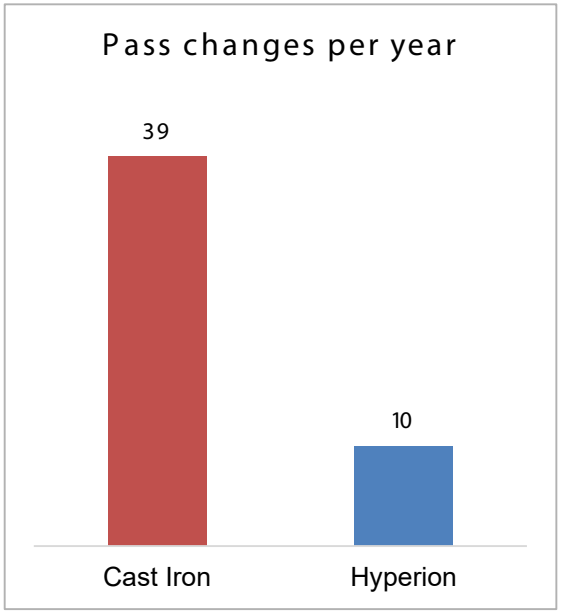
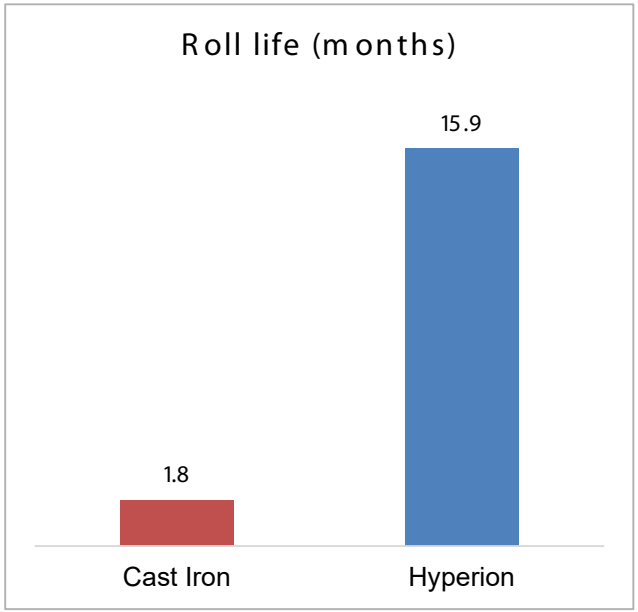
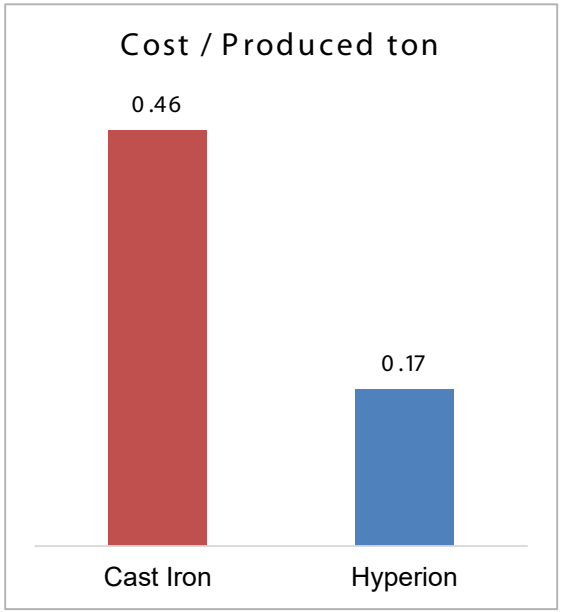
CIC CANTILEVER ST 9 AND 10







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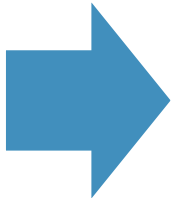
HYPERION MATERIALS & TECHNOLOGIES + MBI ROLLS

We can support your conversion project

Tailored solution

High performing products



Maximize output

Higher profit

Lower total cost of ownership

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Thank you!

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