BALLAST WATER MANAGEMENT SYSTEM RETROFIT

Conceptia Software Technologies Pvt. Ltd.
Naval Architecture & Marine Engineering Division
TYPICAL PROJECT FLOW

VESSEL SURVEY & 3D SCAN

FEASIBILITY STUDY & SYSTEM SELECTION

DETAILED RETROFIT ENGINEERING & CLASS APPROVAL & WORKSHOP DOCUMENTATION

COMMISSIONING

INSTALLATION & PROJECT MGMT.

PROCUREMENT & PRE-FABRICATION
Field experts from Conceptia would visit the vessel onboard to do a complete visual survey and interact with crew. This survey can be done even when the vessel is in service and thereby avoiding any associated downtimes.

Onboard Survey is conducted with focus on following aspects:

I. Space Availability
II. Fresh Water
III. Compressed Air Demands
IV. Electrical Power Demand and Electrical connections
V. Sludge discharges
VI. Foundation and Structural Integration
VII. Control System Integration
VIII. 3D Scanning
VESSEL SURVEY & 3D SCAN

- A 3D cloud points would be utilized in integrating BWMS with the existing system, as a reference.

- Conceptia will initiate feasibility study for retrofitting the vessel with BWMTS.

- The feasibility study is started out by integrating existing Ballast P&ID with BWTS.

- In the 3D scan, the basic 3D models of the equipment to be retrofitted and the piping models are modeled to work out the feasibility of the retrofitting the equipment onboard.
FEASIBILITY STUDY AND SYSTEM SELECTION

Few snaps from CADMATIC for the project that Conceptia is working on:
Based on the feasibility study, the customer would be provided with the best possible solution to successfully integrate the BWMS system considering the following aspects:

I. Selection of suitable BWTS by close communication with Equipment manufacturer and Ship Owner to suit their requirement.

II. Load balance calculation considering vessel’s operating regimes and available power generator capacities onboard.
FEASIBILITY STUDY AND SYSTEM SELECTION

I. Best location for the components of the equipment based on

   a. Spatial analysis in line with installation requirements of the equipment
   b. Suitability of existing ballast pumps with details on operating points based on flow analysis
1. For the preliminary calculation, pressure drop for the whole BWTS is considered as a single component.

2. For the analysis, Flow Pressure Valve (FPV) is set to maintain the flow of 1400 m³/hr to be in line with the filter's maximum flow rate, though FPV is to maintain a flow rate of 1503 m³/hr (in IMO mode).
Pump operating point snap
c. Suitability of existing stripping eductor in conjunction with the retrofitted BWTS during de-ballast operations.

II. Philosophy of Control system integration with Ship’s existing IAS
Once the feasibility of retrofitting the vessel with BWMS is established and accepted by the crew and owner, Conceptia will commence the detail design engineering to retrofit the vessel.

Deliverables starting from schematic diagrams till spool drawings, penetration details, production drawings for structural modifications, shipping in & unshipping routes, pre-fabrication and assembly details, etc. would be produced as a part of the detailed engineering.

Conceptia shall submit the complete design documentation for the yard to schedule the production phases to align with vessel’s retrofit duration.

Conceptia can optionally support the production yard in production, procurement of BWMS system, etc. till the system is commissioned and crew members are trained. As a part of the retrofit design process, Conceptia shall get Ballast Water Management Plan approved by the regulatory bodies.
Piping model snaps from our previous projects
DETAILED RETROFIT ENGINEERING

Fifteen glorious years of service to industry & customers

Piping model snaps from CADMATIC from previous projects
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CADMATIC Pipe isometrics snaps from previous projects
Detailed Flow Calculations – Once the equipment and piping arrangement has been finalized, detailed modeling will be done, the flow calculations are carried out for the system with the detailed arrangements for the following operations.

- Ballasting
- De-ballasting
- Stripping

Complete Pipe and Valve MTO will be provided for the system for the procurement of materials, including installation drawings for shipyard.
Structure

I. Structural foundations would be analyzed using FEA and design criteria are based on applicable Classification society rules.

II. Structural foundations will be modelled in detail design software and production information will be extracted.
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FEA analysis snapshots from previous projects

8/28/2019
DETAILED RETROFIT ENGINEERING

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CADMATIC structural detail design drawing snaps from previous projects
## PIPING

<table>
<thead>
<tr>
<th>Deliverable</th>
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</thead>
<tbody>
<tr>
<td>Piping Diagram – BWMS integrated with existing BWS</td>
</tr>
<tr>
<td>BWMS Operation Manual</td>
</tr>
<tr>
<td>Ballast Water Management Plan (D1/D1&amp;D2/D2)</td>
</tr>
<tr>
<td>Type Approval Certificate (TAC)</td>
</tr>
<tr>
<td>Hazard Analysis (If Applicable)</td>
</tr>
<tr>
<td>Commissioning Procedure</td>
</tr>
<tr>
<td>Bilge &amp; Ventilation piping diagram</td>
</tr>
<tr>
<td>Piping Diagram – Fresh Water, Compressed Air System (As Applicable)</td>
</tr>
<tr>
<td>Updated General Arrangement</td>
</tr>
<tr>
<td>3D Model</td>
</tr>
<tr>
<td>Piping MTO</td>
</tr>
</tbody>
</table>
## Typical Deliverables List

### STABILITY

<table>
<thead>
<tr>
<th>Deliverable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lightship Calculation</td>
</tr>
<tr>
<td>Inclining test report (If Applicable)</td>
</tr>
<tr>
<td>New Trim and Stability booklet (If Applicable)</td>
</tr>
<tr>
<td>An updated Watertight integrity plan (If Applicable)</td>
</tr>
<tr>
<td>New Damage Stability calculations (If Applicable)</td>
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</tbody>
</table>

### STRUCTURE

<table>
<thead>
<tr>
<th>Deliverable</th>
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</thead>
<tbody>
<tr>
<td>Updated structural drawings (If Applicable)</td>
</tr>
<tr>
<td>Foundation Drawings</td>
</tr>
<tr>
<td>Structural Calculation Report</td>
</tr>
<tr>
<td>Structural MTO</td>
</tr>
</tbody>
</table>
### FEASIBILITY REPORT

Feasibility Report for Installing BWMS onboard

### ELECTRICAL

- Description of changes
- Updated electrical power single line diagram
- Making and breaking capacities of new circuit breakers
- Updated electric load balance
- Selectivity between new circuit breakers and upstream existing circuit breakers
- Emergency stop of new fans (if relevant)
- Updated EX documentation (As applicable)
- Cable and Cable Tray MTO
## Typical Deliverables List

### CONTROL SYSTEMS
- Interphase description
- Environmental testing (I080) or data sheets of components (If Applicable)

### FIRE SAFETY
- Structural fire safety integrity, detection, escape arrangement etc. (If Applicable)
- Cargo Ship Safety Certificate and Cargo Ship Safety Equipment Certificate (If Applicable)

### PRODUCTION DRAWINGS
- Piping Production Drawings
- Electrical Production Drawings
- Structural Production Drawings
## TYPICAL PROJECT TIMELINE

<table>
<thead>
<tr>
<th>RETROFIT PHASES</th>
<th>DURATION</th>
</tr>
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<tbody>
<tr>
<td>Preparation, Onboard 3D Scanning &amp; Survey</td>
<td>4 Weeks</td>
</tr>
<tr>
<td>Conceptia Retrofit Design (Including Feasibility Study)</td>
<td>8 Weeks</td>
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<tr>
<td>Class Approval Time</td>
<td>2 Weeks</td>
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<tr>
<td>Shipyard Preparation time on designer's inputs</td>
<td>3 Weeks</td>
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<tr>
<td>Shipyard Retrofit Work</td>
<td>6 Weeks</td>
</tr>
<tr>
<td>Scheduled Special survey of the vessel</td>
<td>NA</td>
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</tbody>
</table>
The software that are used for a typical BWMS retrofit project are as follows:

I. CADMATIC – for detail and production design of structure and piping
II. Solid Works – for FEA for equipment foundation analysis
III. Auto CAD – for drawings
IV. Pipe Flow – for Flow Calculations
V. Naviswork Freedom