Global Industrialisering & Produktkonfigurering
Agenda

1. Introduction to Aalborg Industries
2. Why Product Configuration?
3. The Standardisation Process
4. Challenges
5. Demonstration of Configuration Tool
Global market leader (Marine boilers and energy equipment)

Owned by Danish investors group headed by Axcel

Production area: 80,000 m² in the Aalborg Industries Group

Employees AI Group: 1,412
in Aalborg
455
225 blue-collar workers
230 white-collar workers

Quality certifications
ASME Boiler and Pressure Vessel codes “S”
and NBBI’s “R” since 1986
LRS, DNV, BV, NK, RINA, CS, KS, ABS, AT.
Aalborg Industries
History

- 1912  Aalborg Shipyard established
- 1919  First Aalborg boiler (Scotch marine type)
- 1930's New types of boilers developed
- 1937  Danish J. Lauritzen Holding (shipowners) acquired Aalborg Shipyard
- 1944  First power station boilers built
- 1978  First after sales service company established in Singapore
- 1980  Production of large industrial power plants
- 1988  Burner company acquired (KB burners)
- 1990  Heat exchanger / incinerator company acquired, A/S Vesta
- 1995  The Sunrod Group (marine boilers and heat exchangers) acquired from ABB
- 1997  Zurn Energy Division (HRSG & Keystone® Package Boilers) acquired from Zurn Industries Inc.
- 1997  Pipemasters Oy (UNEX™ marine and industrial boilers) acquired from Finnyards Oy
- 1998  Name change to Aalborg Industries as per 1st September 98 for all group companies
- 1999  Acquisition of Wiesloch (thermal fluid heating systems), The Netherlands
- 2000  Aalborg Industries acquired by Danish investors group headed by Axcel
- 2000  Acquisition of ATA Combustão Técnica, Brazil boilers from Mitsubishi, Japan.
- 2001  Subsidiary Ciserv AB, Sweden, sold to Wärtsilä, Finland
- 2002  Subsidiary Aalborg Industries Inc., USA, sold to Daekyung Machinery & Engineering Co. Ltd., Korea
Industrialization of Boiler Manufacturing
KEDEL

DAMP

Damp

Vand
Three pass smoke tube boiler

- Steam space
- Saturated steam
- Saturated water
- Steam outlet
- Pass 3 tube
- Pass 2 tube
- Flue gas to stack
- 10 bar 184 °C
- 400 °C
- 220 °C
- 1000°C
- 2000 °C
- Burner
- Oil
- Combustion Air
- Feed water inlet
- Internal Reversal chamber
- Furnace
Aalborg Industries
Business areas

- Marine Boilers
- Heat Recovery Steam Generators
- Industrial Boilers
- Heat Exchangers
- Inert Gas Systems
Complete solutions

Exhaust gas economisers
Composite boilers

Heat exchangers
Coolers
Condensers
Cargo heaters

Oil-fired boilers

Inert Gas Systems
Agenda

1. Introduction to Aalborg Industries
2. Why Product Configuration?
3. The Standardisation Process
4. Challenges
5. Demonstration of Configuration Tool
Competitiveness through Standardisation

- Quicker and more precise clarification with the customer
- Increased application of prefabrication
  (From unit production till mass-produced components)
- Increased automation of the order process
- Reduction of mistakes.
- Stronger purchasing power
  (Volume / stock purchase)
Improvement of Business Relationship with our Customers

- Improve the basis for shipyard’s competitiveness through:
  - Improved the communication
    Clarification of technical requirements early in project
  - Fast documentation “up-front”
  - Reduction of lead times
  - Fast response on changes
  - Fast installation and commissioning
  - Less faults
  - 3D models of boiler and other major components
  - In future the Product Configurator allows the customer to design their boiler plant themselves
Agenda

1. Introduction to Aalborg Industries
2. Why Product Configuration?
3. The Standardisation Process
4. Challenges
5. Demonstration of Configuration Tool
Overlapping Boiler Products

Boilers in Grey Italic has no sales record in 2001
Grouping of Products

Boilers in Grey *Italic* has no sales record in 2001
Standardisation into Product Families
Configuration of Boiler Plants
(Complete Systems)
Consolidating "Best Practice"
Predefined Concepts and well-defined Options

Concept # 1
- 2 x MISSION OL
- 1 x MISSION XW
- 1 x Power Panel
- 1 x Feed Water Pumps
- 1 x Circulation Pump
- 1 x Fuel Oil Unit

Concept # 2
- 2 x MISSION OL
- 1 x MISSION XW
- 1 x Power Panel
- 1 x Feed Water Pumps
- 1 x Circulation Pump
- 1 x Fuel Oil Unit

Concept # 7
- 2 x MISSION OL
- 1 x MISSION XS
- 1 x Power Panel
- 1 x Feed Water Pumps
- 1 x Circulation Pump
- 1 x Fuel Oil Unit

Concept # 9
- 2 x MISSION OM
- 1 x MISSION XW
- 1 x Power Panel
- 1 x Feed Water Pumps
- 1 x Circulation Pump
- 1 x Fuel Oil Unit

Container ships
Crude carriers
Gas tankers
Cruise ships
Intelligent Product Configuration Tool

Customer Options
Class Rules
Engineering Experience
Production Experience

Product Configuration Tool
Consistent and well-proven Solutions
Documentation and Drawings from the Product Configurator

- **Price Calculation**
- **Documentation**
- **Drawings**

Configuration tool
Product Family Master Plan

Relationships between service level and transformer

§ If the required service level is essential a transformer and a cabinet separator is mandatory

Relationships between power and the ammeter

§ Use of Ampmeter is optional but if the power is greater than 11Kw a transformer is mandatory

Rules and relations

The preferred class of water and steam section depends on the required steam pressure and the required steamflow. But here are all the classes can be designed for the required pressure range and steam flow range but the plate scantlings will increase dramatically. The typical solution are expressed in the following table

<table>
<thead>
<tr>
<th>Steam pressure (barg)</th>
<th>Steam flow (t/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>30</td>
<td>18</td>
</tr>
<tr>
<td>40</td>
<td>18</td>
</tr>
<tr>
<td>50</td>
<td>18</td>
</tr>
<tr>
<td>60</td>
<td>18</td>
</tr>
<tr>
<td>70</td>
<td>18</td>
</tr>
<tr>
<td>80</td>
<td>18</td>
</tr>
<tr>
<td>90</td>
<td>18</td>
</tr>
</tbody>
</table>

Water level control

Forced circulation system

Water treatment

Main steam system

Exhaust system

"Part-of" model

"Kind-of" model
Variability has a Cost!

- Component
  - Maker [..., .......]
  - Dimension [..., .......]

- Auxilleries
  - Circulation pump unit
    - [0, 1]

- Control system
  - Relay
  - PLC
  - Microprocessor

Variability
Configurable Boiler Plants
supporting Market Demands

Heat and steam generating system
- Type (oilfired, gasfired, WHR, combi)
- Orientation (Vertical, horizontal)
- Burner position (Top, Side)
- Sandbluss [none, SA2.5]
- Paint color [Red, Silver (heat resistant)]

Pressure part

Boiler equipment

Burner system

Controlsystem

Auxilleries

Water / steam system
- Water level control
- Forced circulation system
- Water treatment
- Main steam system
- Exhaust system

NB: Attributes for "Heat and steam generating system" are specified on separate sheet (as "Functional attributes").
Sales and Order Execution

Configuration tool

Customer

Has a need

Quote

Drawing and/or 3D model

Configurator uses rules to select a product family and configure a valid solution

Product platform rules (Predefined Standards)

ERP System

Makes Bill-of-Material

Bill-of-Material is attached to the order in the ERP system

ERP system containing AI items and operations (cutting, welding, etc.).

Item Catalogue

Operation Catalogue

§ § §

Platform rules refer to AI items and operation
Agenda

1. Introduction to Aalborg Industries
2. Why Product Configuration?
3. The Standardisation Process
4. Challenges
5. Demonstration of Configuration Tool
Challenges

• Global Similarities vs. Local Differences
  – Market requirements (e.g. DIN/JIS flanges)
  – Material standards (e.g. EN/GB/NK standards)

• The configurable product platform is not complete

• To handle *partly* configurable solutions

• The order portfolio - long horizon

• Repeat orders
Challenges (Cont.)

Production Sites

Configured Boiler Plant

Order Execution – Etc.
Order Execution - AAL
Order Execution - UKB
Order Execution - PUS

Delivered Boiler Plants

Sales

Ordered Boiler Plants

Suppliers

Production Sites

TAO
AAL
RIO
JKT
Sales and Order Execution Reference Model

100% Scope of Delivery Defined

Sales & Order Execution

Customer interest phase → Concept Sale → Need → Customer Order Received → Order Processing Phase → Order Manufacturing and Delivery Phase → Shipment & Commissioning → After Sales & Maintenance

Customer → Sales & Sales Support → Order-processing → Production & Material Planning → Production → Delivery Accepted by Customer
Sales and Order Execution Reference Model

Customer → Sales & Sales Support → Order-processing → Production & Material Planning → Production → Shipment & Commissioning → After Sales & Maintenance

Scope of Delivery Defined

100 %

Customer Interest Phase → Sales Phase → Order Processing Phase → Order Manufacturing and Delivery Phase → Maintenance Phase

Customer Order Received → Delivery Accepted by Customer
Sales and Order Execution
Reference Model

Customer → Sales & Sales Support → Order-processing → Production & Material Planning → Production → Shipment & Commissioning → After Sales & Maintenance

Scope of Delivery Defined
100%

Sales & Order Execution

Customer Interest Phase → Sales Phase → Order Processing Phase → Order Manufacturing and Delivery Phase → Maintenance Phase

Customer Order Received

Preferred Engineering
Sales and Order Execution Reference Model

Customer → Sales & Sales Support → Order-processing → Production & Material Planning → Production → Shipment & Commissioning → After Sales & Maintenance

Scope of Delivery Defined

100 %

Sales & Order Execution

Customer Interest Phase → Sales Phase → Order Processing Phase → Order Manufacturing and Delivery Phase → Maintenance Phase

Customer Order Received

Delivery Accepted by Customer

Optimal
Sales and Order Execution Reference Model

Customer → Sales & Sales Support → Order-processing → Production & Material Planning → Production → Shipment & Commissioning → After Sales & Maintenance

Scope of Delivery Defined

100%

Web Sales

Customer Interest Phase → Sales Phase → Order Processing Phase → Order Manufacturing and Delivery Phase → Maintenance Phase

Customer Order Received → Delivery Accepted by Customer
Challenges (Cont.)

Shipyard’s Value Chain

Initial Design → Purchasing → Project Design → Boiler Installation

- Boiler Plant Specification
- Scope of Supply
- Boiler Performance
- P&I Diagrams / List of Parts
- Installation Manual

- 3D Boiler Model
- Arrangement Drawings
- Instructions & Datasheets

- As-build Documentation
- Maintenance Manual
Agenda

1. Introduction to Aalborg Industries
2. Why Product Configuration?
3. The Standardisation Process
4. Challenges
5. Demonstration of Configuration Tool
Sales and Order Execution of Configured Solutions

Request

Create/Update Request

Configure Product

Calculate Price

Documents to Customer

Documents for Order Execution

Production Sites

Create Documentation

Non-Configurable Add-On

E.g.
- MISSION™ OS
- Special Pump Unit

TeSAI

Engineering

Price Calculation

Customer

Documents to Customer
Demonstration of the Product Configuration System
Some Experiences

Economical
- Initial cost (investment)
- Increased maintenance cost
- Long term saving

Organisation and workflow
- Changed workflow
- Changed work contents
- Changed skill requirements
- Changed organisation

Non-configurable solutions
- Difficult and complex
- Time consuming
- Availability of skill
Thank you for your attention!