



# WVU's China Experience and Comparative QuickPEP Results

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# Overview

- Introduction
- Hosts, SDRC
- Plant Selection for Assessment
- Data Collection
- Reported Energy Efficiency Measures
- Energy Consumption vs. Recommended Savings
- QuickPEP Recommended Energy Savings
- Comparative QuickPEP Results
- Conclusions

# Introduction

- Team

- Dr. Caulton Irwin, Lead (Director, IOF-WV)
- Dr. Qingyun Sun (US-China Energy Center, WVU)
- Dr. B. Gopalakrishnan (Director, IAC – WVU)
- Dr. Kenneth Means (Director, WVU Projects with Industry Program)
- Subodh Chaudhari (Lead Student Engineer, IAC –WVU)



# Introduction (contd.)

- Visit Dates (August 06 – August 10)
- 3 Plants
  - Shanxi Hengtong Energy Co. Ltd. (SHE)
  - New Oriental Aluminum Co Ltd. (NOAL)
  - Jiaocheng Yiwang Ferroalloy Co. Ltd.

# Shanxi Development Reform Commission (SDRC)

- Mr. Ling, Director General (SDRC)
- Mr. Zhang, Director of Environmental Program, SDRC
- NDRC



# Introductory Meeting with Plant Personnel

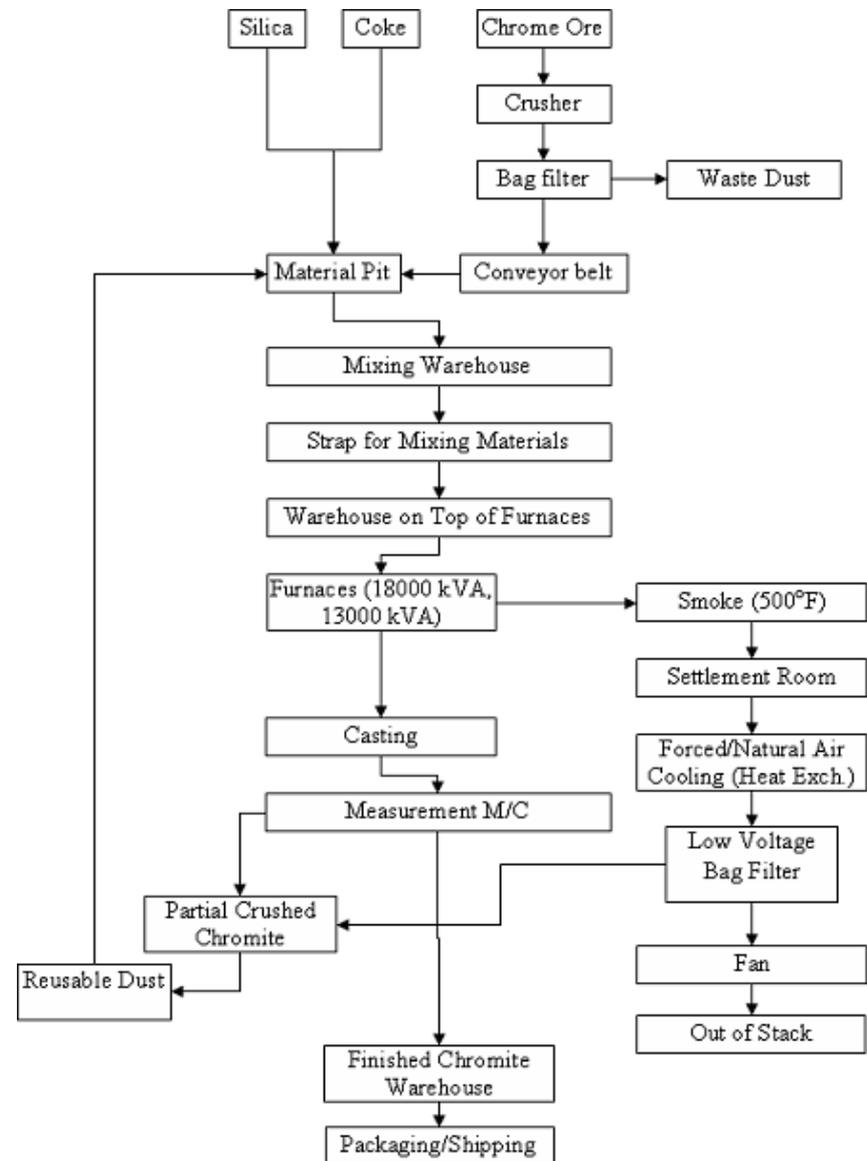
- Mr. Ma Yuanzheng ( President, Shanxi Hentong Energy)
- Mr. Xing Li (Chief Engineer, New Oriental Aluminum )
- Mr. Song Jinle (President, Jiaocheng Yiwang Ferroalloy)
- Background Discussions
  - Energy consumption & bills
  - Product & process
  - Major energy consuming equipment (process)
  - Major energy consuming systems (process support) e.g. Compressed air, Fans and Blowers etc.

# Data Collection (Method/Data obtained)

- Questionnaire (generic data about equipment, shifts, etc.)
- Interviewing with plant people (specific process parameters and equipment data)
  - Video 1
- Measurement through electronic loggers, Infrared and Ultrasonic equipment (Actual process and equipment consumption data)

# Shanxi Hengtong Co. Ltd. – Process Flow Diagram

- Process Description
  - Product – Chrome Alloy



# Shanxi Hengtong Energy Co. Ltd.

- Focus – Furnaces
  - 2 + 1 Furnaces
- Instruments Used
  - Manometer and Pitot tube
  - Combustion analyzer
  - Current transformer and data logger
- Measurements
  - Temperature at different points in exhaust duct
  - Flue gas flow velocity at different locations
  - $\Delta P$  across the exhaust duct
  - One day of logged amperage consumed by exhaust fan



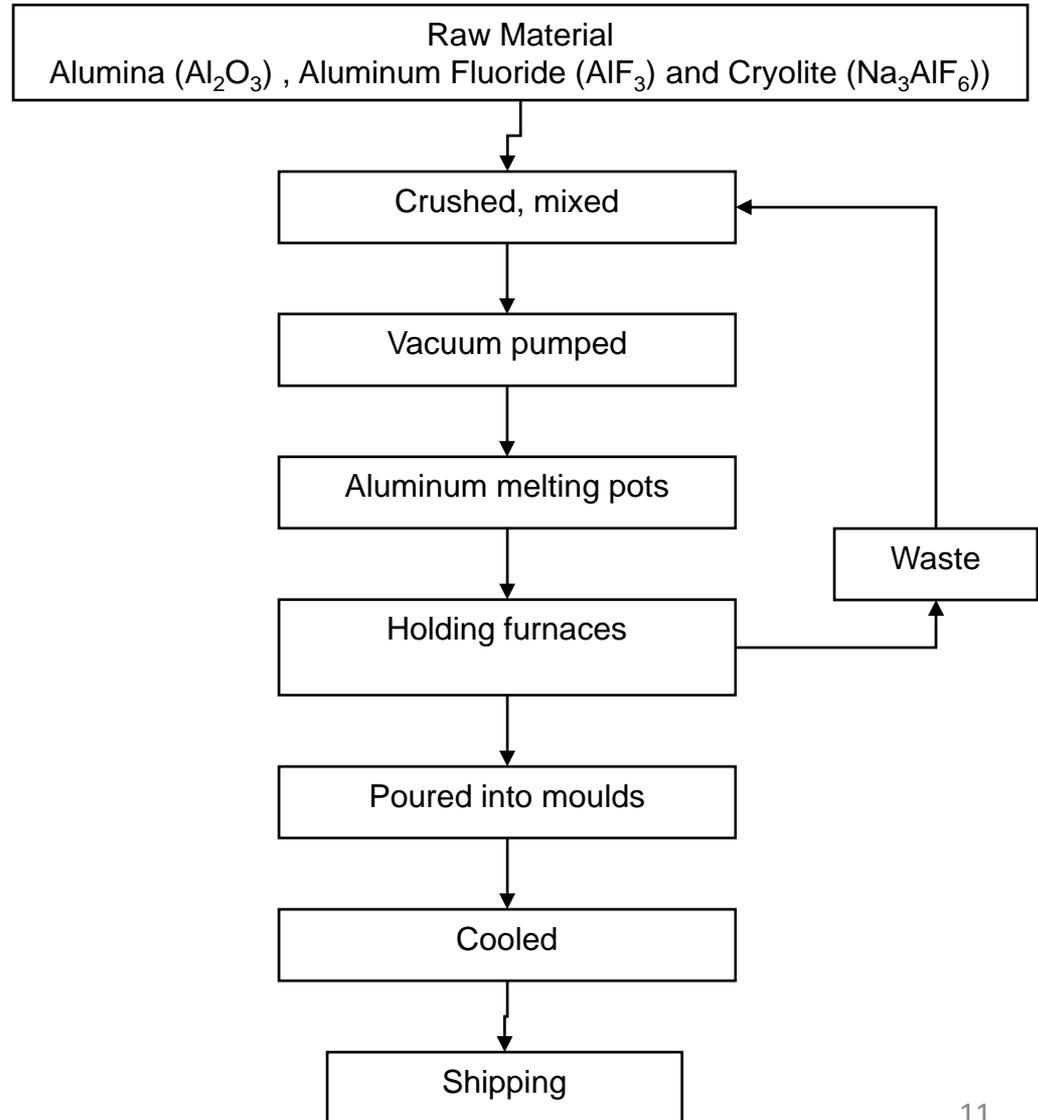
# Shanxi Hengtong – Recommended Energy Efficiency Measures

- Exhaust waste heat recovery
  - Waste Heat Boiler with a Condensing Turbine
  - Low pressure steam for comfort heating during winter months (partial)
- Waste heat recovery to offset boiler used for heating facility
  - [Video 2](#)
- QuickPEP profile



# New Oriental Aluminum – Process Flow Diagram

- Process Description
  - Product - Aluminum ingots



# New Oriental Aluminum

- Focus
  - Compressors
  - Holding Furnace
- Instruments Used
  - Ultrasonic air leak detector
  - Current transducers & loggers
  - Infrared Temperature Sensors
- Measurements
  - Compressor energy consumption, Load profile
  - Ultrasonic sensitivity for air leak loss estimation
  - Surface Temperature of electrolysis pots & holding furnaces



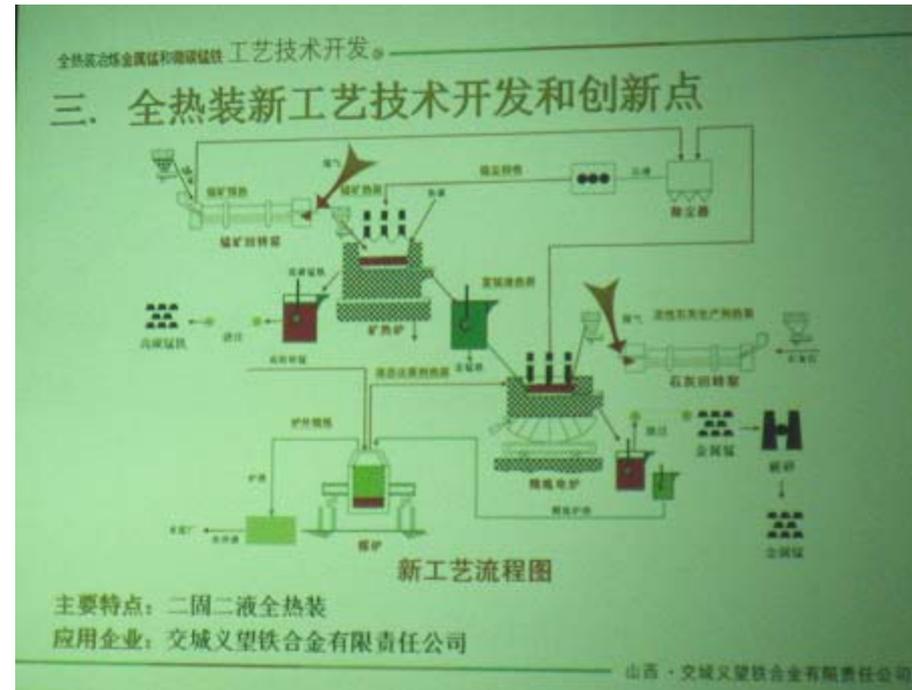
# New Oriental Aluminum – Recommended Energy Efficiency Measures

- Compressed air system optimization
  - Use of AirMaster+
  - Automatic sequencing of compressors based on the air demand
  - Outside air for intake
  - Air leaks maintenance program
  - Synthetic Lubricant for compressors
  - Automatic drain valves to avoid moisture bleeds
- Insulation of holding furnaces
- QuickPEP profile



# Shanxi Yiwang Ferroalloy

- Process description
  - Product – Manganese, Ferro Manganese, Hollow Bricks
- Technology investigated for energy savings
  - High Temperature Metal Dust Separation



# Energy Consumption Vs. Recommended Energy Savings – Shanxi Hengtong

## • Energy Consumption

Electricity		Coal	
MJ	Yuans	MJ	Yuan
733,452,314	RMB 76,118,988	50,642,688	RMB 760,000



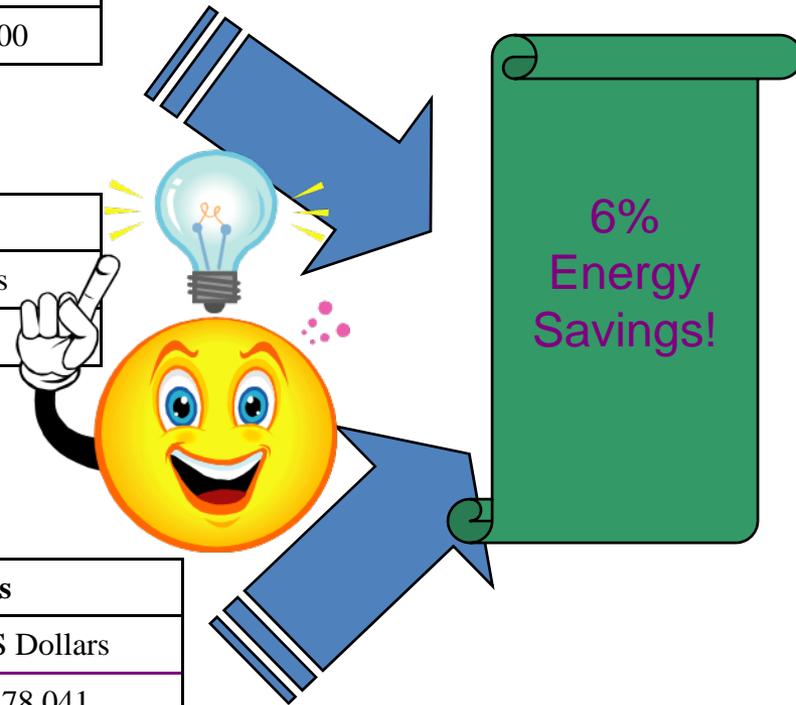
Electricity		Coal	
MMBtu	US Dollars	MMBtu	US Dollars
695,178	10,149,199	48,000	101,333

## • Recommended Energy Savings

Energy Savings	
MJ	RMB
91,064,546	4,335,310



Energy Savings	
MMBtu	US Dollars
86,312	578,041



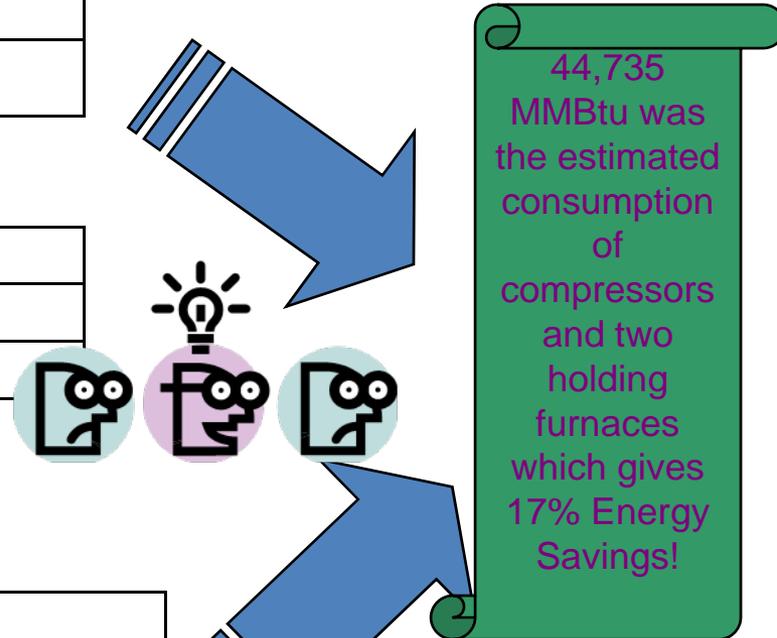
# Energy Consumption Vs. Recommended Energy Savings – NOAL

## • Energy Consumption

Electricity		Coal	
MJ	Yuans	MJ	Yuan
4,209,120,000	RMB 467,680,037	88,693,080	N/A



Electricity		Coal	
MMBtu	US Dollars	MMBtu	US Dollars
3,989,476	62,357,345	84,065	N/A



## • Recommended Energy Savings

Energy Savings	
MJ	RMB
8,193,594	981,165



Energy Savings	
MMBtu	US Dollars
7,766	130,822

# QuickPEP – Shanxi Hengtong

- QuickPEP - Potential Savings

System	Potential Annual Energy Savings (kWh)	Potential Annual Energy Savings (MMBtu)	Potential Annual Cost Savings
Process heating	73,355,696	250,300	\$27,402,800
Facility Energy Use	2,725,561	9,300	\$342,400
Pumps	498,221	1,700	\$190,300
Fans and Blowers	322,378	1,100	\$121,800
Electrochemical processes	0	0	\$0
Other	0	0	\$0
Process cooling and refrigeration	0	0	\$0
Materials handling	0	0	\$0
Materials processing	0	0	\$0
<b>Total</b>		<b>262,400</b>	<b>\$28,057,300</b>

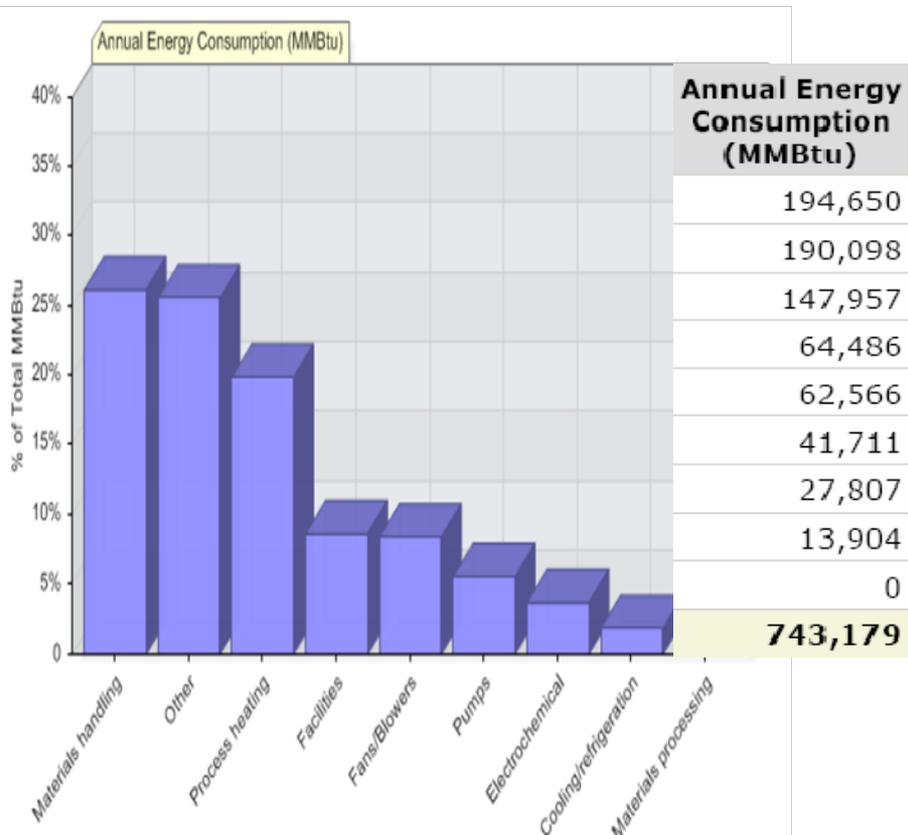
# QuickPEP – New Oriental Aluminum

- QuickPEP – Potential energy savings

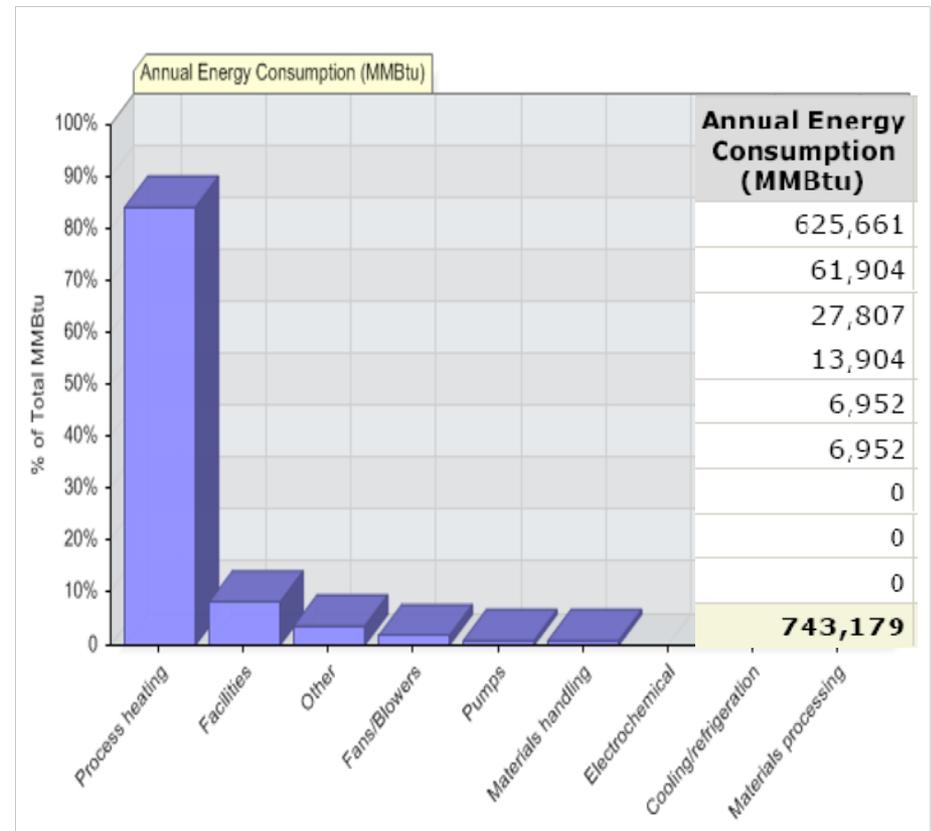
System	Potential Annual Energy Savings (kWh)	Potential Annual Energy Savings (MMBtu)	Potential Annual Cost Savings
<b>Facility Energy Use</b>	5,451,122	18,600	\$901,000
<b>Fans and Blowers</b>	1,875,655	6,400	\$748,300
<b>Process heating</b>	1,758,427	6,000	\$701,500
<b>Compressed air</b>	1,758,427	6,000	\$701,500
<b>Pumps</b>	0	0	\$0
<b>Process cooling and refrigeration</b>	0	0	\$0
<b>Materials processing</b>	0	0	\$0
<b>Materials handling</b>	0	0	\$0
<b>Electrochemical processes</b>	0	0	\$0
<b>Other</b>	0	0	\$0
<b>Total</b>		<b>37,000</b>	<b>\$3,052,300</b>

# QuickPEP – Comparative Analysis

- Energy Consumption
  - Shanxi Hengtong Energy Co. Ltd.



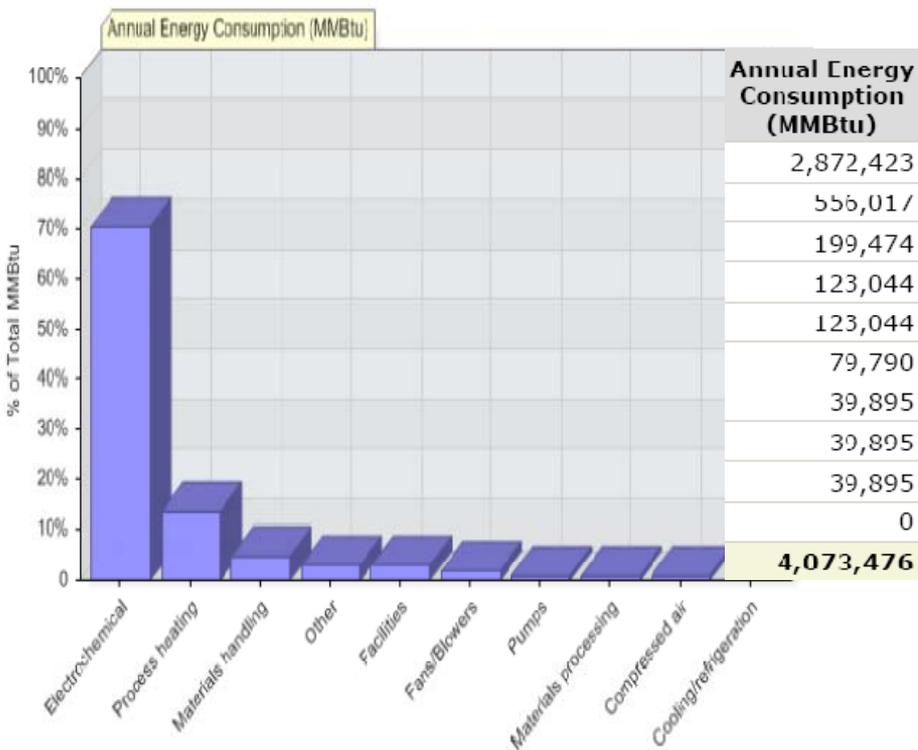
**DEFAULT Percentages**



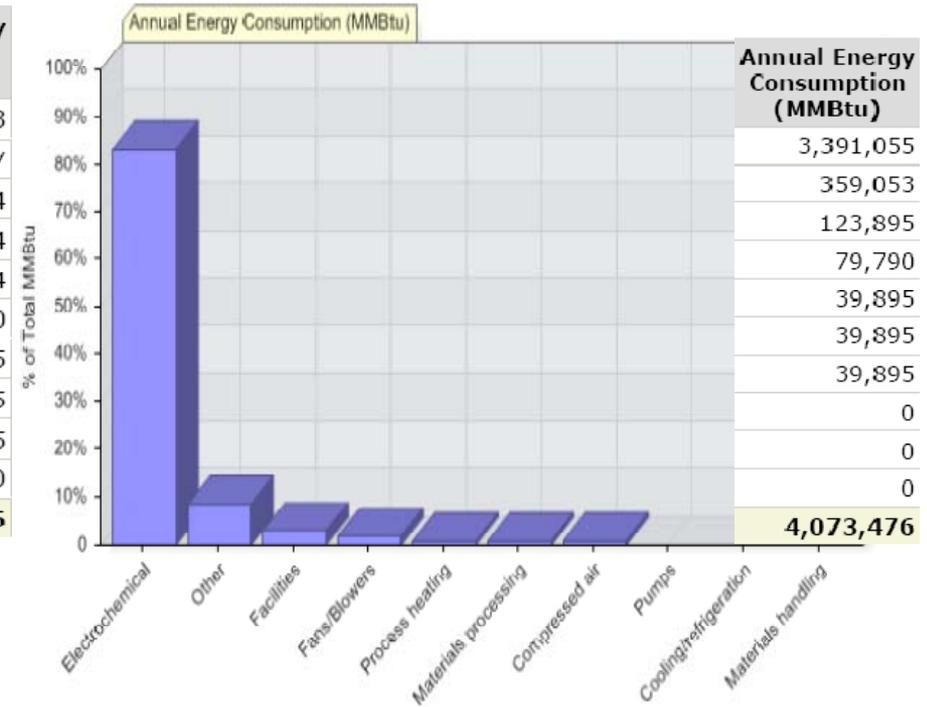
**FOUND Percentages**

# QuickPEP – Comparative Analysis (contd.)

- Energy Consumption
  - New Oriental Aluminum



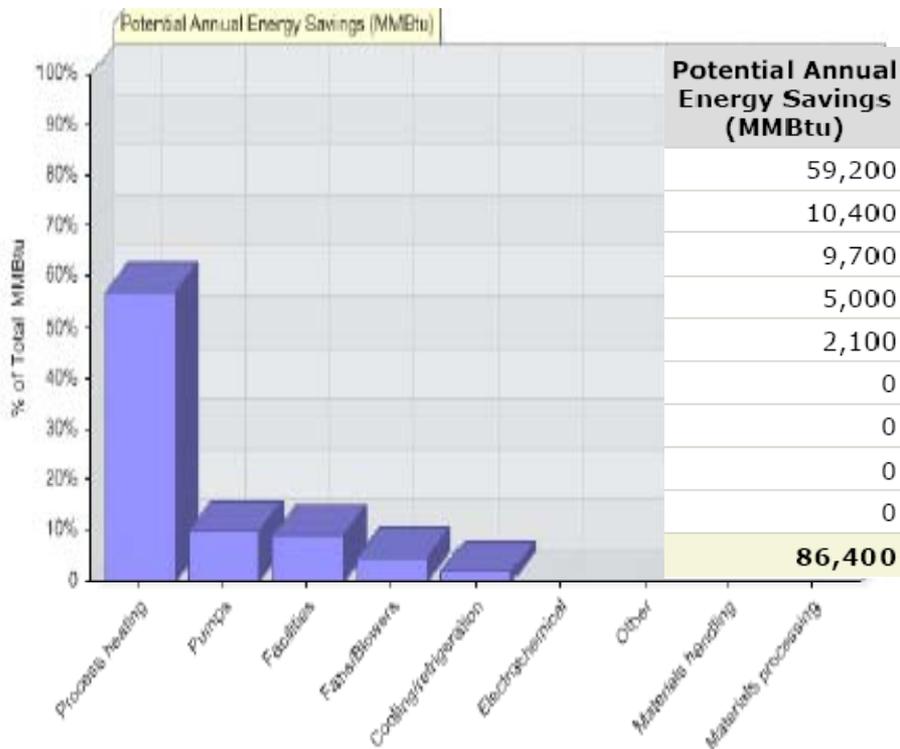
**DEFAULT Percentages**



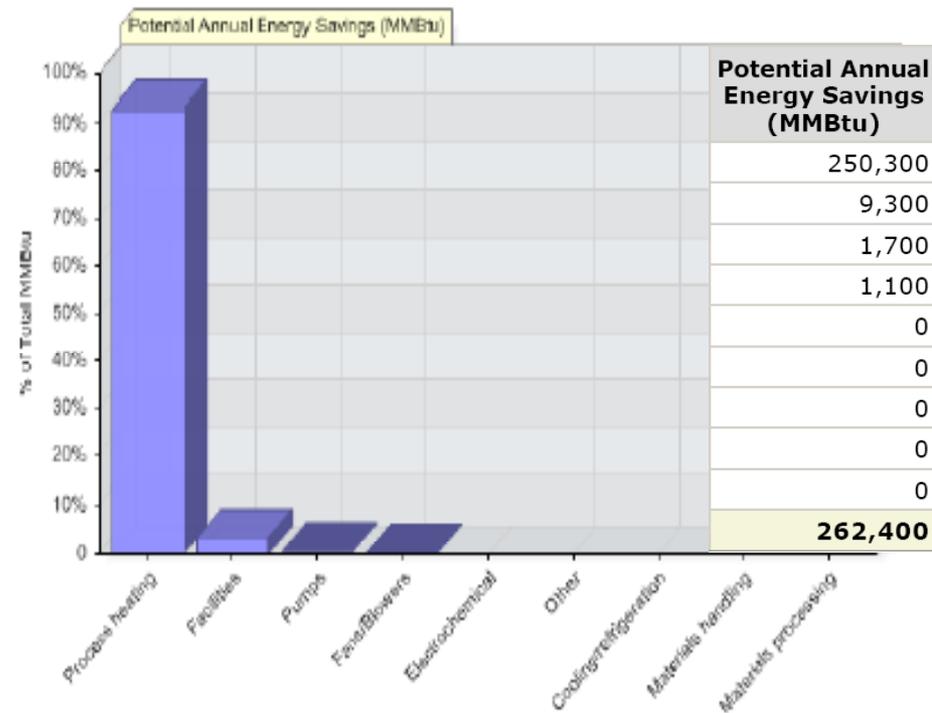
**FOUND Percentages**

# QuickPEP – Comparative Analysis (contd.)

- Potential Energy Savings
  - Shanxi Hengtong Energy Co. Ltd.



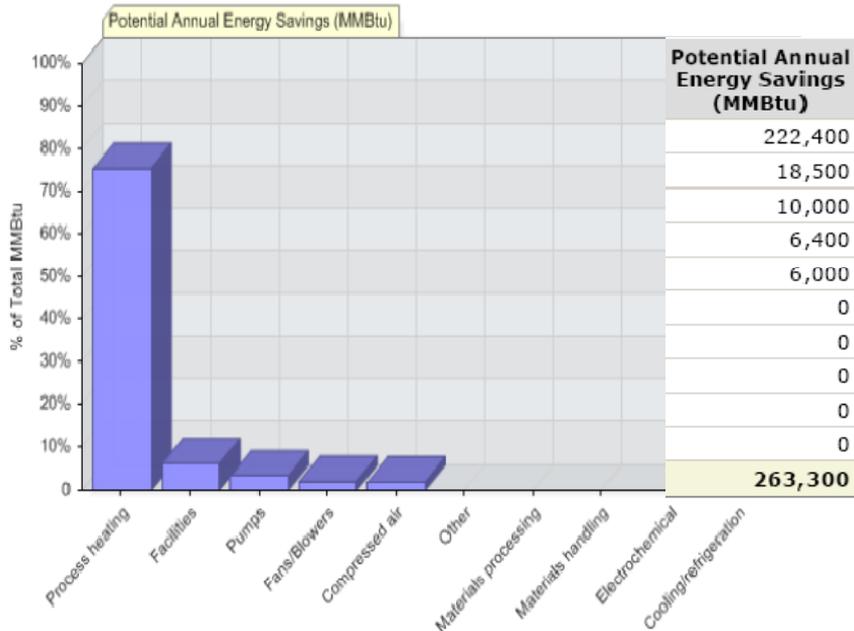
**DEFAULT Percentages**



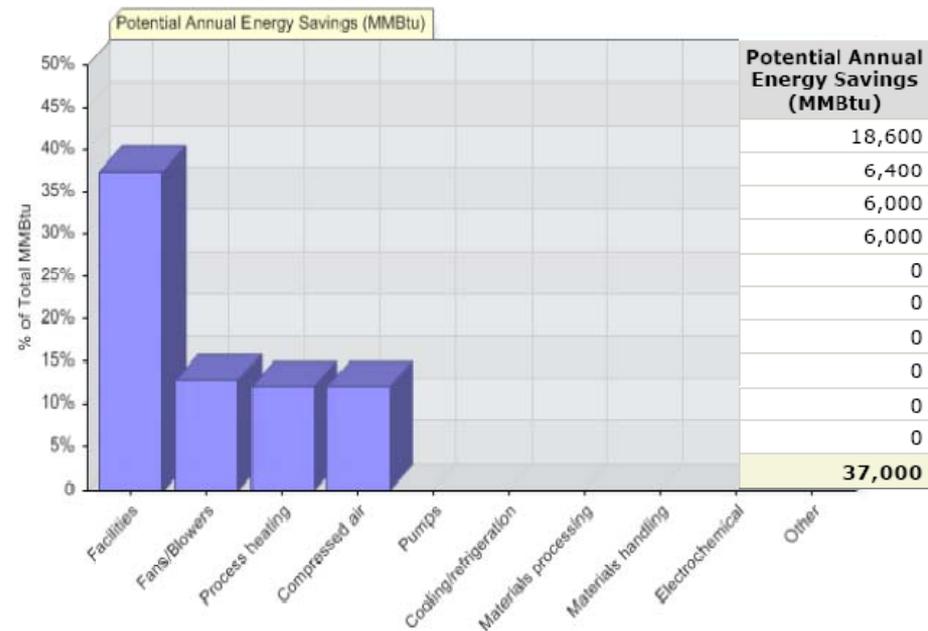
**FOUND Percentages**

# QuickPEP – Comparative Analysis (contd.)

- Potential energy savings – New Oriental Aluminum



**DEFAULT Percentages**



**FOUND Percentages**

# Conclusion

- Overall the assessments were successful
- QuickPEP (Comparative Analysis)
  - Energy consumption percentages in similar industries are vary widely in US and China
  - Potential energy savings estimates from a particular system are similar for NOAL and vary a lot for SHE
  - QuickPEP is significantly easy to use tool to generate an estimate for potential energy savings
- Language barrier – Translation slows things down! (Video 2)



# General Conclusions

- Host organization SDRC facilitation was outstanding
- Plant personnel at all three plants were gracious and very cooperative
- WVU team was well received by all
- Significant potential for energy savings

# Questions???

- Best part of the trip – the “Round – Table” meals!

