

LONG ROLLING PLANT MODERNIZATION

ARCELORMITTAL POLAND (SOSNOWIEC)
2 - STRAND WIRE ROD MILL

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1 BASIS OF MODERNIZATION

- Pre-Modernization Mill Attributes
- Project Scope & KPI's

2 NEW MILL CONFIGURATIONS

- Phase 1 – Civil and Installation work
- Phase 2 – eDrive foundations

3 SUMMARY

- Mill Profile
- Partnership Takeaways
- Lessons Learned

Pre-Modernization Mill Attributes

2 Strand Wire Rod Mill



Yearly production	• 750,000
Billet size	• 162 mm x 162 mm x 12 m 2,389 – 2,500 kg
Materials	<ul style="list-style-type: none"> • Mesh, Low Carbon, Welding Grades • High Carbon
Furnace capacity	• 160 T/h
Finished products	• 5.5 – 21.0 mm
Production rate	<ul style="list-style-type: none"> • Breakdown: 200 T/h • Continuous: 60 T/h (per strand)
Max. rolling speed	• 90 m/s
Coil Dimensions	• 1,250 O.D. x 900 I.D.

Data – 2016 - Pre-Modernization

Pre-Modernization Mill Attributes

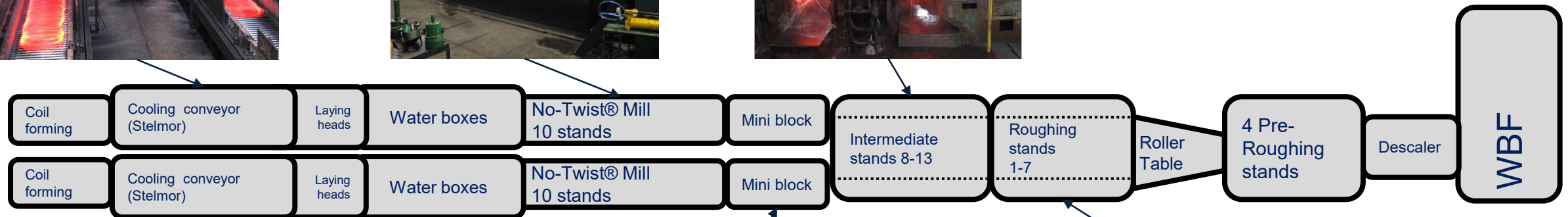
2 Strand Wire Rod Mill

Mill Layout



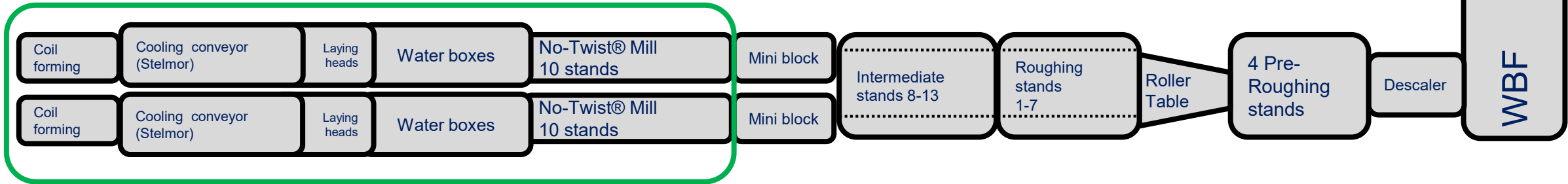
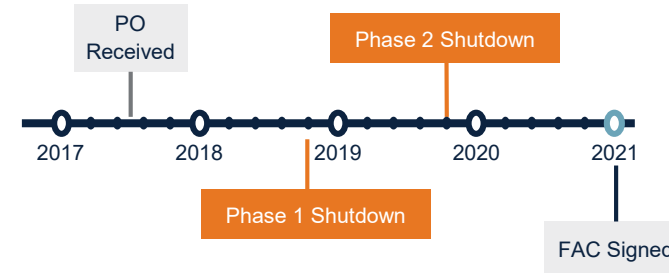
Equipment Suppliers

- 1973 – Morgan / SMS
- 2006 – Revamp Danieli



AMP Modernization Scope & KPI's

Phase 1 – Product Quality Enhancements



Scope – Product Quality

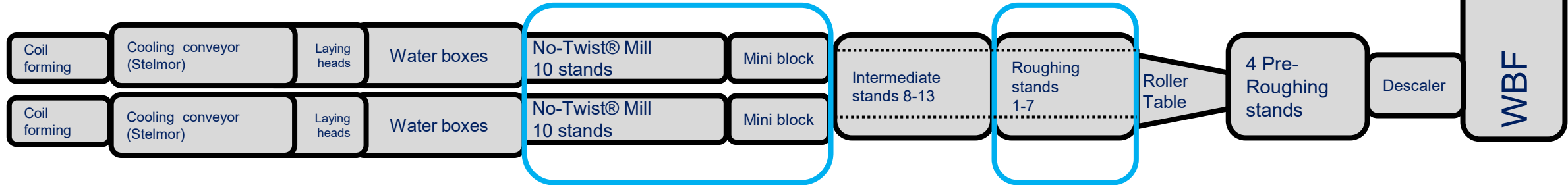
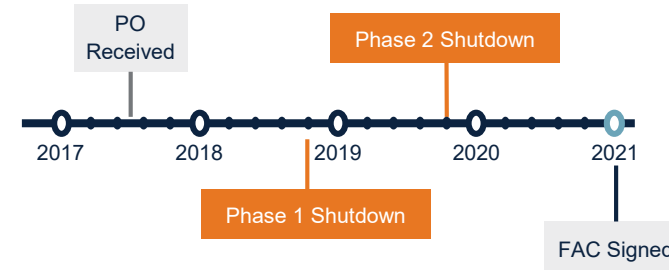
- Guiding equipment for finishing blocks
- 4 new water boxes (traversing type)
- 2 new laying heads (new type)
- 12 new fans for air cooling conveyors
- Air distribution system for 28 fans
- Automation control system for water boxes and fans (water and air cooling)
- 2 new ring distributors for coils forming chambers

KPI's - Product Quality

- Surface quality improvement – max. depth of surface defects = 0,1mm
- Structure improvement – grain size = 7-9
- Improvement of Mechanical Properties – TS = +/- 20MPa for a ring, +/- 25MPa for a coil
- Coil shape improvement

AMP Modernization Scope & KPI's

Phase 1 – Sustainability Enhancements



Scope – Sustainability

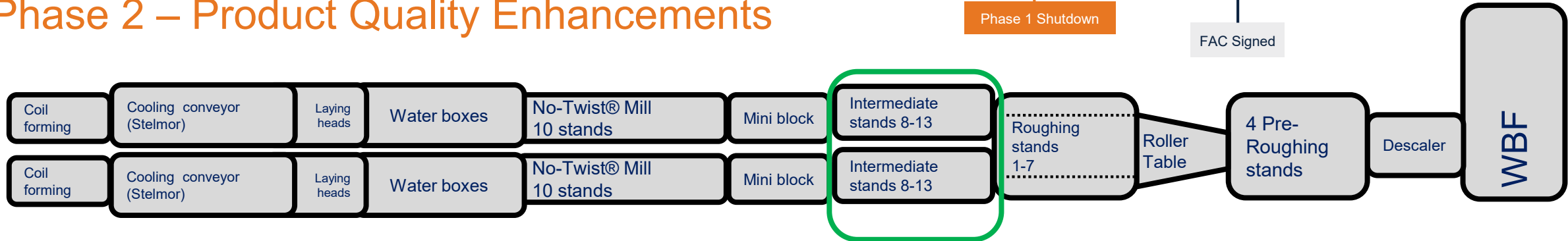
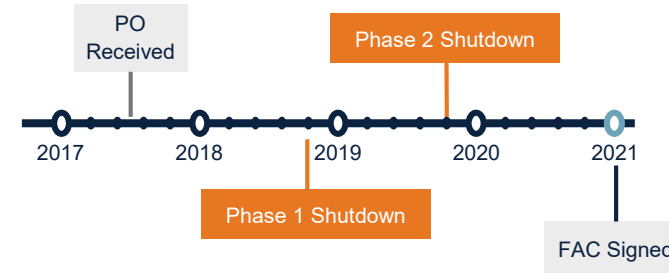
- 7 new AC motors for roughing mill stands with drives, cabling and transformers
- 2 new AC motors for mini blocks with drives, cabling and transformers
- 4 new AC motors for finishing blocks with drives, cabling and transformers
- Automation control system for exchanged equipment (drives of rolling stands and blocks, water boxes and cooling fans)

KPI's - Sustainability

- Mill operational reliability improvement – 96,6%
- Functionality Improvement – Mill setup & control
- Tension control improvement – Cobble reduction

AMP Modernization Scope & KPI's

Phase 2 – Product Quality Enhancements



Scope – Product Quality

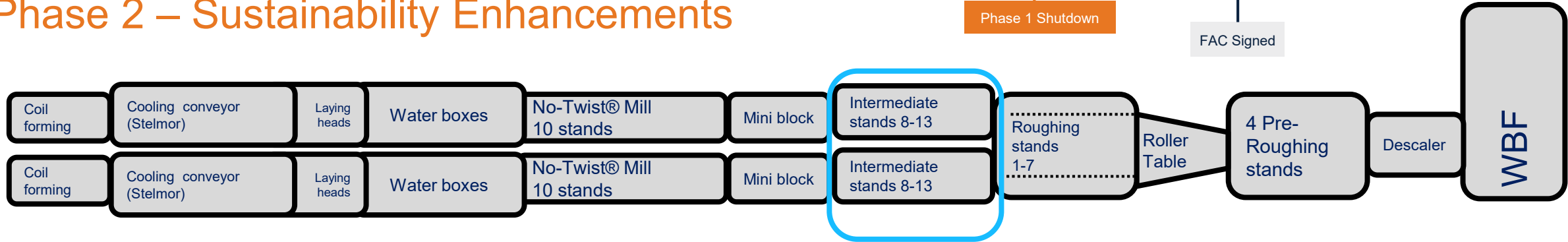
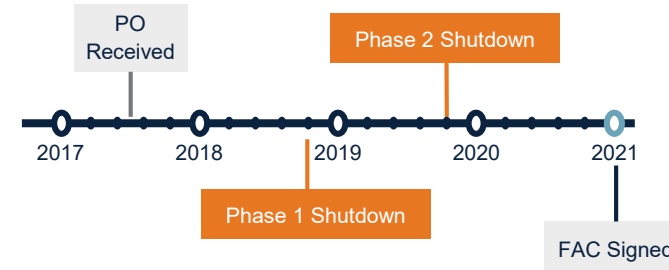
- Guiding equipment for intermediate mill stands
- 4 new independent H-V at the beginning of intermediate mill
- 8 independent eDrive Pre-Finishing mill stands at the end of intermediate mill
- Sideloper tables before intermediate mill stands
- Implementation of new roll pass design

KPI's - Product Quality

- Surface quality improvement – max. depth of surface defects < 0,1mm
- Diameter tolerance improvement:
 - +/-0,15mm for diam. range Ø5,5-10,0mm
 - +/-0,20mm for diam. range Ø10,5-15,5mm
 - +/-0,30mm for diam. range Ø16,0-21,0mm

AMP Modernization Scope & KPI's

Phase 2 – Sustainability Enhancements



Scope – Sustainability

- 12 new rolling stands
- 12 new AC motors for intermediate rolling stands with drives, cabling and transformers
- Automation control system for exchanged equipment (drives of intermediate rolling stands)

KPI's - Sustainability

- Mill Reliability Improvement – 96,6%
- Functionality Improvement – Mill setup & control
- Tension control improvement – Cobble reduction
- Finishing rolling speed increase to 100m/s for Ø5,5mm, production capacity increase up to 800kt/year

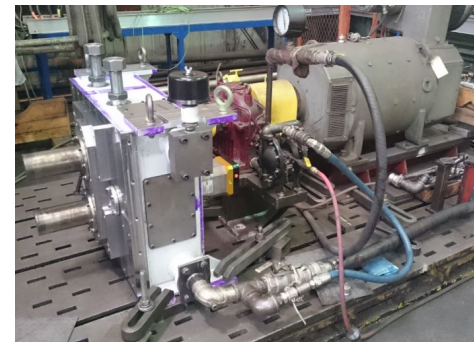
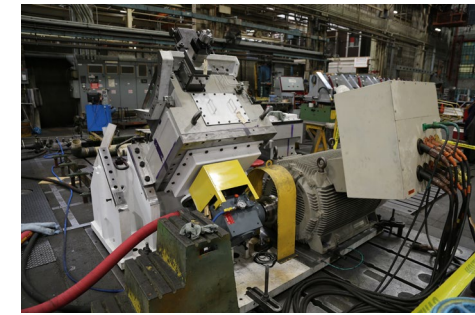
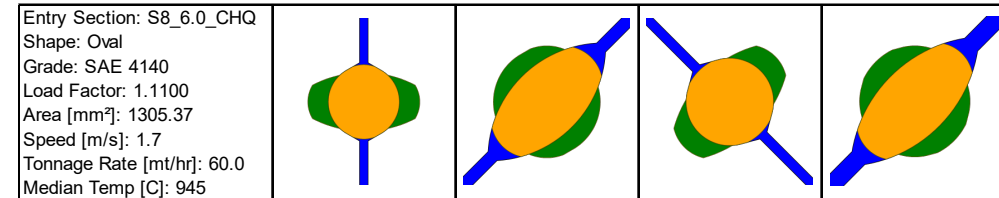
PTUS – Sutton, MA, USA – CoC Long Rolling Core Equipment Engineering & Supply = Alignment with Customer KPI's

Quality

- Process Know How – what to change to improve
- Roll Pass Design – modeling of process

Sustainability

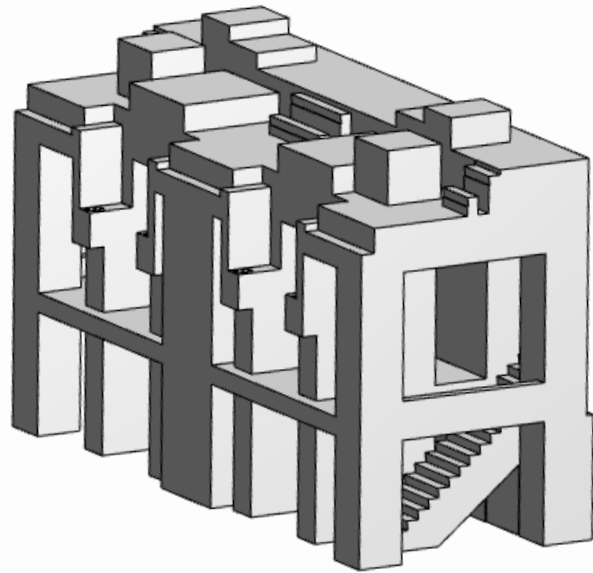
- Initial build quality of core equipment (eDrive PFM, Laying Head and Intelligent Pinch Roll)
 - Engineering design – built in quality
 - Manufacturing – state of the art manufacturing tools
 - Assembly & Testing – ensuring quality product
- Aftermarket Support
 - PT PL providing spare parts support
 - PT UK providing preventative maintenance support and service



Phase 1 – Civil Construction & Installation 5 Week Mill Shutdown

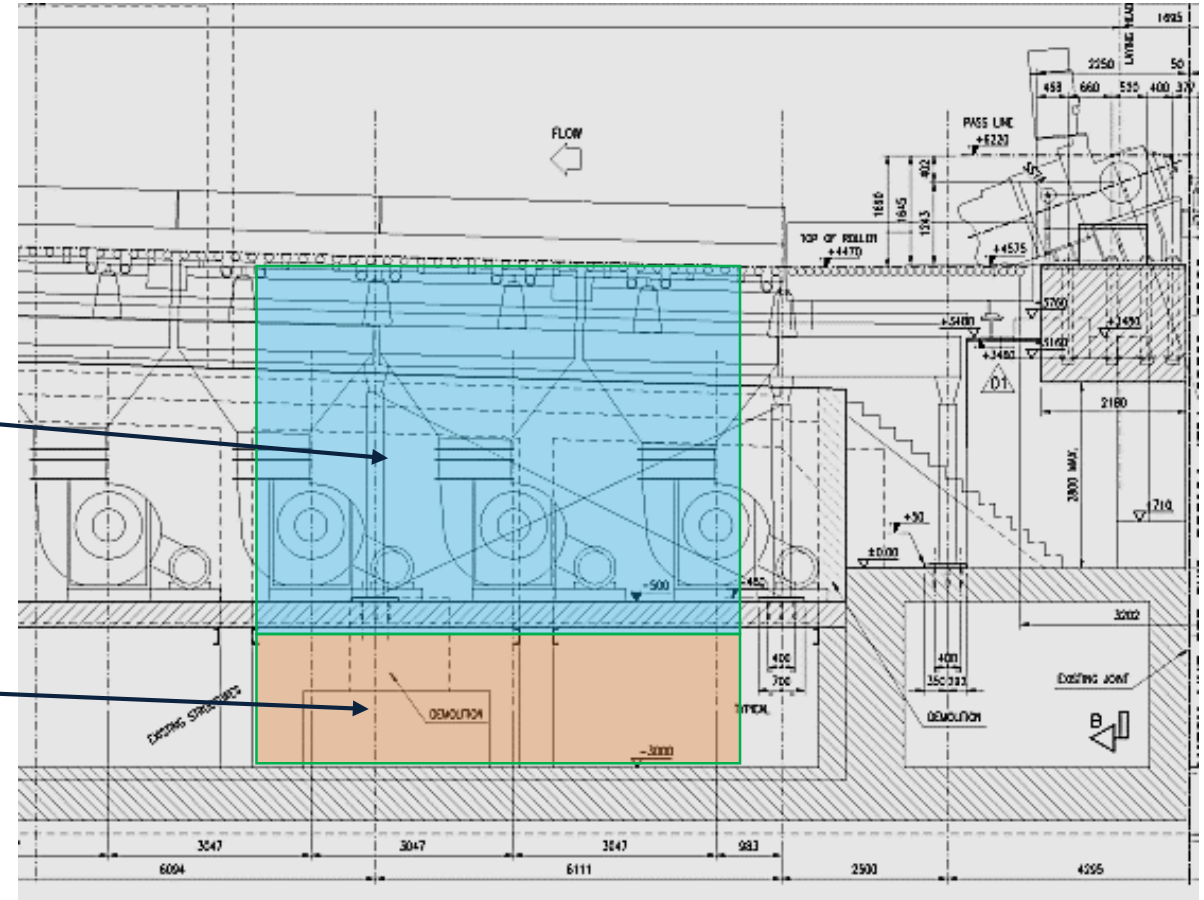
Civil Construction – Highlights

- New Laying Head and waterboxes civil construction. Due to process requirements, the laying head position was moved 12m downstream.



Shutdown
Construction

Pre-Shutdown
Construction



Phase 1 – Civil Construction & Installation 5 Week Mill Shutdown

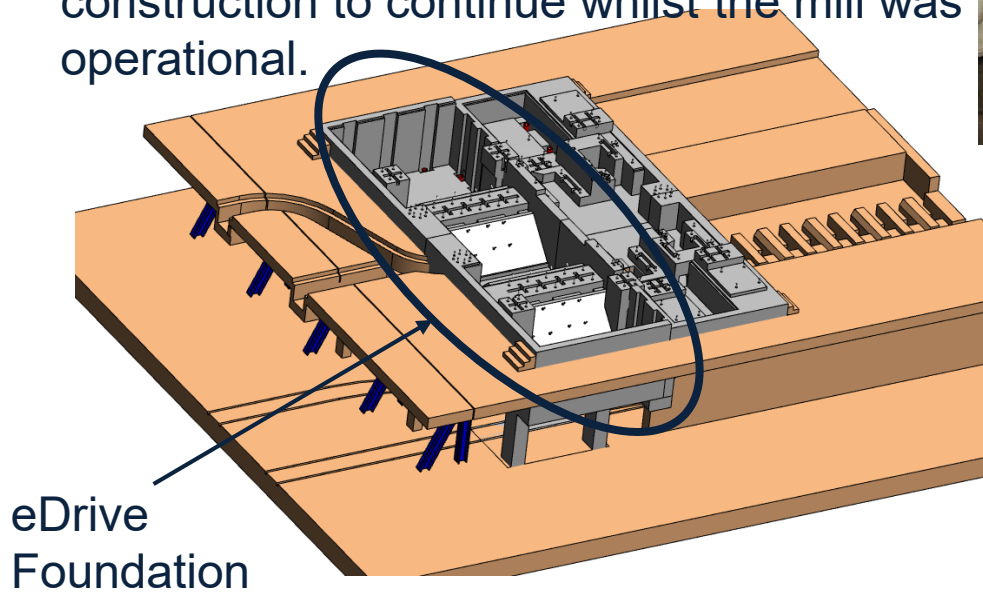
Civil Construction – Highlights



Phase 1 – Civil Construction & Installation 5 Week Mill Shutdown

Civil Construction – Highlights

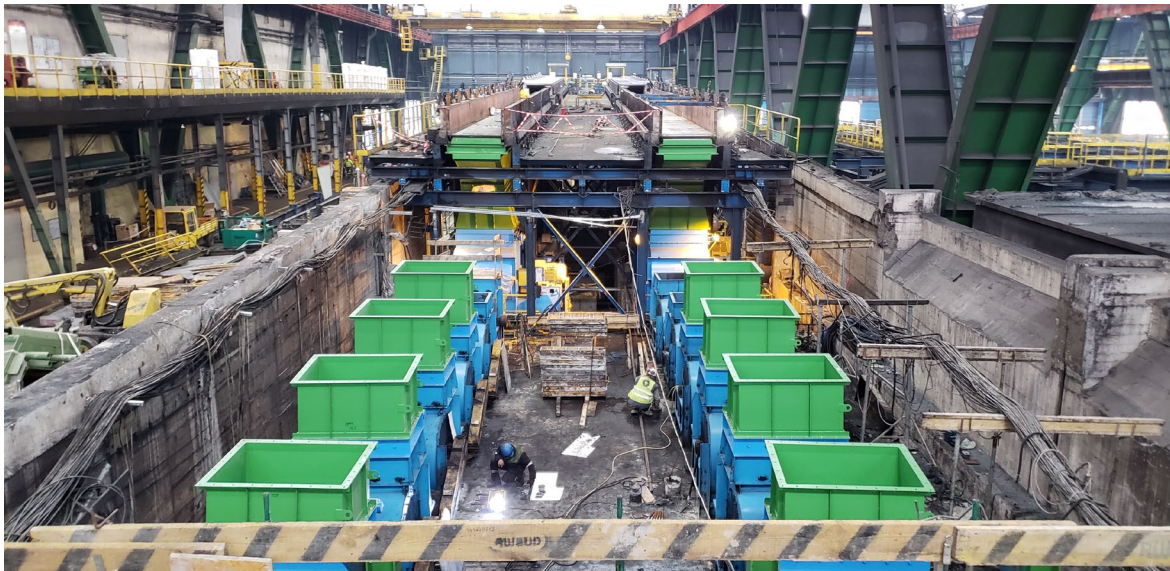
- The foundation for the new intermediate eDrive stands to be installed in Phase 2 required to be started in Phase 1 and a temporary floor was erected to allow construction to continue whilst the mill was operational.



Phase 1 – Civil Construction & Installation 5 Week Mill Shutdown

Installation – Highlights

- Stelmor fans in place with connectors
- Foundation preparation for new steel structure
- Roller deck nozzles and optimesh installation done offsite



- Traversing waterboxes



- Laying Head



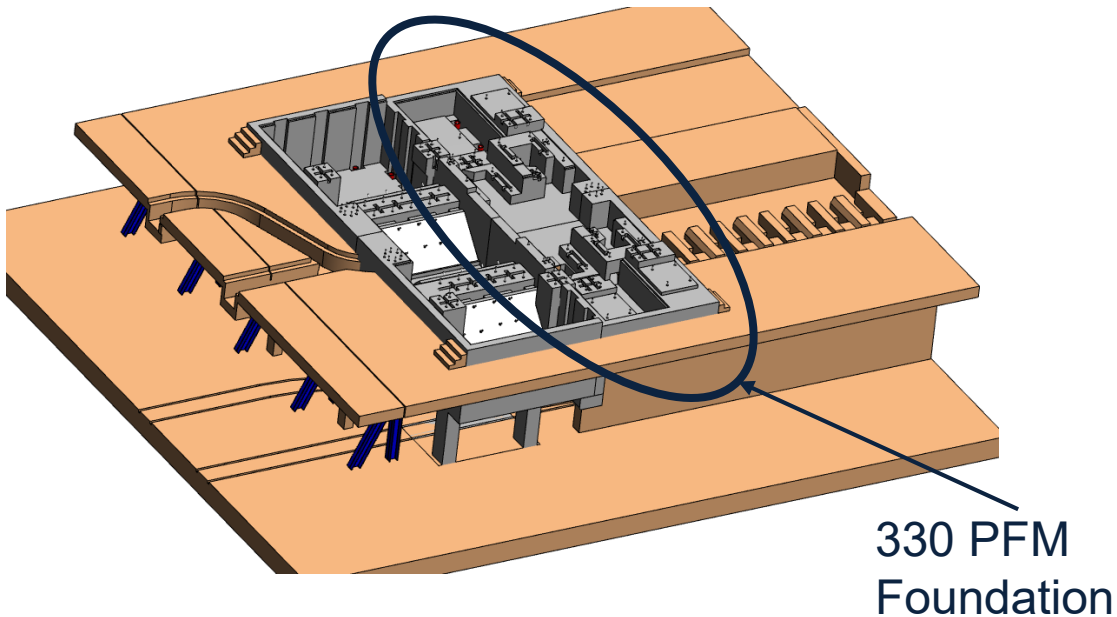
- Hot Commissioning – 12 days Past Schedule



Phase 2 – Civil Construction & Installation 4 Week Mill Shutdown

Civil Construction – Highlights

- Since most of the foundation for the eDrives had been completed before phase 2 shutdown, the next critical area would be for the 330 PFM stands



Phase 2 – Civil Construction & Installation 4 Week Mill Shutdown

Installation – Highlights

- 250 eDrive PFM



- 330 PFM drive unit



- 10 Std K-Mill



- Hot Commissioning – 6 hrs Past Schedule



Mill Profile

Yearly production [t/y]	800,000 – (Future 950,000)
Starting size [mm]	Billet 160 x 160 x 12 m
Materials	Quality steel – Carbon Steel – Low, Med & High Low Alloy Steel – Free Cutting Steel – Spring Steel –
Furnace capacity [t/h]	160
Finished products [mm]	Wire Rod : 5.5 ÷ 21
Max rolling speed [m/s]	100 – (Future115)
Startup	Modernization November, 2019

FAC – KPI's

- FAC tests – PASSED
- Quality and Sustainability KPI's – ACHIEVED + EXCEEDED



Partnership Takeaways

— What Went Wrong

- Delayed preparation of interconnecting piping documentation which may cause a delay in start of shutdown.
- **Phase 1 inadequate preparation causing delay.**
- Delayed deliveries of equipment from Turkey (Stelmor and air blowers modifications) results in delays of modification works.
- Only one team of surveyors (common for civils and mechanical installation) results in delays in equipment alignment.
- **Extended duration of modernization stoppage by 12 days as a result of lack of Contractor manning during night shifts and weekends.**
- Limitation in production realization in 2020 & 2021 due to covid issues related to lack of staffing in specific months
- Problems with availability of charge material and lack of orders in 2022 impacted annual production realization

+ What Went Well

- Detailed engineering documentation released in April 2018.
- Meeting with Primetals held on 7-10 May for clarification of basic engineering and civil works.
- **Monthly maintenance stoppages of mill used to carry out preparation works for modernization stoppage.**
- Positive opinion of AMDEC regarding PT workshops in India and China after visits.
- Completing of civil works on time despite the significantly extended scope of cut-outs of existing foundations. Very good performance of KBS Diamant company.
- **Completing of electrical works on time despite the extended scope of cable traces relocation. Very good performance of Elektrokotel company.**
- Civil works for all areas finished according to the schedule.
- Phase 2 done according to the schedule.
- Two teams of surveyors were present and working together: 1st team for mechanical part, 2nd team for civil works part. Availability of surveyors 24 / h
- Interconnecting Piping designer from Primetals attend during erection.
- **Achieved 800kt run rate of yearly production in Oct 2021, Feb & March 2023**

Lessons Learned – Applied to Phase 2

AM Poland

- **Involvement of external design company for documentation verification**
- Required verification of new drawings with the actual state of the infrastructure of the modernized areas.
- **Establishing of deadline for interconnecting piping documentation release, at least 3 months before the start of shutdown.**
- Required agreement with contractor on required methods of new equipment installation, lubrication systems and water systems flushing, testing of new devices at the stage of works schedule preparation.
- **Simulation workshop for installation and commissioning.**
- Weekly monitoring of the production and delivery status of major equipment and components.
- **Providing sufficient number of surveyors available 24 hours a day, 7 days a week during execution of installation works.**
- Confirmation with contractor at least 3 months before start of shutdown, available Staff to execute individual installation tasks.
- Required daily monitoring of available Staff on each working shift with all subcontractors. Introducing of support companies by main contractor in case of problems with staffing.

PT US

- Customer relationship to be maintained with more frequent face to face meetings.
- Meetings at site every 6 weeks up leading up to shutdown.
- **Establish PM/Management presence through “On Site Activities”.**
- Detailed review of Shutdown schedule including customer civil scope.
- Equipment to be pre aligned/assembled as much as possible before shipping or on site before shutdown.
- **Close coordination and planning with PT contractors prior to shutdown to do as much fluids/piping installation and commissioning before shutdown.**
- Safety system needs to be carefully reviewed and plan in place for commissioning of equipment before safety system is installed and then commissioning of safety system.
- Train customer operation and maintenance staff on new equipment, operational layout and process well before start-up.
- **Survey Monuments must be established before shutdown.**
- Clear Definition of Civil Complete.
- **Simulation workshop for installation and commissioning.**

THANK YOU