# The Power of Data: Different Users, Same Benefits

Presented by **Yuelong Su** Ph.D


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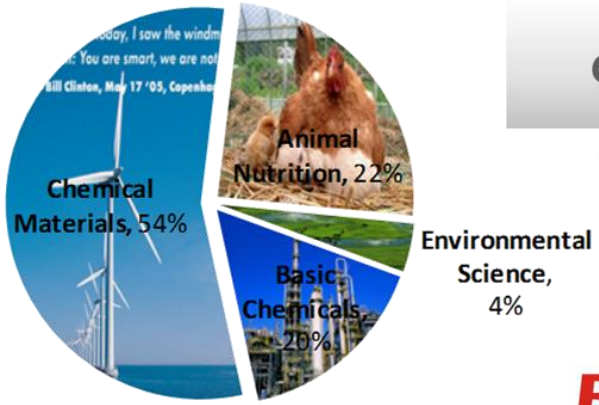
# Overview of Bluestar's Brand Family



**Revenue in 2013----9 billion Dollars**

| MAIN BRAND | BUSINESS BRAND | BRIEF | PRODUCTS |
|---|---|---|---|
| BLUESTAR<br>Owned by ChemChina, and has a comprehensive range of chemical products. Its areas are new chemical materials, animal nutrition, and environmental science.<br>It was founded in 1984 and has grown into one of China's most powerful chemical companies. It has factories spread across China and in Europe, Norway and Australia. Its business reaches more than 140 countries.<br>www.china-bluestar.com | ADISSEO<br>A Bluestar Company | World's largest methinoine manufacturer and an animal nutrition expert. Its products are used as animal feed additives. It is headquartered in Paris, France. And joined Blue Star in 2007.<br>www.adisseo.com | Solid and liquid methinoine |
| | BLUESTAR SILICONES | Uses the initials BSI and is headquartered in Lyon, France. It is the world's leading organosilicon producer and one of the most integrated organosilicon manufacturers.<br>www.blustarsilicones.com | Organosilicon and downstream products |
| | Qenos<br>A Bluestar Company | Qenos is Australia's largest ethylene and polyethylene producer, with a leading position in the country's polyethylene market. It has a more than 30-year history and factories in Sydney and Melbourne.<br>www.qenos.com.au/ | Polyethylene products (HDPE, LDPE and LLDPE) and various special polymers. |
| | Starafil<br>A Bluestar Company | Bluestar Fibres Company Ltd. (Starafil) is the world's largest carbon fiber precursor manufacturer and has a great deal of experience in the field. Its headquarters are in the UK.<br>www.bluestarfibres.com | Carbon fiber precursors |
| | Elkem<br>A Bluestar Company | World's leading solar energy silicon metal producer, with headquarters in Norway. It is currently promoting the use of new energy solar materials.<br>www. elkem. com | Silicon materials, casting products, solar energy silicon metal, carbon. |

CHEMCHINA
A Global Fortune 500 company and China's largest chemical company. It is under the State Council's State-owned Assets Supervision and Administration Commission control.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# Bluestar:
# Different users and same benefits

The China National Bluestar (Group) Co, Ltd is centered on the chemical industry but focuses on new chemical materials and animal nutrition.

It is a subsidiary of China National Chemical Corporation (ChemChina). ChemChina is in the list of Fortune 500 and China's largest chemical company.

## Business Challenge

- **Optimizing production and increasing efficiency**
- **Becoming more energy efficient**

## Solution

- **Data Analysis Engineer**
- **HSE Engineer**
- **Process Engineer**
- **Control Engineer**
- **Quality Engineer**
- **Different Departments of HQ**

## Results and Benefits

- **These successful applications have the same benefits for the whole company- optimizing production and increasing energy efficiency.**


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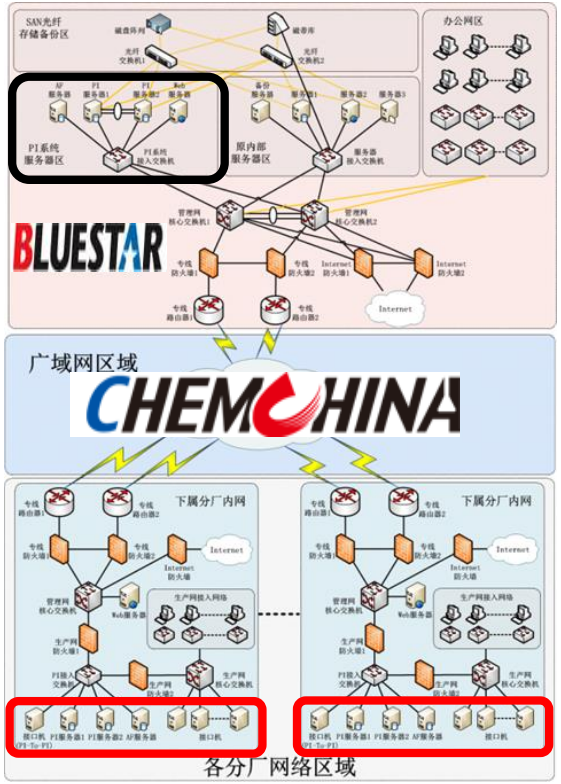
# 1. INTRODUCTION




**Bluestar PI System IT structure**

| | | | |
|---|---|---|---|
| **Project Planning (first stage)** | 2012/07-2014/07 | **Sites and HQ Locations** | |
| **Sites (Points)** | 12 (120000) | | |
| **Headquarters (Points)** | 1 (80000) | | |

- PI System of 12 sites in 9 provinces had been implemented (red rectangle);
- Every site sends local data to Bluestar headquarters PI System in Beijing (black rectangle) through PI to PI Interface and Chemchina private network;
- PI to PI Interfaces are distributed in every site for collecting data from local PI Server.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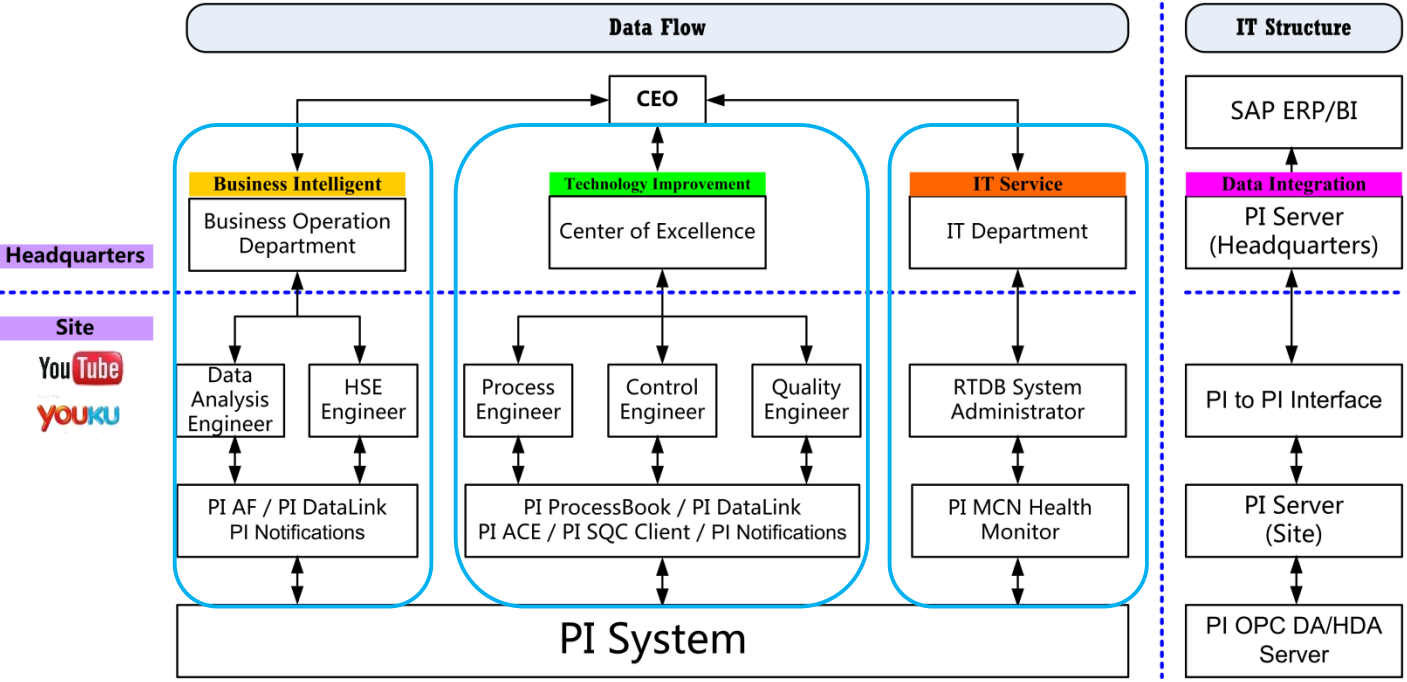
# 2. DATA FLOW AMONG DIFFERENT PI SYSTEM USERS IN BLUESTAR




Data flow between different PI System users

- Sites' applications based on PI System include tank management, overall equipment effectiveness analysis, control method simulation, statistical quality control (SQC) and implementing six-sigma improvement;
- Combining with every site data and requirements, HQ's above mentioned departments can realize KPI calculations, technology improvements and IT services, the results and benefits will be reported for CEO finally.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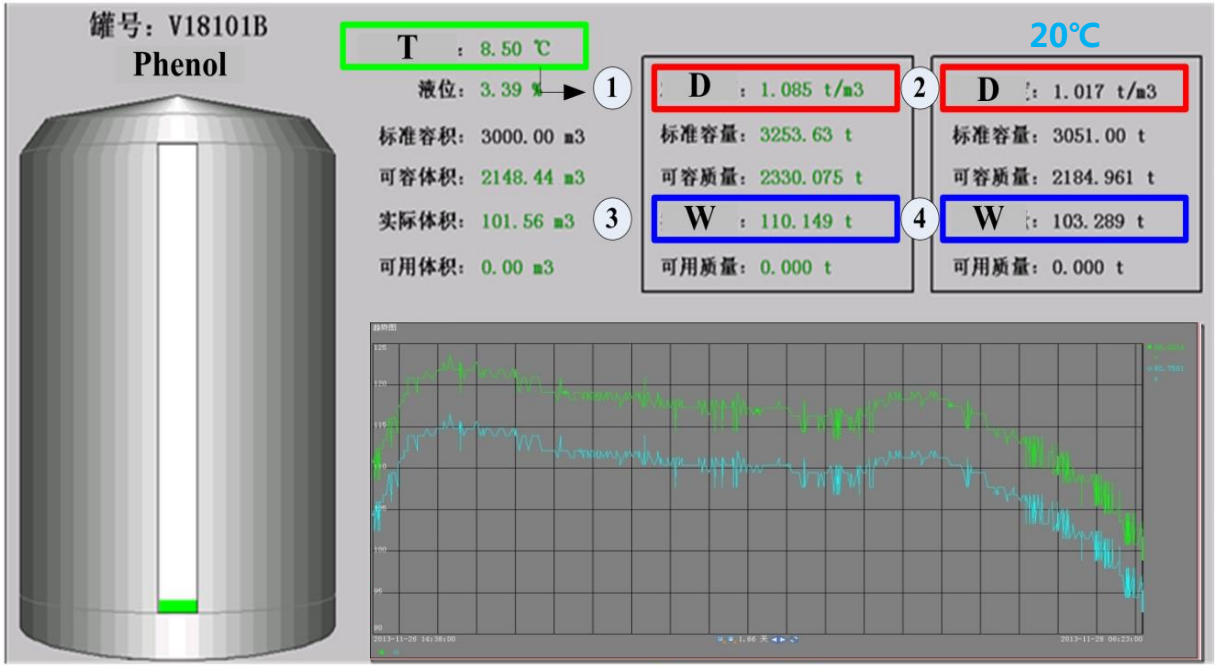
# 3. HOW TO USE PI SYSTEM IN THE SITE

- PI System for HSE Engineer




Application’s running in PI AF

| | |
|---|---|
| Problem | Only use standard density for tank material weight calculation? |
| Solution | Temperatures and densities reference table |
| Realization | PI Asset Framework (PI AF) |
| Benefits | Using this actual material weight for monthly balance automatically |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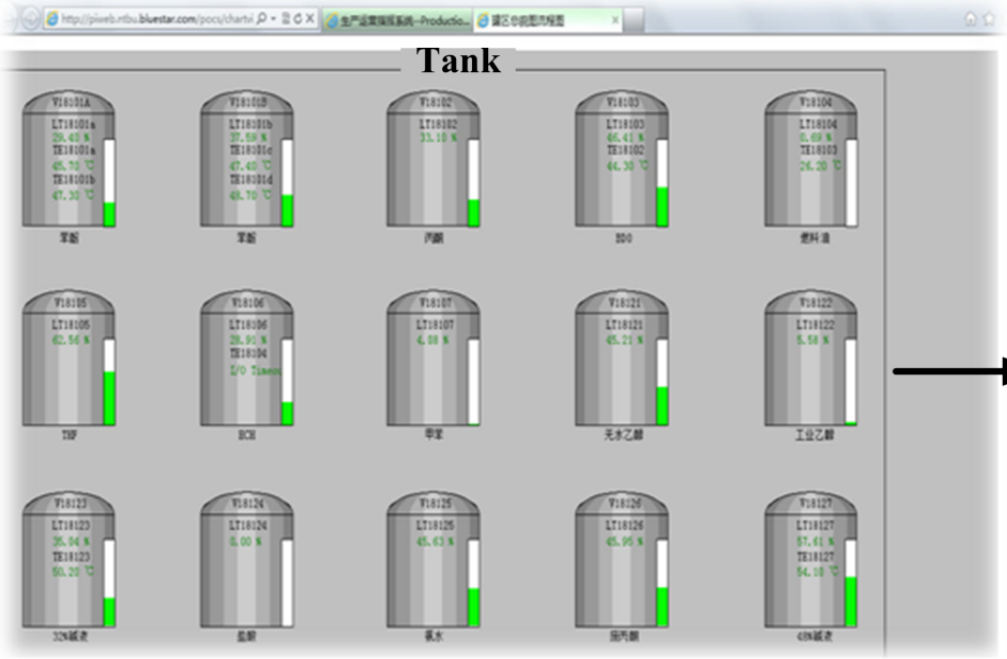
# 3. HOW TO USE PI SYSTEM IN THE SITE

- PI System for HSE Engineer




- Different tanks in different locations can be monitored at the same time.
- Exceeding limitation tank temperature or level can be alarmed automatically.

Tank management using PI System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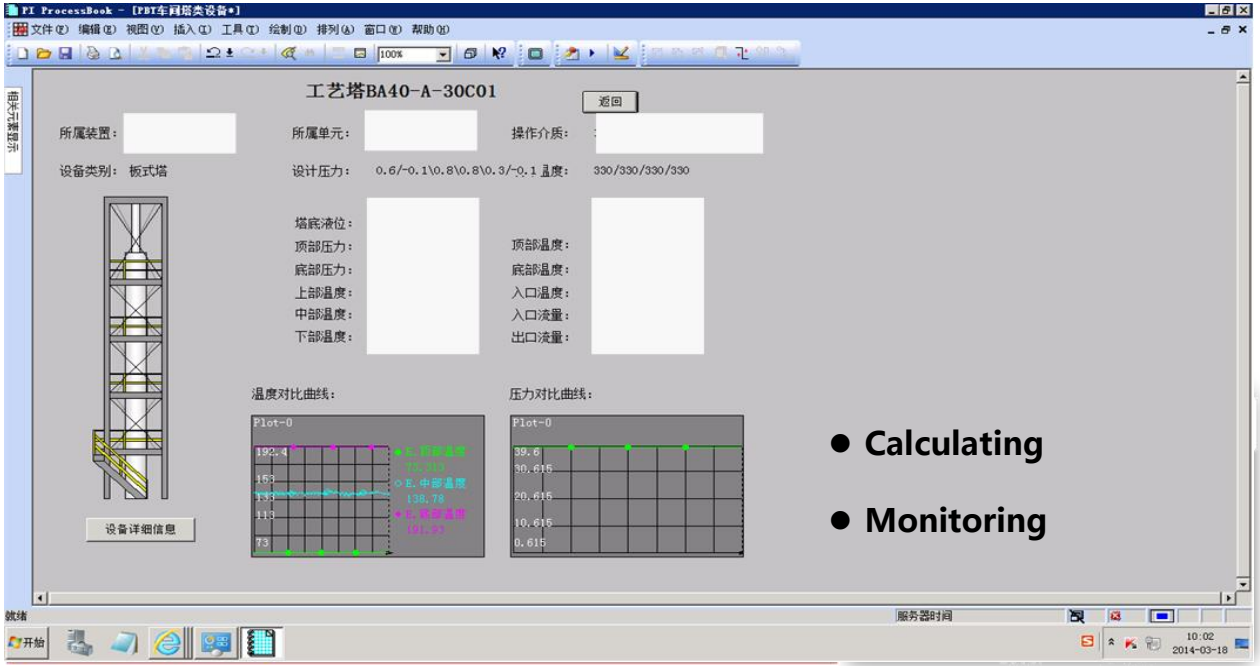
# 3. HOW TO USE PI SYSTEM IN THE SITE

- PI System for Process Engineer




Process Column Effectiveness Analyses

| | |
|---|---|
| Problem | Our site process column is worked in which level? |
| Solution | Analyzing/Finding/ Calculating/Monitoring |
| Realization | PI ProcessBook + PI DataLink + PI AF |
| Benefits | Becoming more energy efficient |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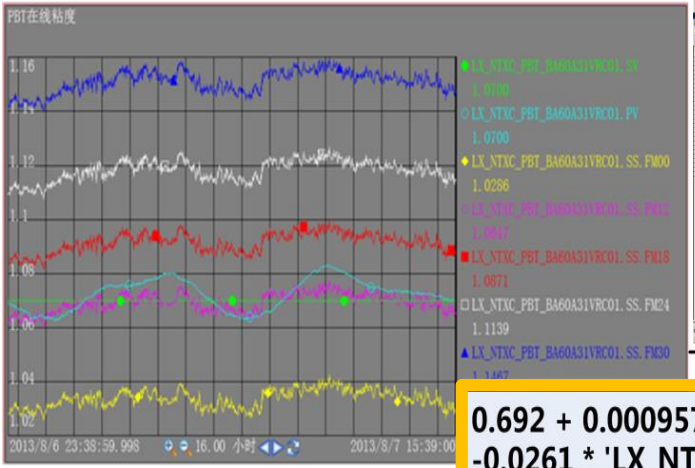
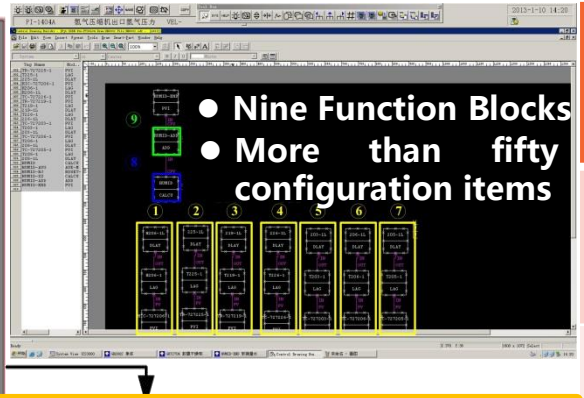
# 3. HOW TO USE PI SYSTEM IN THE SITE

- PI System for Process Control Engineer

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| | |
|---|---|
| Problem | Measurement device or process limitation in chemical industry |
| Solution | Realizing Soft-sensing Model |
| Realization | PI PE +PI ProcessBook + PI DataLink |
| Benefits | Making adjustment in time in order to reduce raw material and energy cost |

**Building PI System calculation points for realizing soft-sensing model is the one way for solving above mentioned problems.**


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# 3. HOW TO USE PI SYSTEM IN THE SITE

- PI System for Process Control Engineer

$$\text{Standard Variation} = \frac{\left(\frac{\sum |PV - SP|}{n-1}\right)}{Average(PV)} \cdot 100\%$$

Where: $PV$ : Measured Process Variable

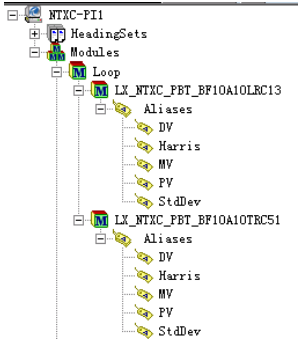
$SP$ : Set Point

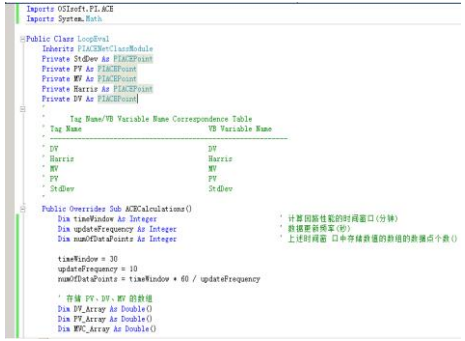
$n$ : Number of Data Points

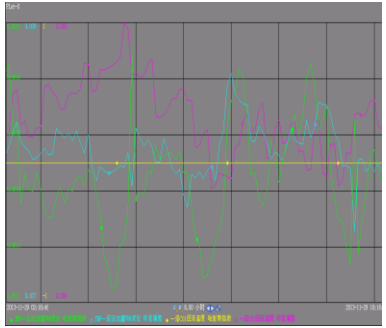
**It can be used to check performance improvement before and after tuning a loop PID!**

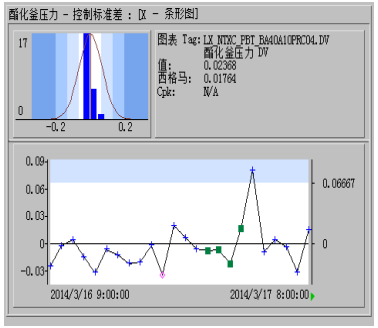
$$\text{Harris Index} = \frac{\sigma^2_{MVC}}{\sigma^2_{SP-PV}}$$

**It is comparable index for work performance between different loops!**








| | |
|---|---|
| **Problem** | **How to evaluate a loop working performance? How to compare different loops performance?** |
| **Solution** | **Standard variation/ Harris Index** |
| **Realization** | **PI ACE + PI SQC + PI ProcessBook** |
| **Benefits** | **Increasing production throughput and reducing energy consumption** |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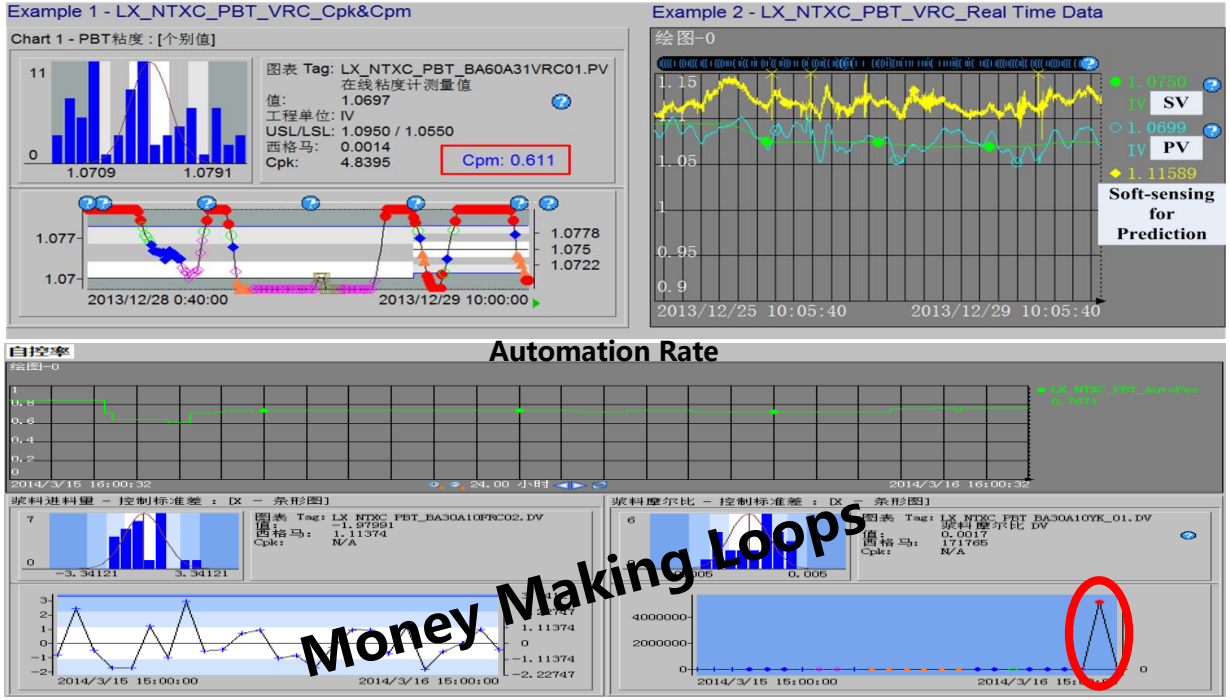
# 3. HOW TO USE PI SYSTEM IN THE SITE

- PI System for Quality Engineer




| | |
|---|---|
| **Problem** | **How to monitor the quality of goods and services in real time** |
| **Solution** | **PI SQC chart symbol** |
| **Realization** | **PI ProcessBook (SQC Add In) + PI SDK + OSIsoft vCampus** |
| **Benefits** | **Quality in a product or service is what the customer is willing to pay for!** |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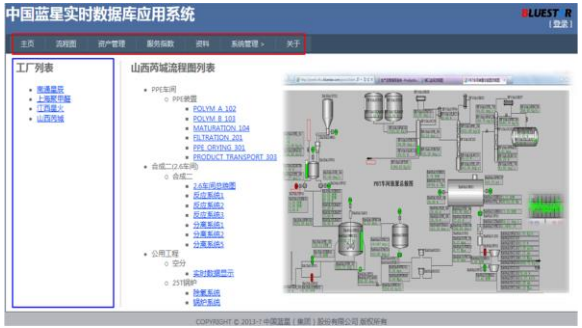
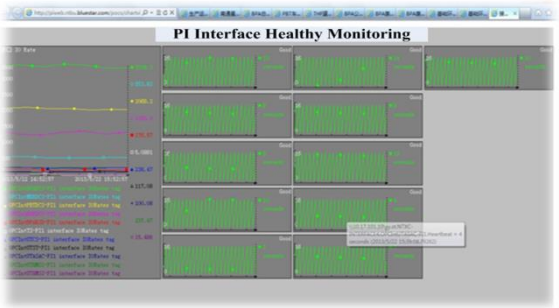
# 4. HOW TO USE PI SYSTEM IN THE HEADQUARTERS

| | |
|---|---|
| Business Operation Department | ➢ Accurate physical inventory;<br>➢ Major hazard sources consisted in different sites' tank;<br>➢ Integrating operation data with ERP or other information systems. |
| Center of Excellent (CoE) | ➢ Increasing international top experts work efficiency and providing more services;<br>➢ International top experts communicate and discuss with site's engineers based on PI System for solving difficult problems, solutions for these problems can make Bluestar optimize production and become more energy efficient. |
| IT Department | ➢ IT services are changed visualization, data-intensive and intelligent. |
| **Realization** | **PI ProcessBook + PI DataLink + PI ACE + PI ActiveView + PI WebParts + PI Web Services** |







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# 5. BENEFITS FROM USING PI SYSTEM

## Increasing Efficiency

90%

Control Program Simulation/
Report Generation

## PI System

**Strategy->Operation**

## Becoming More Energy Efficient

200,000 $/Year

Benefits for saving stream
( Statistic including only one soft-sensing model running in PI System)

## Optimizing Production Unit

30%

Organo-Silicon/PBT/
BPA/PPE…

## Patents and Papers

10

Applying patents and publishing papers based on PI System in 2013


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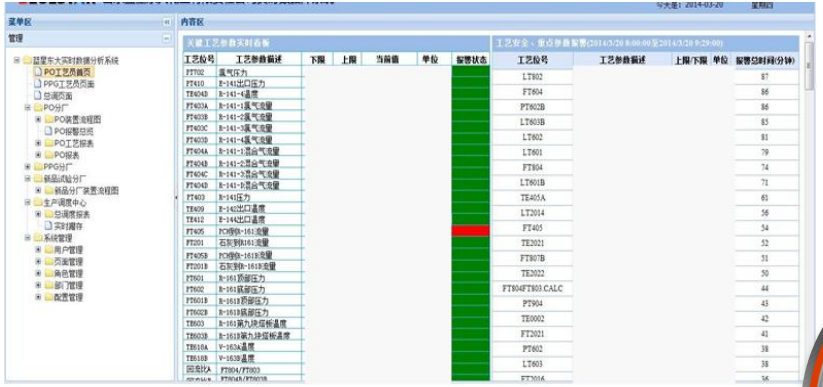
# 5. BENEFITS FROM USING PI SYSTEM



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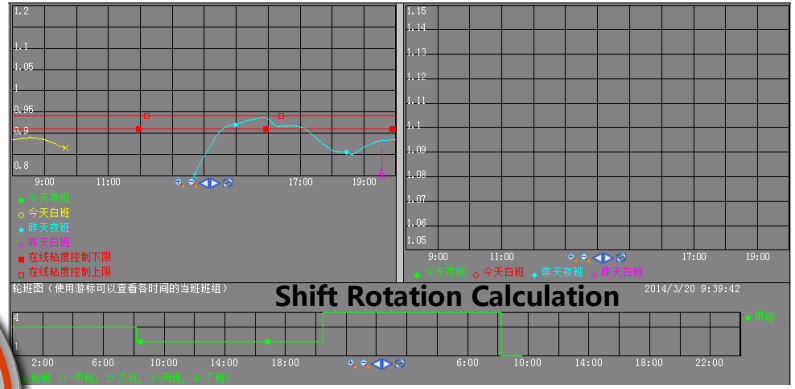
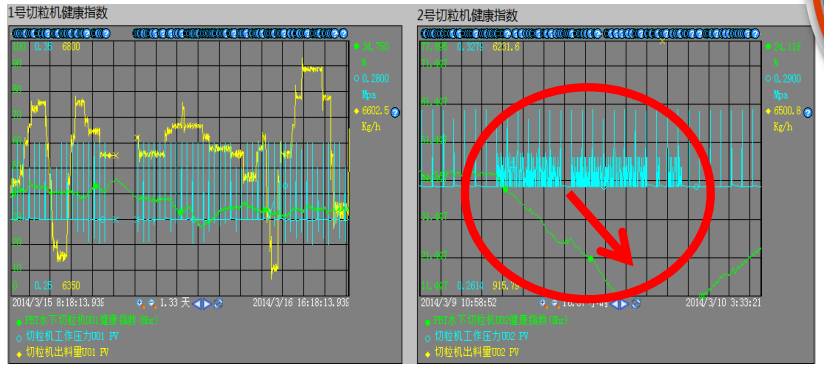
MES

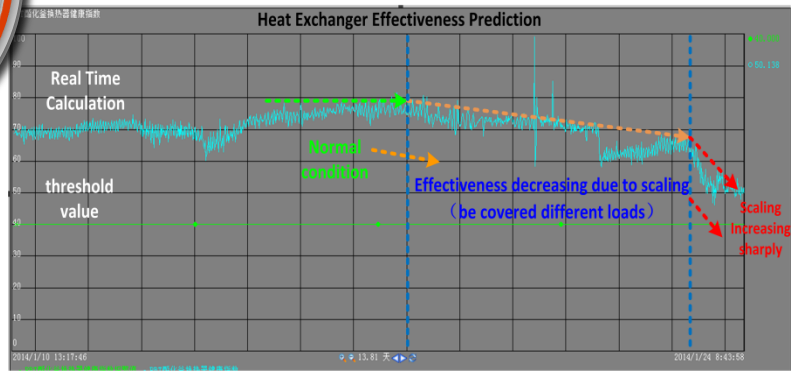



How to Use Big Data




③ ④

Data Prediction





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# 6. CONCLUSIONS AND WORK IN THE FUTURE (2014)

Target

Big Data


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# 6. CONCLUSIONS AND WORK IN THE FUTURE (2014)

## Equipment KPI Based on PI System

**I. General Description---CMO/CEO**

- Equipment Daily Output
- Equipment Daily Load and Overall Yield
- Equipment Daily Consumption (Material/Energy)

**II. Equipment Operation Situations---Workshop Manager/Engineers**

- Key Control Index----SQC Chart
- Key Control Index----Real Time Changing Trend
- Loop Service Index----Automation Control Loop Ratio

**III. Comparisons between Different Shifts---Group Leads**

- Key Control Indexes Comparisons
- Productivity Comparison
- Material Consumption Comparison
- Energy Consumption Comparison

**IV. Operation Units Healthy Index---Engineers**

- Heat Exchanger
- Pumps
- Pelletizer
- Other Key Operation Units


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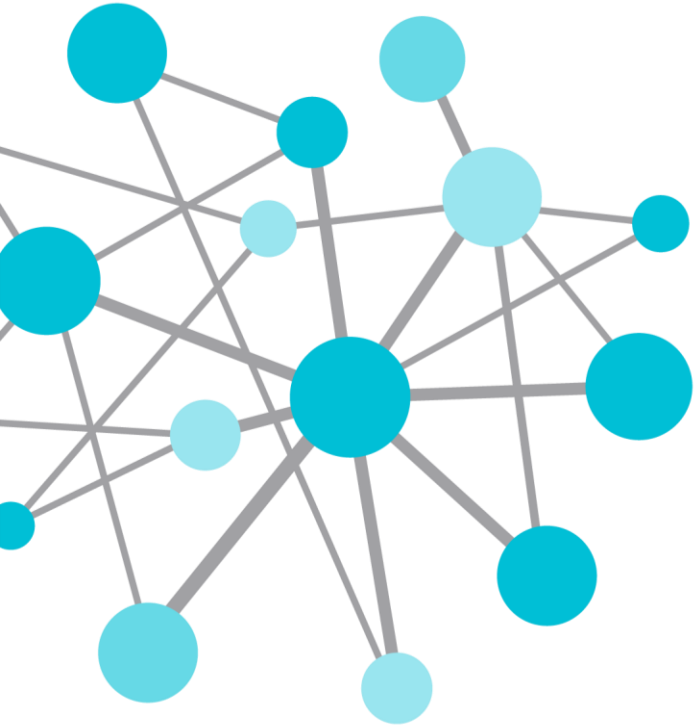

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