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ENGINEERING STUDIES PROJECT REFERENCE LIST

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FEASIBILITY STUDIES:

- Revamp mill for a larger 5" x 7" billet with new Cooling Bed & 2 new stands
- Feasibility Study to evaluate how existing mill capability can be improved in phases. Included evaluation of rolling cycle as well as equipment changes and process changes.
- Feasibility Mill study to investigate process, equipment and capital costs for increasing product range.
- Large Rounds Feasibility Study with Capital Budget
- Feasibility study including process simulation, capital budget, Electrical, Mechanical, Civil and Utilities installation engineering for a phased expansion to increase billet size to 6".
- Process Impact Study for New Reheat Furnace and Stacking Equipment
- Engineering, Process design and equipment designs for upgrading rail mill to roll 7" billets.
- Evaluation, process recommendations, scheduling, equipment and operations of complete rail, bloom & billet rolling facility with regard to short and long term corporate planning.
- Engineering study, computer simulation, evaluation of mechanical, electrical and utilities equipment including capital budgets to upgrade Rebar mill.
- Mini mill comparison study to allow for simulating the effects of fixed and variable costs on the steel mill Rolling and Melting conversion costs.
- Technical assistance and equipment evaluation for proposal sale of Used Rail Mill.
- Complete feasibility study for new Structural Mill and Finishing End including pass design, mill layout, mechanical and electrical specifications.
- Engineering study to develop plan for Process and equipment upgrades for improved mill productivity and product quality.
- Operations Assessment and development of 5 year Phased Upgrade Plan for Bar Mill
- Engineering Operation Assessment and Capacity Study for large section mill
- Feasibility study including detailed capital budget estimates, equipment specifications & project schedule for multiple phase Structural Mill expansion.
- Capital budget study, equipment specifications, project budget and schedule for a major upgrade of Structural Mill including doubling Reheat Furnace width and increasing capacity, new Dividing Shear and modified hot transfer.
- Study to determine the technical and capital budget requirements, as well as a phased plan and schedule to implement upgrades to Rolling Mill equipment from the Reheat Furnace through to Product Finishing.

- Feasibility & capital budget study for upgrade of Structural Mill including simulation and evaluation of process requirements, selection of new drive requirements, design of new mill stands, roller tables, bar turners, cooling beds, cold shear and stacker.
- Engineering analysis of process and equipment for developing short term improvements to production capacity.
- Development of 5-year plan outlining required technical modifications and capital costs with quantified improvements for a special sections mill.
- Investigation of new mill facility including mill layouts, process selection, equipment definitions and capital budget to roll a range of new special section.
- Rolling Mill Upgrade Budget Study
- Process and mechanical evaluation of planned upgrades to Rod Mill including converting the mill from three to two strands, increasing billet size and increasing finishing speed.
- Process and mechanical consulting for State County Steel retention study. Project involved visiting steel plants and evaluating the potential to compete in the current market.
- Feasibility study to evaluate rolling of oval sucker rod from single size feedstock.
- Engineering study, equipment, process, capital budget and schedule for a phased upgrade plan for a Billet Mill to roll 200,000 tons/year of rounds and squares from 50 mm to 120 mm.
- Engineering study, computer simulation, capital budget and phased implementation schedule for Rod and Bar Mill with a view to increasing production, increasing utilization, improving yield and improving product quality.
- Detailed engineering, equipment modifications, detailed pass design, equipment specifications, installation engineering and project management for increasing billet size in Rod and Bar Mill.
- Engineering study and capital budget for installing a used no-twist Rod Block, increasing coil weight and adding a new finishing end to an existing Rod Mill.
- Engineering implementation of adding a no-twist Rod Block and Coil Finishing end to existing Rod Mill. Used equipment was sourced to reduce capital costs.
- Engineering study of 18" Structural Mill using computer simulations and capital budgets to quantify the benefits of the various recommendations with a view to increasing efficiency, throughput, expanding product range and optimising yield.
- Engineering study, capital budget, installation engineering, project management and site supervision of adding a Breakdown Stand and new Finishing Facility to a structural mill.

- Engineering process & feasibility study and technical evaluation of Bar Mill for upgrade of rebar operation to 600,000 tons per year.
- Conduct an economic, market, environmental impact and process study to evaluate the feasibility of upgrading an existing mill to roll universal beams, sections and rails.
- Feasibility Study for new Medium Section Mill including mill layout, basic pass designs and definition of mill equipment.
- Engineering study including design modifications of some Mill and Melt Shop equipment.
- Mill Constraints Study for increasing production to 770,000 tons per year
- Engineering study including process simulation, pass design evaluation, new and upgraded equipment designs to develop a long term plan for upgrading a Specialty and Stainless mill facility and improve new product lines.
- Engineering study of Specialty Bar Plant with a view to increasing product quality and mill utilization.
- Mill Upgrade, process simulation & capital budget Study for large rounds mill to roll larger blooms
- Feasibility study and process evaluation of two used universal beam rolling mills for reapplication for different product mix.
- Feasibility and engineering Services for a Phased Rebar Mill Upgrade Study
- Evaluation of new rail mill facility to determine how new plant capability compared to the original "Business Plan" objectives.
- Study to conceptualise a Bar Mill to meet management objectives
- Specialized rolling process Feasibility Study and Audit of prototype rolling mill facility for patented stainless clad rebar process. Feasibility study, Site Preparation and Basic Engineering for new commercial production plant.
- Feasibility process study to evaluate the ability to roll larger billets. Process evaluation and cost estimate for implementing a number of cost improvement projects in the small Bar Mill.
- Feasibility study to evaluate rolling from larger billet sizes on continuous special metals rounds rolling mill.
- Feasibility and process improvements study and upgrades for special metals Hand Rolling Mill.
- Mill Evaluation Study & Operation Assessment of rail slitting mill. Preliminary Installation Engineering for moving rolling mill to be in-line with cooling bed, incorporating relocated and new equipment.
- Feasibility and product capability study to establish what additional products standard and special sections products could be rolled on a Medium Section Mill

- Engineering study and installation engineering of no-twist Rod Block and associated equipment. Process engineering including pass design, power requirements and throughputs; equipment specifications of all new and modified equipment; equipment layouts of mill equipment, rod cooling line and coil handling/compacting; Field verification in Russia of information and equipment location.
- Engineering services for design and installation engineering for the rod mill outlet at the 250 mm Bar Mill in Russia. The engineering scope extended from the first new roughing stand to the coil removal capstans

REHEATING:

- Engineering study for installation of new reheat furnace & mods to caster discharge.
- Process Evaluation of modifications to Pusher for Reheat Furnace.
- Evaluation of furnace charge and discharge requirements including project budget and schedule.
- Evaluation of process routing between Caster and Reheat Furnace including method of transportation and bloom cooling.
- Billet Building Crane Runway Analysis
- Engineering services to conduct a mill study to analyze bottleneck rates and annual production capability to justify increased furnace capacity.
- Reheat Furnace location and heating process definition study.
- Engineering Study for Upgrade to Descaler System.
- Investigation of Reheat Furnace Skid System, Furnace Pusher and Peel Bar to accommodate larger billets
- Engineering investigation of potential Reheating Furnace configurations for stainless steel billets.
- Basic Engineering for Reheat Furnace & Caster Upgrade

ROLLING:

- Engineering study of the slitting process for #3, #4 and #5 rebar comprising analysis of problems, flow charts, Rolling Mill Simulation and recommendations.
- Engineering evaluation of new roughing mill stands for capability to roll 6" billets.
- Process Evaluation & recommendations for revamping an existing Crop & Cobble Shear.
- Process Evaluation, pass flowcharts and mill simulation for developing Specifications for new gearboxes for Mill.
- Process Evaluation to develop specifications for new shears and sample taking system.

- Engineering evaluation study with recommended changes to operation & equipment to roll 'half tolerance' rails.
- Analysis of Roll Failures at Second Rougher in Rail Mill
- Study to investigate upgrades to Rail Mill to roll to tighter tolerances.
- Evaluation of the impact of rolling large high carbon rounds on the existing mill equipment.
- Design evaluation of Horizontal Edger Mill Stand for wide flange beams.
- Evaluate air/oil lubrication system for Large Section Mill.
- Study of motor cooling concepts for main drive mill motors.
- Engineering for Redesign of Vertical Chocks in Large Section Mill
- Engineering for retrofitting Air/Oil Lubrication System for existing mill Stands, pinch rolls, guides & inter-stand conveyors
- Engineering Study & Design of Off-Line Setup System for Bar Mill
- Wide Window Stand Retrofit Engineering Feasibility Study to utilize existing rolls & chocks.
- Engineering design & details for upgrading Axial Adjustment for medium section mill
- Engineering Study for Modifications to Horizontal & Vertical Roll Gap Adjustment Systems on medium section mill to allow "Force" Rolling Concept
- Detailed Design of Hydraulic Latches for Universal Carrier and Bottom Roll on existing medium section mill Stands
- Concept Design, Budget and detailed design to Upgraded Inter stand Troughs, Tables and Sideguides for large section mill.
- Preliminary design of new vertical mill stand for use in a Bar Mill.
- Process evaluation using computer simulation to determine capability of Bar Mill to roll special light beam sections.
- Engineering Feasibility for locating laser gauge on rotating housing for inline mill including conceptual layout drawings.
- Energy audit for Pumphouse to establish methods for reducing electrical consumption.
- Study to investigate the feasibility of implementing a larger common billet size, which could be used on both Rod and Bar Mills.
- Assessment of rolling mill operations at specialty steel bar mill.
- Feasibility Design for Installing Hydraulic Roll Balance to Operate with Existing Fabric Bearing Chocks and New Roller Bearing Chocks on blooming mill
- On-Site Operations Assessment Regarding Roll Breakage for blooming mill
- On-Site Operations Assessment for Rod & Bar Mill
- Process engineering evaluation of "Knuckles" defect on Hand Mill

- Engineering study design of 12" Mill Pinion
- On-Site Operations Assessment of Rail Slitting Mill
- Design of roller detwister guide for rail.
- Conceptual design of wide window Mill Stand for quick change of rolls and guides.
- Universal Roll Mounting Study
- Engineering Feasibility Study for rolling Track Shoe
- Process analysis study of 12" mill bearing failures
- Process & FEA analysis of roll breakage in reversing roughing stand.
- Engineering upgrades for increased capacity of crop shear.
- Detailed capital budget and basic design of Twin Crop and Divide Shears for two strand Rod and Bar Mill.
- Engineering evaluation of replacement pinion stand options.
- Engineering for new entry drop trough and exit chute, including sample system of divide shear.
- Engineering for upgrades to divide shear to convert from clutch/brake design to direct drive.
- Engineering study of Rolling Mill to analyse capability to roll new larger products.
- Engineering for upgrading intermediate mill stands for new roll neck bearings.
- Development of Specifications for new mechanical drive system for intermediate stands
- Engineering for new larger sized stand 1 to locate on existing mill bedplate.
- Feasibility study, Engineering, Design & Supply of upgrades to pinch roll system.
- Pass Design Study to improve product quality and reduce corner defects in Roughers
- Engineering analysis of mill equipment capability including roll separating forces, rolling powers, stress calculations and gearbox analysis.
- Process Investigation & modifications required for Shear to cut larger product range
- Engineering investigation of upgrading bar mill stands.
- Engineering study and detailed design of Mill Stand Spindle Supports
- Process analysis study of finishing stand gearbox gear failures.
- Investigate the installation of wide window stands
- Engineering evaluation of Mill Stand designs to roll half tolerance bar.
- Engineering Analysis of Stand Drive Train to eliminate overload failures
- Mill Productivity Analysis
- Engineering Failure Analysis of Finishing Mill Roller Bearings

- On-site assistance with engineering, maintenance and operations for Wide Flange Universal Beam Mill.
- Process capability investigation to roll Sheet Pile Sections on WF Beam Mill and Medium section beam mill.
- Investigation of bite angle, drive power and throughput capability of 18" Mill to roll blooms with different aspect ratio.
- Feasibility study, capital budget and schedule for replacing 3 Hi Rougher with Reversing 2 Hi Stand.
- Development of 'discrete event' process simulation model to evaluate products to achieve optimum rolling conditions.
- Feasibility Study of removing large inertia flywheel from cross country Mill. On-site dynamic data collection was included.
- Study to investigate separation of common drive arrangement on Finishing Stands.
- Engineering Study and detailed design to Determine if larger 24" Maximum Diameter Rolls could be retrofitted to the Existing 18" vertical and horizontal mill stands
- Rod Mill installation general consulting.
- Mill evaluation to implement increased range of wider flats and feasibility of beam rolling.
- Process study to determine rolling mill hot shear capability
- Equipment design, equipment supply, installation engineering, project management, construction supervision, training & commissioning services for the Quad supplied roughing and finishing 'wide window' quick-change mill stands for a special sections & beam mill.
- Redesign of spindle support system for bar mill
- Analysis of failures on rolling mill gearbox
- Evaluation of Universal Mill to establish reasons for failure of vertical rolls. Included recommendations for short-term solutions as well as long term design changes to solve problem.
- Continuous Rolling Mill upgrades preliminary engineering.
- Evaluation of beam rolling mill for improvements to mill setup and control system as well as hydraulic AGC system.
- Investigation of Rolling Mill for addition of new finishing stands and modifications to upgrade the mill. Included selection and specification of new and used equipment for mill drives.
- Detailed design of stand side shifting bedplate system with spindle supports for use with existing mill stands

- Detailed design of high-speed hot rail transfer system to transfer hot billet from furnace to new mill pass line location

COOLING:

- Cooling Bed Upgraded Study to increasing cooling rates.
- Study to investigate new Cooling Bed to accommodate higher product speeds off mill, and future installation of new Finishing End.
- Investigation of Air Flow & Product Temperature Across Cooling Bed
- Engineering process, thermal finite element and CFD analysis of rod mill cooling line to increase product strength
- Process Investigation of modifications to existing Cooling Bed to improve cooling rates and product quality off cooling bed.
- Cooling capability process engineering Study and layout options for special sections mill cooling bed
- Engineering Study To Investigate Cooling Bed Upgrade
- Investigate of cooling bed performance using CFD analysis and thermal finite element analysis to assess modifications to cooling bed.
- Evaluation of Cooling Bed and engineering study of modifications to obtain straight bars off bed.

FINISHING:

- Engineering design and supply of cold shear entry equipment to improve safety, quality and increase production throughput.
- Engineering Services for Repairs to Existing 450 Ton Cold Shear
- Process study to improve Length Accuracy on Continuous Cut to Length shear system
- Specification, layout and budgets for product inspection system including 100% surface and internal inspection for "verifiable zero defect" product.
- Study to evaluate the finishing end of the 16" Mill with regard to rolling larger flats, angles and channels.
- Feasibility Study, process simulation. equipment specifications, capital budget and scheduling for new Bar Mill Finishing End involving Flying Cold Shear concepts.
- Investigation of modifications to hydraulics piping at Straightener.
- Operation Assessment & process engineering of sign post punch press line
- Study of offline finishing facility including straightener, inspection, sawing, and stacking for elevator tees, rounds, bulb angle and rails.

- Engineering evaluation of capability of finishing end for structural mill to establish upgrade requirements.
- Feasibility study for new or upgraded warehouse
- Upgrade to Pipe Chamfering Line
- Study of Scrap Baler and Shear to upgrade system for quicker operation and automation sequencing.
- Feasibility Study to investigate operational and equipment changes to increase SBQ finishing end production and measure the impact of each change on annual production.
- Detailed engineering design, equipment supply, installation engineering and site assistance services for finishing end improvements including revamping the cooling bed and cold shear line.
- Finite element analysis of overloaded Cold Shear frame to establish safe shearing loads. This included design of a tension bar to change “C-frame” to a closed frame configuration for reduced stresses and increased cutting capability.
- Cold shear operation assessment, production improvement and defect reduction study
- Cold Saw Engineering Study for processing Large Round Products
- Basic engineering & process operating specifications for Large Rounds Cold Saw area revamp
- Finishing End Upgrade & Capital Budget Study for a new special sections mill finishing end.
- Investigation of modifications to existing Cooling Bed to allow pack annealing of larger flats
- Basic Engineering for New Bar Mill, Water Boxes, Bundler & Bag house