Asset Management strategy

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Head of Corporate Asset Management - Senior Asset Integrity Engineer
THE ESSENTIALS

Our history

Our mission « Resourcing the world »

Our three activities

Our key figures for 2017

An integrated global group
Our history, our organization

**1853-1900**

Drinking water is delivered to cities to meet the challenge of urbanization.

**1900-1939**

Wastewater services, waste treatment and access to energy expand on a large scale.

**1945-1992**

Environmental services provide support for reconstruction and the industrial growth.

**1992-2013**

A concern for sustainable development gradually emerges as a global priority.

**2014**

In the face of growing scarcity, resource management must be reinvented to create a new economic and social dynamic.

1853

Founding of Compagnie Générale des Eaux

2008

The Group is renamed Veolia Environnement

April 2018
Our mission « Resourcing the world »

**IMPROVING ACCESS TO RESOURCES**

Veolia offers operational solutions that consume fewer environmental resources and are more economically efficient, so as to expand both the potential and the accessibility of the resources available.

**PRESERVING RESOURCES**

Veolia develops solutions to conserve resources and optimize their use, while protecting their quality and efficiency throughout the usage cycle.

**REPLENISHING RESOURCES**

Veolia provides solutions for creating new “secondary” resources that will gradually offset the increasing scarcity of natural “primary” resources, generating new opportunities for social and economic development that protect the environment.

April 2018
Veolia designs and deploys solutions for **water**, **waste** and **energy** management, participating in the sustainable development of cities and industries.

**WATER**

Management of the global water cycle, from production and distribution of drinking water to the collection, treatment and recycling of wastewater.

**WASTE**

Liquid and solid non-hazardous and hazardous waste management
Our expertise covers the entire waste life cycle from collection to recycling, leading.

**ENERGY**

Energy efficiency, efficient management of heating and cooling networks, green energy production.
Our key figures for 2017

- **WATER**
  - 25,125 M€ revenue
  - 168,800 employees
  - 96 million people supplied with drinking water
  - 4,117 drinking water treatment plants managed
  - 62 million people connected to wastewater systems
  - 2,878 wastewater treatment plants operated
  - 40 million people provided with collection services on behalf of municipalities
  - 47 million metric tons of treated waste
  - 737,977 business customers
  - 579 waste treatment facilities operated

- **WASTE**
  - 45 million MWh produced
  - 2,291 industrial sites managed
  - 40,210 heating installations managed

- **ENERGY**
  - 595 heating and cooling networks operated
An integrated global group

€25,125 M revenue
168,800 employees

AFRICA MIDDLE EAST
€1,741 M revenue
12,375 employees

ASIA OCEANIA
€2,945.9 M revenue
22,690 employees

NORTH AMERICA
€2,396.8 M revenue
8,593 employees

LATIN AMERICA
€840.6 M revenue
12,441 employees

FRANCE
€7,682.9 M revenue
50,337 employees

EUROPE
€9,517.4 M revenue
62,364 employees

46% Industrial sector
54% Municipal sector

April 2018

www.railway-asset-management.org
Asset Management

Asset Management as a transformation tool

Asset Management Policy

Asset Management Strategy
- People
- Process
- Tools

April 2018
Asset Management Global Policy

(1) Achieve the levels of service our customers require

(2) Manage asset risks and performance to ensure lowest life-cycle costs

(3) Continuously improve our AM service portfolio to deliver best value to stakeholders
Corporate Policy → Business Unit Strategies
Asset Management Strategy - People 1/2 - Our specialists network

A dedicated group of experts

- 1500 practitioners around the world to drive improvement and share best practices
Asset Management Strategy - People 2/2 - Shared resources

- Standards and reference documents
- Learning from Experience
- Best Practices
- Forums
Asset Management Strategy - Process 1/2 - Shared resources

- Identification of the tool box(es)
- Definition of minimum standards per activity
- Organise to have the teams ready
- Kpi’s to monitor the implementation and progress
Structured reporting

- Use of robusts and shared EAMs
When it comes to mid/long terms strategy, how to make sure that the decisions taken are optimised and documented?

Introduction of advanced decision making tools.
Asset Management Strategy - Asking the right questions...

Where is my need?

- Are the intervals of my maintenance activities correct, considering my costs and the risks to which I am exposed?
- What opportunities do I have to bundle my major maintenance shutdowns at an optimum time?
- What should be my investment priorities, considering my budget constraints?
- When is the optimum moment of replacement of my equipment?
- Do I size correctly my stock of spare parts, with an acceptable risk level?
- How can I track the actions of my asset management strategy?
- How can I be supported for the implementation of a strategy in accordance with the requirements of the ISO 55000 standards?
Asset Management Strategy - DMT 1/5 - Creation of Base scenario

TCO breakdown at 12th year and 25th year for a 25% risk appetite (RA) (MAED)

<table>
<thead>
<tr>
<th></th>
<th>Reference Plant 1</th>
<th>Reference Plant 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>12th year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penalties</td>
<td>121</td>
<td></td>
</tr>
<tr>
<td>OPEX</td>
<td>44.8</td>
<td></td>
</tr>
<tr>
<td>CAPEX (Renewal)</td>
<td>17.61</td>
<td></td>
</tr>
<tr>
<td>(Renewal)</td>
<td>22.59</td>
<td></td>
</tr>
<tr>
<td>Initial CAPEX</td>
<td>35.7</td>
<td>52.03</td>
</tr>
<tr>
<td>25th year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penalties</td>
<td>171.64</td>
<td>306</td>
</tr>
<tr>
<td>OPEX</td>
<td>46.77</td>
<td></td>
</tr>
<tr>
<td>CAPEX (Renewal)</td>
<td>27.7</td>
<td></td>
</tr>
<tr>
<td>(Renewal)</td>
<td>20.66</td>
<td></td>
</tr>
<tr>
<td>Initial CAPEX</td>
<td>35.7</td>
<td>28.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20.11</td>
</tr>
</tbody>
</table>

- At 100% flow, **potential penalties represents 28% to 56% of TCO at 25% Risk Appetite.**

- **76% of this penalty risk is linked to second phase of operation (12th-25th year)** where critical components (inlet pumps, TSE, centrifuges) reach the end of their life cycle.

- First potential penalties at 100% flow appears at **year 4 in Plant 1** and year 5 in Plant 2.
### Potential optimisation levers

<table>
<thead>
<tr>
<th>Leverage</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Lever 1</td>
<td>Increase or decrease the frequency of overhaulings</td>
</tr>
<tr>
<td>Lever 2</td>
<td>Increase or decrease the number of overhaulings before renewal</td>
</tr>
<tr>
<td>Lever 3</td>
<td>Use a condition based maintenance policy</td>
</tr>
<tr>
<td>Lever 4</td>
<td>Increase the number of spare assets</td>
</tr>
<tr>
<td>Lever 5</td>
<td>Improve the efficiency of condition monitoring</td>
</tr>
<tr>
<td>Lever 6</td>
<td>Change the design of an asset family (equipment quality, redundancy level)</td>
</tr>
<tr>
<td>Lever 7</td>
<td>Try a new technology for a given asset</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

- Alternative maintenance scenarios using one or more of these leverages were collaboratively defined and tested for each asset family.
Asset Management Strategy - DMT 3/5 - Decision Making tools

Current strategy

Individual optimum (Maintenance)

Global optimum

Getting the best frequency for the major maintenance activity, with controlled costs and risks
Asset Management Strategy - Tools 4/5 - Decision Making tools

RESULTS (example)

- **HPP**: On the 3rd scenario, having 2 pumps in stock compared to repair kits generates a profit of **41 000 Euros**

### Stock: replacement kits

<table>
<thead>
<tr>
<th>Code Actif</th>
<th>Stock ACT</th>
<th>Stock OPT</th>
<th>GAIN STOCK</th>
<th>IET ACT</th>
<th>IET OPT</th>
<th>GAIN IET</th>
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<tbody>
<tr>
<td>HPP_SLOW_SC1-B_SPARE_KIT</td>
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<td>71162</td>
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<td>-1</td>
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<td>1</td>
<td>0</td>
<td>97534</td>
<td>97534</td>
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<tr>
<td>HPM_SLOW_SC3-B_SPARE_KIT</td>
<td>1</td>
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<td>1</td>
<td>133484</td>
<td>132851</td>
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<tr>
<td>RPP_SLOW_SC1-B_SPARE_KIT</td>
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<tr>
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<td>98827</td>
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<tr>
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<td>2</td>
<td>2</td>
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<td>131761</td>
<td>8%</td>
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<tr>
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<td>66970</td>
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<td>2</td>
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<td>101092</td>
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</table>

### Stock: complete asset

<table>
<thead>
<tr>
<th>Code Actif</th>
<th>Stock ACT</th>
<th>Stock OPT</th>
<th>GAIN STOCK</th>
<th>IET ACT</th>
<th>IET OPT</th>
<th>GAIN IET</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPP_SLOW_SC1-A_FULL</td>
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<td>22840</td>
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<tr>
<td>HPM_SLOW_SC2-A_FULL</td>
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<td>1</td>
<td>0</td>
<td>20192</td>
<td>20192</td>
<td>0%</td>
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<tr>
<td>HPM_SLOW_SC3-A_FULL</td>
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<td>1</td>
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<td>2</td>
<td>1</td>
<td>31167</td>
<td>20666</td>
<td>34%</td>
</tr>
</tbody>
</table>

Supporting or challenging the strategic choices of parts stock sizing, with an acceptable risk level
results 1

- Replacement **identically**
- → Renewal **8 years** (LCC purchase)

results 2

- Replacement with equipment **more efficient**
  - CAPEX <5K
  - Operational Costs <1K
- Renewal → **7-year**
- → **gain of 85K** on the economic horizon (25 years)

Determining **the best renewal strategy**, and the optimum moment of replacement
In a nutshell, Veolia uses Asset Management to:

- Make sure to deliver compliance to our client (Reliability, Safety)
- Take into consideration all factors for better documented decision making
- Bring sustainability and resilience to our client and our business
Any questions?