Approach to Saving Energy in Idemitsu Japan

The role of the Energy Manager to support energy conservation

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Energy Manager
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Introduction

Energy conservation is not a job that employees want to do. Also their mind cannot be moved by rules or governmental law.

On the other hands, most of energy conservation investments do not work out economically.

Therefore, the role of manager is very difficult and important.
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About our company Idemitsu

Core Business

Resource Development & Procurement

R&D

Around 5,000 Gas Station retail

Refining and Petrochemicals
Idemitsu has 4 refineries and 2 petrochemical factories in Japan. Chiba refinery is the largest one in our company and well integrated in petrochemicals.

Chiba refinery began operating in 1963
Mission

- Survive our old refinery complex
  - Basically, complex competitiveness is decided by configuration and its scale.
    - Installed cutting edge technology
    - High efficiency equipment are used
    - Well considered configuration that suitable for the market

Big handicap in our old complex!
Mission

Survival key items

Energy conservation is one of key item to keep competitive edge
- To integrate chemical products (Fuel to Chemical)
- To know our production plant well
- To catch up new technology
- To maintain equipment well

Bring up intelligent operators through EC

Big handicap turns to a power!
Improvements what we can apply are lost for these several years.
Background

Most energy conservation matters do not consist economically. So we need

“Financial support”

“Tax discount”

Motivation up

“Mind & Technical support”

Energy managers have to manage them. Governmental support is also important.
Governmental support in Japan

<Financial support >
- Finance subsidy (NEDO, PEC)
- Taxation, Loan treatment

<Mental support>
- Commendation (EC award)
Governmental support in Japan

NEDO: Up to 50% investment assistance to the excellent conservation of energy investment.

Affiliated association of the METI Japan

ECCJ: Supporting financial matter and they host EC AWARDS in Japan.
They lead spilling over success case of EC
Energy conservation is one of the activities of **TPM** (Total Productive Management) in IDEMITSU. We keep being awarded the energy conservation prize that explained before for 24 years in a row!

**Awards**

*<The small group activity>*

It is usual to make a small group to advance the improvement activities. Each group has a responsibility to do ‘KAIZEN’ (improvement activities) They are competing hard mutually.
Management viewpoints

To success the energy conservation, there are two important viewpoints.

One is “Improve Performance”. Another is “Keeping Performance”.

In old plant site such as ours, Keeping performance is more and more important. The performance of the machine decreases without fail. Exchangers have to foul.
Management viewpoints

CROF (CRude Oil Fouling) PJ *1) says

Pre-heat train fouling is estimated to cost around $1.2 billion per annum in the US alone.

$6 billion per annum in the World ! !

$300 million per annum in Japan !

Billion $ order losses Japan overall !!!

*1) Imperial College London
Management viewpoints

Basic idea

How to treat the plant well?

- Check real time
- Think quickly
- Action agile

Manager needs “Checking tools” and “Organization that quick response can be achieved”
Environmental Board

Expert Committee

Energy supervisor

Meeting once a month

Designated by law

Production Division

Admin. Division

Top management

Energy managers

Promotion Structure
In production facility

All Divisions for prod. support
Promotion Cycle

Head Office

Midterm plan

Annual Plan → Do → Check result

Action

Discovering

Review & Execution

Administration section

Engineering section

Twice a year

Production sect. Prod. control sect.
Visualization (TOOL)

Alert shows some difference observed in its plant.
Visualization

Know the Original

- Operating conditions changed little by little from first design.
  - Catalysts, feedstock, fouling etc.
- We cannot judge present state good or not, if we do not know original design.

It’s just like children’s imagining Grandfather’s younger days!
Visualization (term difference)

We do not recognize slow change.
Visualization (term difference)

We have to check short/middle/long term changing of equipment performance.

We need checking tools!
“Keeping Performance”

Appropriate maintenance makes heat exchanger performance well
Heat exchangers

Tank 20°C

260 degC

Feed heater

Target 365 degC

Crude

Kero Diesel H.Oil
Fouling makes fuel consumption worse. And fouling tendency has been changed by crud oil property.

Temperature decrease with fouling of heat exchanger
Ex. Fouling
Ex. Previous fouling indicator

\[ dt = Th1 - Tc2 \]

- \( dt \): increase with fouling
- \( Tc2 \): decrease with fouling
Ex. Fouling indicator

Over all heat transfer coefficient indicates Fouling condition well.
Ex. Fouling mechanism

Asphaltene causes fouling.
Clean surface that has high temperature makes more coke. (Good chemical compound is necessary)
Ex. Fouling prevention Chemical Effect

Asphalt cohesion

Fouling prevention chemical

Oil

High temperature surface

Without chemical
We check fouling trend of each heat exchanger. And we decide cleaning schedule.
Ex. Improvements

Fouling prevention chemical works well

\[ U \text{ (W/m}^2\text{K)} \]

- ‘07
- ‘03

- with chemical
- without chemical
### Ex. Energy savings

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saving energy amount</td>
<td>9,000 coe-kl/y</td>
</tr>
<tr>
<td>CO2 reduction amount</td>
<td>2,400 ton/y</td>
</tr>
<tr>
<td>Saving cost amount</td>
<td>4 million $/y</td>
</tr>
</tbody>
</table>

Coe: Crude oil equivalent

Fouling prevention technology and right timing cleaning are necessary.
Extreme ideas for fouling prevention

<Fouling Decrease Project in Japan>

We are advancing the preparation for the project now. Significant fouling and CO2 decreasing are expected.
**Extreme ideas for fouling prevention**

**<Fouling Decrease Project in Japan >**

Usually, provision against fouling is cleaning and adding the chemical. We will find the mechanisms of fouling and apply these theory to real plant to demonstrate them.

Visualization is not enough way to prevent fouling. We have to get new weapons against them and spread them.
Summary 1

- Energy Manager have to do.....

  - Check performance (Visualize)
    - Check initial design, performance ..... 

  - Correct agilely if changing occurs
    - Change operating conditions soon 
    - Suitable organization was constructed. 
    - Recover the performance of equipments 
      » Renewal, cleaning etc. 

  - Check new technology and apply 
    - Develop new ideas based on the logic 
    - Evaluate new technology and demonstrate 

  

2013/1/21
Summery 2

Japan
- Intelligent operators
- Small member shift
- Work until retirement
- No or small incentives

Developing countries
- Manual operators
- Big member shift
- Hopping job easily
- Need incentives

Technology / know how
Success case

Energy Manager has
Big responsibility

Spilling over success cases makes big improvement!
Spilling over items are the easier the better.
Thank you for your attention.