



**GEM**  
Gas Energy Mixing by CWT

## CASE STUDY

### COLD ROLLING MILL – EMULSIFIED OILY WATER

#### INTRODUCTION

Clean Water Technology, Inc. (CWT), the creator of the Gas Energy Mixing (GEM), System provides the most advanced primary treatment system on the market. The GEM System offers superior reduction of total suspended solids (TSS), biological and chemical oxygen demand (BOD/COD), oils and grease (FOG) and turbidity.

With the ability to break oily wastewaters and float fines, the engineered small footprint and high-performing GEM System is appealing to the Steel Manufacturers in China to meet compliance and to replace expensive ultra-filtration (UF) systems. Based on the successes described herein, the GEM System is now widely accepted by the steel industry in China and has been installed in most of the emulsified oily wastewater streams at Cold Rolling Mills in China including but not limited to Baosteel, WISCO, Valin Mittal, the Shougang Group, JFE, Siwenkede, Guang Steel, the Baosteel / Nippon Steel / Arcelor (BNA) Shanghai project and more. CWT, headquartered in the USA with global offices, is bringing the GEM System to steel manufacturers in the U.S. and worldwide.

#### CHALLENGE

Steel manufacturers in China had been searching for a sustainable wastewater treatment solution to address issues they were experiencing with existing UF systems. UF had long been used to remove emulsified oils with systems designed for a variable flow range of 30-1,000 gallons per minute (gpm). The capital and operational expense (CapEx/OpEx) required to utilize UF systems had a multi-million dollar price tag when more cost-effective solutions, such as the GEM System, existed that was sized for Clients' specific flow rates with significantly lower costs and better results.

**WISCO**, China's oldest and third largest steel manufacturer, contracted with CWT in 2008 to install the **GEM System 20/75** (sized for less than 20 gpm up to 75 gpm) for reductions in total suspended solids (TSS), Oily Wastewater and BOD/COD.



Onsite Demonstration at WISCO

#### SOLUTION

The superior results of the WISCO GEM System was highly accepted by the China steel industry and in 2009, CWT received its next order from **BNA** to supply a **GEM System 75/150** (sized for less than 75 gpm up to 150 gpm) to replace an existing ceramic UF system at the Shanghai Cold Rolling Mill.

The GEM System is fed from an existing equalization (EQ) tank and CWT's D-Loop which pH adjusts and homogenizes the wastestream. Water flows by gravity to the GEM System where 100% of the flow is subjected to specific chemistry and pressurized air. The GEM System provides very stringent control over mixing speed and mixing energy resulting in a higher level of contaminant removal while also providing the flexibility to add chemistry under pressure or to add one or more chemicals after the pressure drop and bubble formation. The treated and separated waste stream is then released into the bloom chamber near the surface of the GEM System while the solids are skimmed off for further decanting.

#### RESULTS

The GEM System achieves significantly higher reductions than UF systems and conventional flotation technologies such as dissolved air flotation (DAF). Table 1 below outlines the results obtained at the **Shougang Jing Tang Steel Facility** in Hebei.

TABLE 1: GEM PERFORMANCE – SHOUGANG JING TANG STEEL, HEBEI				
PARAMETER	INFLUENT	EFFLUENT	% REDUCTION	(COAG/CAT/ANI)
TSS / ppm	851	83	90 - 99%	0/51/13 pH: 7.28
COD / ppm	2,412	1,013	58 - 70%	
Oil	507	25	95 - 99%	

The GEM System installations also result in 30-50% less polymer due to CWT's patented method of uncoiling polymers to avail more charge sites. This attracts more waste particles per polymer providing more efficient chemical usage, better contaminant removal and tighter and firmer sludge (less "sludge by volume"). The sludge produced by the GEM System is 25 - 50% less than other technologies while the size of the unit is 50 - 90% smaller. This offers substantial savings in overall CapEx and OpEx.

## CONCLUSION

The success of the GEM System at China's steel mills can lend itself to the steel industry here in the U.S. and Canada. In fact, it can be used globally in this and other heavy industrial projects. From the GEM System installations in China and corresponding projects worldwide, CWT clients who purchase the GEM System also benefit from the following:

- Significant savings on capital investment
- Significantly smaller footprint than UF Systems
- 50 - 90% smaller than other flotation technologies such as DAF
- Up to 99% reduction in TSS and Turbidity
- 25-50% savings in sludge storage, dewatering, hauling and disposal.
- Easy Operation with start/stop auto controls or continuous run capabilities
- No capital expenditures required for growth in flow due to expandability of GEM System
- Easy Operation
- Can be moved to adapt to changes at facility



GEM System 150/300 at Shougang Jingtang Steel



GEM System 20/75 at Baosteel No. 5 CRM



GEM SYSTEM + MEMBRANE BIOREACTOR (MBR): Cold Rolling Mill, Shanghai, China  
Installed June 2009 for BNA - JV Between Baosteel, Nippon Steel and Arcelor.

**PLEASE REFER TO CWT'S HEAVY INDUSTRIAL AND FOOD/BEVERAGE REFERENCE LISTS UNDER SEPARATE COVER**