From: Steve Burchill

Ministry of Defence

Equipment Support (Sea)/
Warship Support Agency
Marine Auxiliary Systems
DCAPE, Fir 1b #4110,
Abbey Wood,
Bristol, BS34 8JH
(BT: 0117 91 39580) (MoD 9352 39580)
(Fax: 0117 91 39903)

Hale Hamilton Valves
Cowley Road
Uxbridge
Middlesex
UB8 2AF

Reference: MXS/ACF/Trial Report

DATE: 05TH MARCH 2007

Attention of Mr Bill Dormer

Dear Bill,

MXS Auto Charge Facility – Final Trial Report

Please find attached for your information and retention the final report on the Hale Hamilton Automated Charge Facility fitted to HMS OCEAN.

Yours faithfully,

Steve Burchill

Deputy Compressed Air and Pipework Engineering
ABW 39580
mxsdcape@wsa.dlo.mod.uk

HMS Ocean
Minor Trial Report “FBG”

Hale Hamilton (Valves) Limited
AUTOCHARGE
Automated Cylinder Filling (ACF) System

July to December
2006

Originating author:
CPOMEA (ML) J.D.Moore R.N.
MXS IPT ACF Trial PTO

MOD MXS IPT
Abbey Wood
Bristol

Approved and Issued by:
Commander J. Merritt
MXS IPT
March 2007

Summary

The Hale Hamilton ACF unit successfully proved during the course of an extended Minor Trial to be a welcome addition to the Breathing Air Charging Arrangements onboard HMS Ocean. It proved to be an extremely valuable addition, which all ranks of the ship's company have found to be easy to operate.

As ship borne manpower is further reduced, the ability to correctly charge more than one BA bottle at a time in a heightened NBCD state is an absolute must. This coupled with the "man hour" savings obtained in its day to day use for routine BA bottle charging and the knowledge that the bottles have been charged at the correct fill rate means that MXS IPT can fully endorse the use of the Hale Hamilton ACF system on Royal Navy platforms.

Introduction

The Automated Cylinder Filling (ACF) system was developed for Naval application by Hale Hamilton (Valves) Limited of Uxbridge, England from their proven Industrial gas filling application in-service with BOC Gases in the UK.

Hale Hamilton, in conjunction with the Defence Logistics Organisation's (DLO) Marine Auxiliary Systems Integrated Project Team (MXS IPT), first installed a prototype unit for trial ashore at the Royal Naval School of Fire-fighting (Phoenix), in HMS Excellent in October 2004. The ACF system proved to be a welcome enhancement to the existing BA charging facilities. The unit was put into constant use and was well received by both the Phoenix staff and their trainees, with their EDBA sets being consistently charged with a uniform, fixed mass of air and in half the time and with far greater precision than was being achieved using their existing manual BA Charging Panels.

As a result of the positive feedback received from Phoenix, permission was then sought from The Royal Navy "Fleet Engineering Organisation" to conduct a six month Minor Trial of an ACF system fitted complete with a domnick hunter HPBA Breathing Air 'clean up pack' onboard HMS OCEAN. Approval for this "Minor Trial" was given and the installation of the trial ACF system commenced on the 26 July 2006.

Minor Trial

The installation of the ACF system on board HMS Ocean was undertaken at DML in Plymouth and with this fully complete DML Laboratory testing confirmed that the air passing through the unit was in compliance with Def-Stan 68-284 "Compressed Breathing Gases for Aircraft, Diving and Marine Life-Support Applications" Issue 2, 8 November 2002. Ship's staff began to use the ACF system routinely in August 2006 to charge EDBA bottles.

Results

A log book was established for all users of the ACF system to make their comments. Overall the written feed back received was very positive, especially with respect to the "ease of use" and the amount of "time saved" when charging more than one bottle.

During several liaison visits, MXS IPT personnel sought the views of both Officers and Ratings; these too were extremely positive and re-enforced the benefits of using this equipment in preference to the existing manual BA Charging Panels, especially when used post Damage Control and Fire-Fighting training exercises.

Reported defects

During the course of the trial the following recurrent defects were reported to MXS IPT by CPOMEA Paterson (HMS Ocean's HP Air maintainer).

1. Incorrect operation of charging hose end non-return valves, facilitating free passage of High Pressure Air through unused hoses (if less than five bottles were being charged); resulting in ship's staff being unable to use the ACF system until the maintainer had inspected the hose end valves and rectified the defect.
2. Constant losses of hose end valve 'o' seals; resulting in ship's staff having to replace 'o' seals on approx 75% of operations, with increased charging times as a result.
3. Hose end valves failed to seat correctly when attached to EDBA bottles, allowing air to pass through the bottle "Tell Tale" on connection to the ACF system in preparation for charging; resulting in ship's staff being unable to use the ACF system.

Rectification actions

The above defects were rectified as follows:-

- Defect 1 was initially addressed by fitting a replacement distribution manifold which incorporated manual isolation valves on four of the five charging 'legs' (Note 1 - see Post Trial Recommendations). This enhancement facilitated quick isolation of the air to affected hoses and enabled continued use of the ACF system. Subsequently, Hale Hamilton redesigned the hose end non-return valves to ensure correct operation.

- Defect 2 was initially addressed in the supply of different 'o' seals direct from Hale Hamilton; however, whilst the number of occurrences of the problem reduced, it was still a fairly regular occurrence. Further investigations revealed that the 'o' seal grooves had been machined incorrectly. Replacement hose end connections were manufactured and fitted in conjunction with the hose end valves as detailed above and these actions reduced the number of reported occurrences to a similar level to those experienced at manual BA Charging Panels.

- Defect 3 was addressed by a combination of the improved hose end valve design and improved operator training.

Enhancement

During the course of the trial, enhancements were carried out with respect to the ACF system's programming, to provide the ability to test the particulate content of the Breathing Air.

Post-Trial Conclusions & Recommendations

1. MXS IPT required Hale Hamilton to fit all ACF system charging 'legs' with manual isolation valves to facilitate the continued use of the system in the likely event of damage to one or more of the charging hoses when in use in the "Action scenario".

2. MXS IPT concluded that the ACF trial system should remain installed and in use on HMS Ocean. MXS IPT required Hale Hamilton to undertake a full service of the unit at the earliest opportunity and to produce an RCM based maintenance schedule.

3. Limitations – as is the case with the existing manual BA Charging Panels, the ACF system is only able to charge to the maximum available ship's HP air system pressure (max 276bar). When the ship's HP air ring main is operating at less than its maximum pressure, bottles will need to have a second charge when the ship's HP air supply has been recharged itself, to maximise the mass of gas charged. MXS IPT took an action to write a Standard Operating Procedure in this respect.

Post-script:

In light of the successful outcome of the HMS Ocean Minor Trial, MXS IPT made the recommendation to the Major Warships IPT to fit the Hale Hamilton ACF system on the new Type 45 AWD in build with Prime Contractor BAE SYSTEMS. BAE SYSTEMS subsequently contracted directly with Hale Hamilton for the supply of six ship sets, totalling 30 ACF systems. A similar recommendation to the UK Aircraft Carrier Alliance has led to Hale Hamilton receiving a Letter of Intent to supply three ship sets, totalling 18 ACF systems. (Hale Hamilton has named their system the *AUTOCHARGE*).

IN MARCH 2006, MXS IPT AND HALE HAMILTON PRESENTED A JOINTLY AUTHORED TECHNICAL PAPER "AUTOMATED CONTROL OF BREATHING AIR CYLINDER CHARGING" AT THE INSTITUTE OF NAVAL ENGINEERING MEETING IN LONDON; THIS PAPER WILL AUGMENT THE READER'S UNDERSTANDING OF THE ACF SYSTEM TECHNOLOGY.

END.