

Flowmaster integration provides, flexible onboard simulation solution to reduce component failure and maintenance costs

*“The ability to integrate Flowmaster into a front end spreadsheet program, enabled us to provide our engineers with a fully capable and adaptable simulation package, able to be rapidly and easily tuned to actual real world onboard operating line-ups.”*

David Millar,  
Senior Design Engineer.  
Babcock Marine

### Overview

Babcock Marine is the UK's premier naval support contractor. It owns and operates both Devonport and Rosyth Royal Dockyards and manages the Clyde Submarine Base at Faslane. Babcock Marine is the sole support partner for the Royal Navy's submarine force and is a major partner in the provision of support to the current surface fleet and to the future aircraft carrier programme. Flowmaster is used within Babcock Marine's Design and Technology Mechanical Engineering Group, which offers front-end design, analysis and through-life support solutions.

Babcock Marine was contracted by the Ministry of Defence (MoD) to investigate and propose solutions to frequent component failures within the Sea Water fire mains systems onboard both the HMS Albion and HMS Bulwark vessels. To carry out the required number of system tests as fast and efficiently as possible, Babcock Marine utilised Flowmaster's integration capabilities

by linking the software with Microsoft® Excel to cleverly drive multiple 'Real World' testing line-ups and immediately extract results from the Flowmaster model, all via one 'Front End' diagrammatical spreadsheet.





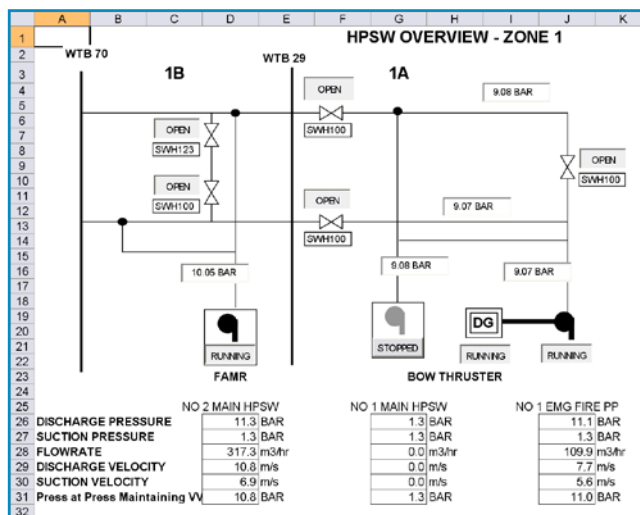
## Design and Integration

Due to the size and complexity of the ship's system (5 Fire, 2 Normal Demand and 2 Emergency pumps connected into a ring main with numerous cooling demands and fire fighting spray systems) Babcock Marine decided to develop a custom user interface designed to mimic the look and behaviour of the current ship's onboard system management software. This custom interface was developed in Microsoft Excel and fully integrated with Flowmaster, enabling service engineers to run simulations and view results through a familiar software environment.

The activation of pumps and valves could be simulated through the spreadsheet by clicking on symbols. The valve and pump status were automatically updated in Flowmaster when the simulations were run.

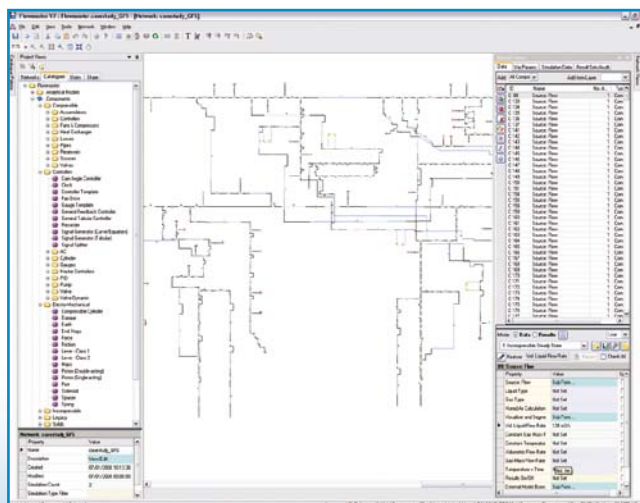
### 1. Babcock's Custom User Interface

Designed to mimic current onboard system management software



### 2. Flowmaster

Reading in the test data and carrying out the simulation



3. Flowmaster Results Fed Back Into User Interface

To improve efficiency, certain systems were grouped together so for example; all fire fighting sprays could be turned on in a certain zone through the click of one button, enabling the operator to model different operating scenarios.

The integration of Babcock Marine's user interface enabled engineers to validate the system designs in Flowmaster quickly and easily. Aspects, such as the effects of the pump degradation and defective pressure control valves could be quickly ascertained and decisions to whether the system would perform under ideal conditions and actual "worn" conditions could be made with confidence.

To add clarity to the results, pressure readings were automatically extracted from the Flowmaster model at the actual positions of the onboard remote pressure indication. These readings were superimposed onto the model diagrammatic to give direct correlation with the readings visible on the onboard control programs.

## Onboard Simulation and Validation

To measure the performance of the Flowmaster model, a true life level of demand needed to be established. Extensive onboard testing using ultrasonic flow measurement and various system line-ups were carried out to record the actual flow demands on the cooling systems.

Flowmaster together with Babcock Marine's spreadsheet based user interface was used onboard to run 'what if' scenarios which were then replicated in the actual 'Live' system, with the predicted results compared to the actual system performance. These tests proved invaluable in building up an understanding of system performance requirements, the reasons behind the problems being experienced and ultimately enabled Babcock Marine to recommend design improvements that would reduce any further component failures.

This project clearly demonstrates Flowmaster's ability to integrate with third party software, to enable engineers to simulate real onboard operating line-ups, utilising Flowmaster's technical capability through one simple user interface.