



Compatibility of "Steri-7" Sterilising Solution with Brass Grade CW614N

For the attention of:
R Fraser,
Sentinel International Ltd,
11 Batsworth Road,
Surrey CR4 3BX

CAPCIS Ref. MC5055
Rev A
April 2006

LIST OF REVISIONS

Rev No.	Date	Revision Details	Author(s)	Issued by
a	26/4/06	DRAFT	M Billingham	

This document has been prepared for the titled project or named part thereof and should not be relied upon or used for any other project without an independent check being carried out as to its suitability and prior written authority of CAPCIS Ltd being obtained. CAPCIS Ltd accepts no responsibility or liability for the consequences of this document being used for a purpose other than the purposes for which it was commissioned. Any person using or relying on the document for such other purposes agrees, and will by such use or reliance be taken to confirm his agreement to indemnify CAPCIS Ltd for all loss or damage resulting therefrom. CAPCIS Ltd accepts no responsibility or liability for this document to any party other than the person by whom it was commissioned.

CAPCIS Ltd www.capcis.co.uk		
2 Rubislaw Place ABERDEEN AB10 1XN United Kingdom t. +44(0)1224 612400 f. +44(0)1224 612401 e-mail: info@capcis.co.uk	CAPCIS House 1 Echo Street MANCHESTER M1 7DP United Kingdom t. +44(0)161 933 4000 f. +44(0)161 933 4001 web: www.capcis.com	Unit 6 Long Hanborough Business Park Long Hanborough OX29 8LH United Kingdom t. +44(0)1993 882445 f. +44(0)1993 882559

CONTENTS

Page

1.	BACKGROUND	1
2	TEST PROCEDURE.....	1
	2.1 Test Materials	1
	2.2 Test conditions.....	2
3.	RESULTS.....	3
4.	COMMENTS	3
5.	CONCLUSIONS.....	4

1. BACKGROUND

Sentinel International produce a sterilising solution product "Steri-7". End-users have queried whether the product is suitable for use with brass, specifically valves and other fittings used to handle pressurised gases. The principal concern is stress-corrosion cracking: brasses are known to be susceptible to stress-corrosion in the presence of ammonia.

Sentinel instructed Capcis to perform tests to investigate the behaviour of commercial brass in contact with the "Steri-7" product, initially both neat and at the recommended dilution for use.

2 TEST PROCEDURE

The test procedure was be in general accordance with BS EN ISO 7539-7, "Corrosion of metals and alloys – stress corrosion testing: Part 7. Slow strain rate testing".

The slow strain rate method involves slowly pulling a sample of the material to failure. Tests are performed in the environment and also in an inert or safe environment as a baseline. Advantages of this test method include:

- the test is relatively fast compared with static stress-corrosion tests;
- the test covers the whole range stress – strain range, useful when the service stress cannot be defined (as in the present case);

2.1 TEST MATERIALS

Sentinel International supplied sachets of sterilising solution, marked as making 5L when fully diluted.

Testpieces were machined from a sample of commercial grade CW614N brass provided by Capcis. This is a leaded free-cutting grade of brass, and is the grade typically used for gas cylinder regulators, valves and associated fittings. A notch was included to produce a stress concentration, similar to the thread forms on valves and fittings. The testpiece gauge length was 25.4mm, the diameter 6.35mm and notch minor diameter 4.76mm, with a 0.4mm radius at the notch tip.

2.2 TEST CONDITIONS

Duplicate testpieces were tested in the baseline condition and in diluted and neat sterilising solution, Table 1.

Table 1: Test conditions

Test Runs	Description	Comments
3,4	Potable water	baseline
5,6	Normal concentration solution	1 sachet made up to 5L with potable water
7,8	Neat solution	

The test temperature was $25\pm 2^{\circ}\text{C}$

The strain rate used was 2×10^{-7} .

The pH of the diluted sterilising solution was measured as 3.33.

The pH of the neat sterilising solution was measured as 2.78.

3. RESULTS

Table 2 contains a summary of the test data. Load extension plots are presented in Fig. 1. The mean values in potable water have been taken as the baseline.

Table 2: Test Data

Run	3	4	5	6	7	8
Environment	Potable water	Potable water	Normal dilution	Normal dilution	Neat	Neat
Peak load, kN	10.43	9.1	10.09	11.07	11.77	9.95
Peak stress, MPa	586	511	567	622	661	559
Peak stress, % of baseline			103	113	121	102
Time to failure, hours	70.5	64.75	73.25	80	76.5	70.75
Elongation at fracture, %	5.1	4.7	5.3	5.8	5.5	5.1
Elongation, % of baseline			108	118	112	104
Reduction in area, %	3.4	4.2	10.1	5.2	7.0	6.1
Reduction in area, % of baseline			266	137	185	161

It was noted that the testpieces were slightly tarnished to a similar extent in potable water and in the diluted solution. After testing in neat solution, there was a slightly darker tarnish, Fig. 2, 3. The appearance of the test solutions remained constant (clear, colourless) during testing.

4. COMMENTS

All testpieces fractured with relatively little extension or ductility, as a result of the notch. Components often contain threads or other stress concentrators, so this is considered a realistic test condition.

The performance in the diluted and neat sterilising solution was similar or slightly superior to that in potable water: the Elongation at Fracture, Peak Stress and Reduction in Area parameters were all greater in the environments than the corresponding mean values in potable water.

Grade CW614N brass is known to be sensitive to stress cracking in the presence of ammonia. At the acidic pH values measured on the product, there will be minimal free ammonia (NH₃) present. Some "ammonium" compounds, such as quaternary amines, do not contain free ammonia or ammonium (NH₄⁺) and are not generally harmful to brass.

5. CONCLUSIONS

Grade CW614N brass was tested for susceptibility to stress-corrosion cracking in both neat and diluted Sentinel International "Steri-7" sterilising solution.

The performance of grade CW614N brass in both conditions was similar or slightly superior to that in potable water. There was no evidence of the sterilising solution having an adverse affect.

On the basis of these results, Steri-7 sterilising solution is considered to be suitable for use in contact with brass gas fittings.

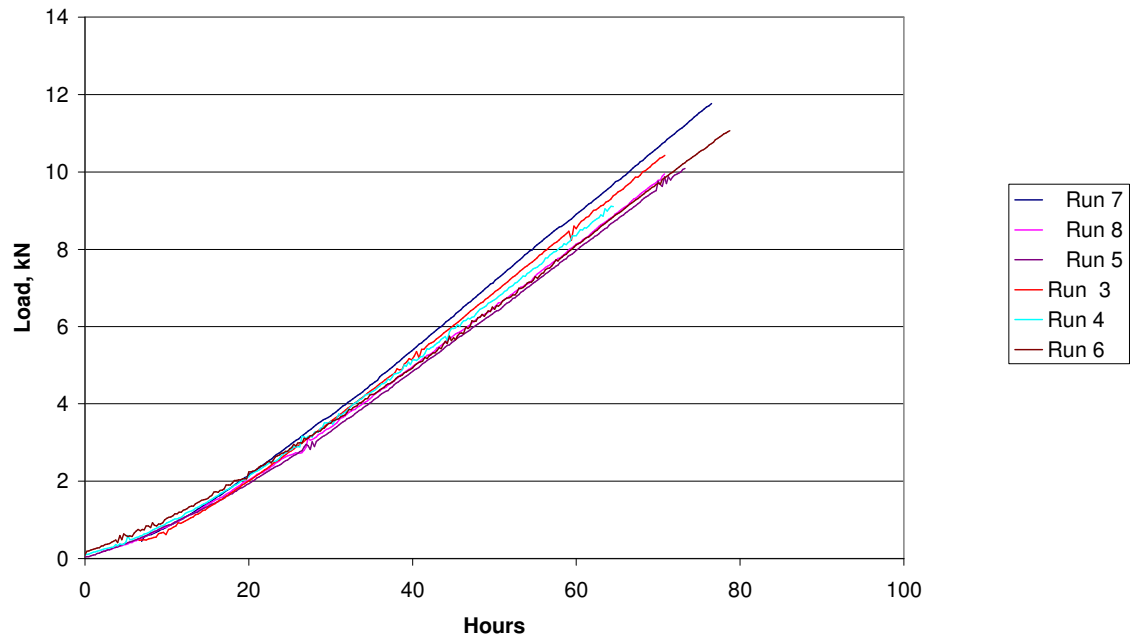


Fig. 1: Load-extension data for slow strain rate tests



Fig. 2: Testpieces 3 (potable water) and 6 (diluted solution) after exposure



Fig. 3: Testpieces 7 & 8 (neat solution) after exposure