



## STATEMENT OF QUALIFICATIONS

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## STEEL EXPERIENCE



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# INTRODUCTION

Hard Hat Services (HHS) is a full-service environmental engineering, project management, and construction company with extensive experience in steel industry projects. We offer reliable design and construction, and have the common sense to implement cost-effective, sustainable solutions for your steel industry projects.

HHS' principal focus is industrial clients, including many companies in the iron and steel industry who have water and wastewater needs, and are in need of engineering and construction assistance. HHS can accomplish your objectives quickly and efficiently, and has worked together with dozens of personnel at steel plants to conduct studies, engineering, design/build, and operational modifications to water and wastewater treatment system.

Our recent experience includes reviewing, modifying, and engineering the cooling water systems and overall steel plant water usage in a number of steel plants, and we are currently involved in four projects that include overall water systems evaluation.

Additionally, HHS presented "Industrial Water Use: Where'd it all go? - Balancing for Efficiency" at the 2007 Industrial Water Quality Conference in Providence, Rhode Island (<http://www.hardhatinc.com/files/HHS-2007-IWQ-Manuscript-12A.pdf>). The presentation was part of the Industrial Re-Use session, and provided a step-by-step process for water balance and re-use at an industrial facility.

HHS can and does make steel plants more cost-effective through efficient reuse of water and efficient treatment of wastewaters.



**Designing and Building Sustainable Clean, Green Solutions  
For Industry**



## **Project Management for 2 AC/2 Pump House Upgrade, ArcelorMittal Steel – East Chicago, Indiana**

HHS performed a feasibility study for upgrading the No. 2 Pump House (2 PH). HHS decided to break Pump House Upgrade Project into several small projects, with a staggered approach as follows:

- Project 1: Interim upgrades, focusing on rehabbing the 2 PH structure and testing one conventional traveling screen before purchasing four more.
- Project 2: Interim upgrades installation of conventional traveling screens.
- Project 3: Complete Process and Facilities upgrades to the circulating water system.
- Project 4: Excavation and installation for fish returns, slip-lining for direct feed to the furnaces, and installation of the 4,500 feet of yard pipeline from 7 PH to the 2 PH system.
- Project 5: Rebuilding or purchasing new equipment and the installation (mostly pumps).

## **Plant 4 Cooling Tower Hydraulic Evaluation, ArcelorMittal Steel – East Chicago, Indiana**

The client decided to demolish an old cooling tower and replace it. During this period, in order to maintain enough cooling capacity, the mill rented four temporary cooling towers. HHS provided flow balance calculations, pressure drop calculations and recommended piping changes to make sure the cooling water system ran properly with minimal effort.

## **Plant 1 Electrical and Compressed Air Utility Relocation Design for Demolition, ArcelorMittal Steel – East Chicago, Indiana**

HHS provided engineering support for all tasks, starting with Phase I, which included:

- Assisted with the development of reasonable cost estimates for the electrical and compressed air piping utility relocation work;
- Gathered information about power requirements and utility consumption to optimize equipment and piping sizes;
- Generated construction drawings for installing new equipment, such as steel electrical poles, 3-wire cables, rectifiers, air compressors, pipe bridges, etc;
- Generated demolition and utility relocation drawings for each utility and building, as needed;
- Generated as-built drawings after utilities have been permanently relocated;
- Provided overall sense of project direction through scheduling, meetings, project updates, etc.

## **High Line Rectifier Building Design, ArcelorMittal Steel – East Chicago, Indiana**

HHS provided engineering design for the construction of a 21'W x 40'L x 16'H concrete block building. The design documents included construction drawings and specifications for the concrete foundations, concrete block building and roof system, and basic electrical wiring for the building (lights, electrical outlets, motorized rollup door, wall fans and louvers).

## **80" HSM Scale Pits 2 and 3 Sluice Gate Replacement, ArcelorMittal Steel – East Chicago, Indiana**

HHS provided professional engineering services to select sluice gates, prepare construction drawings and specifications (including civil, mechanical, and electrical details), and provide as-built drawings following installation of the new gates. The project included investigating



options for keeping the concrete channel clean to allow for proper seating and sealing of the sluice gates.

### **DIW Treatment System Piping Changes, ArcelorMittal Steel – East Chicago, Indiana**

The DIW treatment system removes waste oil from the No. 3 Cold Mill effluent water, which is collected in a storage tank and periodically pumped through a 3-inch diameter steel pipeline approximately 800 feet to the Oil Tech Facility. The waste oil tank is steam jacketed and insulated in an attempt to heat the waste oil, reducing the viscosity to make it easier to pump. Since startup of the DIW system in 2008, efforts to maintain the waste oil temperature at 140F have been unsuccessful and the pipeline to Oil Tech has plugged several times.

HHS designed a pigging system to purge the pipeline running from the DIW building to the Oil Tech Facility following each transfer of waste oil through the pipeline, including the ability to sweep the 90 degree elbows.

### **Gas Cleaning Blowdown Automation, ArcelorMittal Steel – East Chicago, Indiana**

HHS designed a controls upgrade for a wastewater management system for blowdown from a gas cleaning system. The objective of the upgrades was to better manage and decrease water usage/discharge and to improve treated water quality. The design included flow metering and control plan with construction details, PLC and control panel design, and electrical power and signal control/signal distribution.

### **Industrial Water Recycle & Feasibility Analysis, US Steel – Fairfield, Alabama**

HHS evaluated each component of the existing cooling and process water system to identify opportunities to recycle industrial service water, thereby reducing city water usage and reducing or eliminating discharges from the facility. Nalco Industrial Outsourcing (Nalco) and HHS worked as a team on this project, evaluating the existing condition, performance and capacity of various process and cooling water systems. A feasibility study and initial design were completed.

### **Beta Steel System Improvements, GE Water – Portage, Indiana**

HHS provided engineering and consulting expertise to GE Water and Beta Steel for upgrades to the Beta Steel EAF mill wastewater system. The system was originally designed for zero liquid discharge, but lacked the capacity to treat the volume and type of contaminants that are now present at the mill. HHS worked as a team member to upgrade cooling water capacity, sand filter treatment, dissolved air flotation, pumping and storage capacity. HHS also provided a detailed analysis of water usage and discharge from each area within the facility, so an overall system water balance could be accomplished.

### **3 CAL Water Quench System, ArcelorMittal Steel – East Chicago, Indiana**

HHS performed a system evaluation of the 3 CAL Quench Water Treatment system, including a review of all available information, collection and analysis of water data and flow data, and testing for additional data points. HHS also employed interim measures to minimize the impacts on product quality simultaneous while seeking and designing a permanent solution. An evaluation was performed of alternative make-up water sources and water treatment technologies to be used for the new, proposed “Closed Loop” System, including the Belgian System and the Burns Harbor Quench Water System. HHS completed the design for a



permanent solution including piping, instrumentation, control valves, cooling tower, chemical feed systems, structural modifications, and PLC upgrades.

### **Sinter Plant Solids Capture and Recycle, ArcelorMittal Steel – East Chicago, Indiana**

HHS conducted 3 separate projects to assist with the capture of fugitive solids from the existing Sinter plant. Following a feasibility study, HHS evaluated a multi-stage cyclone separator for removal of particulate from the air stream coming off of the big and mini oscillators, as well as the other ducts within the plant. HHS completed a design for solids removal, which included the engineering of the system and process and ancillary equipment. This detailed the final sizing and selection of the cyclone, ductwork, and structural steel for the new equipment, and tie-ins to available, existing systems. The engineering focused on process flow, equipment sizes, system footprint, maintenance, access requirements, and integration into the existing structural system and duct work.

### **80-Inch Hot Strip Mill, ArcelorMittal Steel- East Chicago, Indiana**

HHS engineered and designed a service and repair plan to bring the existing 80-Inch Hot Strip Mill cooling water treatment system back to operating expectations. The work included an assessment of the physical condition and operational performance of the existing water treatment system components, review of available equipment drawings and manufacturer information, water analysis data, operational data such as flow rates and pressure readings, chemical dosage rates, backwash frequencies, temperature readings, and corrosion issues. HHS performed internal equipment/vessel inspections and assisted ArcelorMittal personnel with servicing and repair activities.

### **DIW System, ArcelorMittal Steel – East Chicago, Indiana**

HHS performed a Pre-Design Study, completed a Preliminary Engineering Design Report, designed a wastewater treatment system to remove solids and fats, oils, and grease (FOG) from recycled process water for steel manufacturing operations. The system included a circular clarifier, equalization tank with rope skimmer, flash mix tank, dissolved air flotation units, pumping systems, chemical feed systems, FOG and solids handling systems, instrumentation and control, and HVAC.

The main design engineering tasks included:

- Civil Site – site preparation, demolition, control room / electrical room construction, existing utility relocation, utility tie-ins, leveling the system area, general arrangement of system, and ancillary equipment.
- Structural – Concrete building foundation and slab, equipment pads and foundations, approach apron, structural steel mezzanine structure, structural steel for building.
- Mechanical – Equipment, piping, pumps, HVAC, chemical feed systems, building utilities.
- Electrical – Power feed & distribution, conduit and cables, panel layouts, PLC functional logic, instrumentation & control.

### **Water Balance Study, Gallatin Steel- Ghent, Kentucky**

HHS evaluated the existing cooling water systems with regard to capacity, productivity, optimization, and efficiency. A water balance study, concentrating on the water use through the various cooling systems and heat loss/gain through the hot and cold sides of the cooling sys-



tems was conducted. HHS also evaluated filtration needs and capabilities as they related to the increased production rates. Pumps, piping, tanks, and hydraulic capacity of equipment, as well as modifications to increase capacity, were considered. HHS conducted a feasibility study that will result in a selected set of options for each portion of the necessary cooling water upgrades.

### **Contaminated Sediment Removal from Grand Calumet River, US Steel – Gary, Indiana**

HHS provided dredging expertise, as well as engineering and surveying services, to US Steel for the identification and removal of residual contaminated sediments from the Grand Calumet River in Gary, Indiana. HHS provided on-site oversight of the dredging contractor, documenting all activities on a daily basis. HHS personnel provided review and comment on dredging contractor activities work plan and procedures. HHS provided surveying and CAD services to confirm that dredging activities had achieved project goals, and provided detailed cross sections and quantity calculations for sediment removal.

### **#2 Galvanized Line Quench Recycle, ArcelorMittal Steel – East Chicago, Indiana**

HHS performed an evaluation and submitted a Basis of Design document of the #2 Galvanized Line. The project objective was to define the major design criteria for the quench water recycle system being considered for construction in order to reduce reliance on service water, and recycle existing quench water. The Basis of Design document included a General Layout, PFD's, P&ID's, Hydraulic Profile and Electrical Schematic and served as the basis for Final Design. HHS assessed if changes were required due to updates, additions, deletions and / or changes to influent, effluent or process changes. HHS was also hired to prepare an Alternatives Analysis for the quench water at the #2 Galvanized Line in order for ArcelorMittal to proceed with the optimal path. The three alternatives to be evaluated were: Recycle/Re-use system (previously designed system with any proposed changes); Treatment and discharge to existing NPDES Outfall; and Discharge directly to POTW.

### **Central Treatment Plant Chrome Removal, ArcelorMittal – East Chicago, Indiana**

HHS assisted with conceptual design of Surge Capacity, pH Control and Hexavalent Chrome Reduction for the ArcelorMittal Central Wastewater Treatment Plant Indiana Harbor West. The project was being considered to eliminate potential surge discharges (not common) of chromium from the system, which required a side stream approach that would “treat and bleed” back into the original system. Tasks included designing a retention basin for surge capacity of 3500-5000 gpm, instrumentation and controls, sequence of operations, and all ancillary conceptual layout work.

### **2BOF Water Treatment, ArcelorMittal Steel- East Chicago, Indiana**

HHS inspected the 2BOF Water Treatment Operation in order to distinguish upgrades needed to get system moving at maximum production speed. Work included:

- Evaluating the head tank overflows, pipe sizes, and determining if additional piping and/or tanks were needed;
- Evaluating new technologies to increase grit removal using auger type classifiers, magnetic separators, etc;
- Assessing options to prevent or minimize plugging of the classifier water effluent lines;
- Evaluated and recommended alternatives to alleviate cavitation problems with the venturi pumps;



- Assessing the feasibility of moving the make-up water (service water) feed from the venturi tank to a better location;
- Assessing potential issues associated with addition of a third thickener (clarifier); and
- Relocation/replacement of the existing pumps and evaluating the total system design to look for inefficiencies and propose potential optimization solutions.

### **Caster Mold Evaluation, Gallatin Steel - Ghent, Kentucky**

The overall objective for performing the caster mold cooling water evaluation was to investigate the effect of a 40% increase in production to 2.2 MM tons, and how each component of the cooling system would need to be modified in order to accommodate the increase in production. Secondary objectives included looking at best practices for water reuse, treatment options, as well as evaluation of current operational efficiency and identifying potential maintenance issues.

### **Clarifier Feasibility Study, US Steel - Fairfield, Alabama**

HHS was responsible for evaluating the potential to convert the caster spray water filter backwash tank into a clarifier or similar mechanism in order to better settle the solids within the tank so that the decant water could be recycled into the existing system. The main objective of the study was to determine if USS could reasonably, reliably modify the tank in order to create a quiescent zone that would better settle backwash solids. HHS investigated the existing conditions of the backwash surge tank system (tank, level controls, pumps, valves, piping), reviewed and observed the current backwash sequence for all 4 filters, (including flow rates, duration, water quality, air sparge, chemical feed and particle settling within the surge tank), evaluated different alternatives to convert the tank to a thickener or clarifier mechanism, and evaluated the current backwash sequence to determine whether operational changes may improve settling (i.e. backwashing one filter at a time versus all 4 at once)

### **Cooling Systems Design, Republic Engineered Products – Canton, Ohio**

HHS designed two closed cooling loops, one for the air compressors and one for the transformers, to replace the once-through system and conserve water. Each independent cooling loop consisted of pumps, piping, cooling units, and controls, to be located near the air compressor and transformer locations. HHS provided the drawings necessary to complete construction of the system, including PFD, piping and instrumentation drawings, piping layout, electrical single line/conduit & cable schedule, and building design (air compressor area only). HHS also procured and installed the necessary system components, making piping and electrical tie-ins. Each system was designed to operate independently, without tie-in to any existing control or monitoring systems.

### **Water Balance Study, Beta Steel – Porter, Indiana**

HHS evaluated five water systems to determine what flows (rate or source) were coming from each system to the water treatment area, and what flows were recycled back to each of the systems. The facility was built without a discharge, and therefore the oils, solids, and salts within each of the water streams were continually accumulating. The systems included: Hot Strip Mill, Spray Water, Mold Water Softening and RO, Machine Water, and Mold Cooling Water. A number of ultrasonic flow meters were installed on pipes to help evaluate the flow rates, and field reconnaissance was performed in order to generate updated drawings of the water systems.



## **No. 3 and No. 4 Blast Furnace Recycle System, ArcelorMittal Steel – East Chicago, Indiana**

HHS performed a flow verification and system input/discharge study on readings from select flow meters throughout the No. 3 and No. 4 Blast Furnace Recycle System. Nine flow meters that read flow rates throughout the main recycle system loop were selected for verification. HHS personnel used a portable, clamp-on ultrasonic flow meter to confirm the flow readings of the flow meters. HHS inspected and measured the components of the recycle system, and modeled such operations as cooling tower drift/evaporation to develop a list of known major influent sources and discharges for the system. In addition, the existing drawings and field inspections were used to develop a water volume summary for the recycle system.

## **Scrubber Water Recycle System, ArcelorMittal Steel – East Chicago, Indiana**

HHS designed a pump system that would maintain a constant draw down in the flume basin to prevent the basin water from overflowing into the cold well at the No 7 Blast Furnace. The pump system was designed to transfer water from the flume basin to the splitter box directly upstream of the clarifiers. Pumps were sized and designed with variable frequency drives so that pumping speed can adjust to increases or decreases in flow through the flume basin. As an additional feature, the pump system included redundancy so that a single pump failure would not cause overflow of the flume basin water into the cold well.

## **Laminar Cooling System Evaluation, Gallatin Steel – Ghent, Kentucky**

A water balance study, concentrating on the water use through the Laminar Cooling system and heat loss/gain through the hot and cold sides of the cooling system, was conducted. HHS evaluated filtration needs and capabilities as they related to the increased production rates. Pumps, piping, tanks, and hydraulic capacity of equipment, as well as modifications to increase capacity, were also included in the study. HHS then provided a feasibility study with a selected set of options for each portion of the necessary cooling water upgrades and detailed design.

## **Satellite Wastewater Treatment System Design, GE Water – Hibbing, Minnesota**

HHS assisted GE Water with conceptual design, equipment sizing, cost estimating and scheduling for three satellite treatment systems within a new planned steel mill in northern Minnesota. Systems included scale pit water, oil and scale removal, caster contact and mold water cooling, hot strip mill quench and laminar system, and indirect non-contact cooling water systems.

## **Recycle Cooling Water Flow Meter, ArcelorMittal Steel – East Chicago, Indiana**

HHS designed and installed a recycle water flow metering system for the 22,000 gpm cooling water recycle system at Indiana Harbor West. Flow was intercepted and measured inside a 36-inch open channel flow flume, to capture and control flow rate to feed pumps from recycle pond. The project was completed in order to meet requirements of new Indiana Department of Environmental Management discharge permit.

## **Cooling Water Supply Pipe Reroute, ArcelorMittal Steel – East Chicago, Indiana**

HHS was responsible for the cooling water supply pipe reroute for the No. 5 and No. 6 Blast Furnaces. Work included replacing pipes and tie-ins, tapping into existing piping, and modifying the service ramp to allow for the new routing.

