DONCASTER ANALYTICAL SCOTLAND LTD

Report Number: S22108D
Customer Order Number: DWS 2275
Date: 19th May 2022

Assessment of wireline sample

Reference: CWR-0855 ex SARATEC

For

Danum Well Services Ltd

Testing and reporting by:

S. Lee
Metallurgist

Signed for and on behalf of
Doncaster Analytical Scotland Ltd

Doncaster Analytical Scotland Ltd.
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Company Registration: SC705392
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1.0 Introduction

The Laboratory was commissioned by Danum Well Services Ltd to assess the condition of wireline samples submitted, Figure 1.

Samples reference: **SARATEC – CWR-0855**
Test certificate **2103-064** is provided in the Appendix

2.0 Scope of work

The following was performed on the sample provided:

- Physical measurements, cast & helix and diameter
- Visual and SEM inspection of the sample surface
- EDS material verification
- Breaking load evaluation
- Wrap ductility evaluation

3.0 Results

3.1 Physical measurements

Test	DAS cert 2103-066	Current value
Cast and Helix		25” diameter with 5” hanging
Diameter:	0.1079”	0.1077 to 0.1078”

3.2 Visual inspection

Section of the line were cut and cleaned with petroleum spirit to remove any surface contamination present. Macroscopic inspection found fine longitudinal score lines present along the sample, Figure 2.

High resolution SEM images of the found them to be relatively shallow, small nicks were present, again is shallow depth, Figure 3.

3.3 Material verification

A section of line was ground with 600 grit carbide paper and PMI was performed using EDS analysis, Figure 4. Testing confirmed the line to be manufactured from SUPA 75.

3.4 Breaking load evaluation

Breaking load evaluation and wrap ductility testing was performed on the sample provided, Figure 5 shows the final test pieces.

The test pieces of the breaking load samples revealed a semi-ductile shear type fracture which are typical for a line that has been worked.

Testing found a marginal pickup of breaking load compared to the test certificate, Figure 6.

Test	DAS cert 2112-027	Current value
Breaking load	2,270 lbf	2,288 and 2,297 lbf

3.5 Wrap ductility testing

A standard wrap test was performed on the sample and achieved multiple turns without failure or surface ruptures, Figure 7.

4.0 Summary

From testing the line sample provided the following was concluded:

- Line was manufactured from SUPA 75 a 6% molybdenum super austenitic stainless steel successfully used in sour well conditions around the globe
- Small nicks are present on the surface however this has not affected the wrap ductility as testing passed without ruptures present
- There is a nominal change in diameter from 0.1079" certified to the current **0.1077**/0.1078" which indicated that line has not been heavily used.
- Breaking load has nominal increase from the original certified 2,270 lbf to the current 2,288/2,297 lbf.

The testing has found the line sample to be of acceptable condition for operational use, however continual wrap ductility testing and monitoring of the diameter should be routinely undertaken.

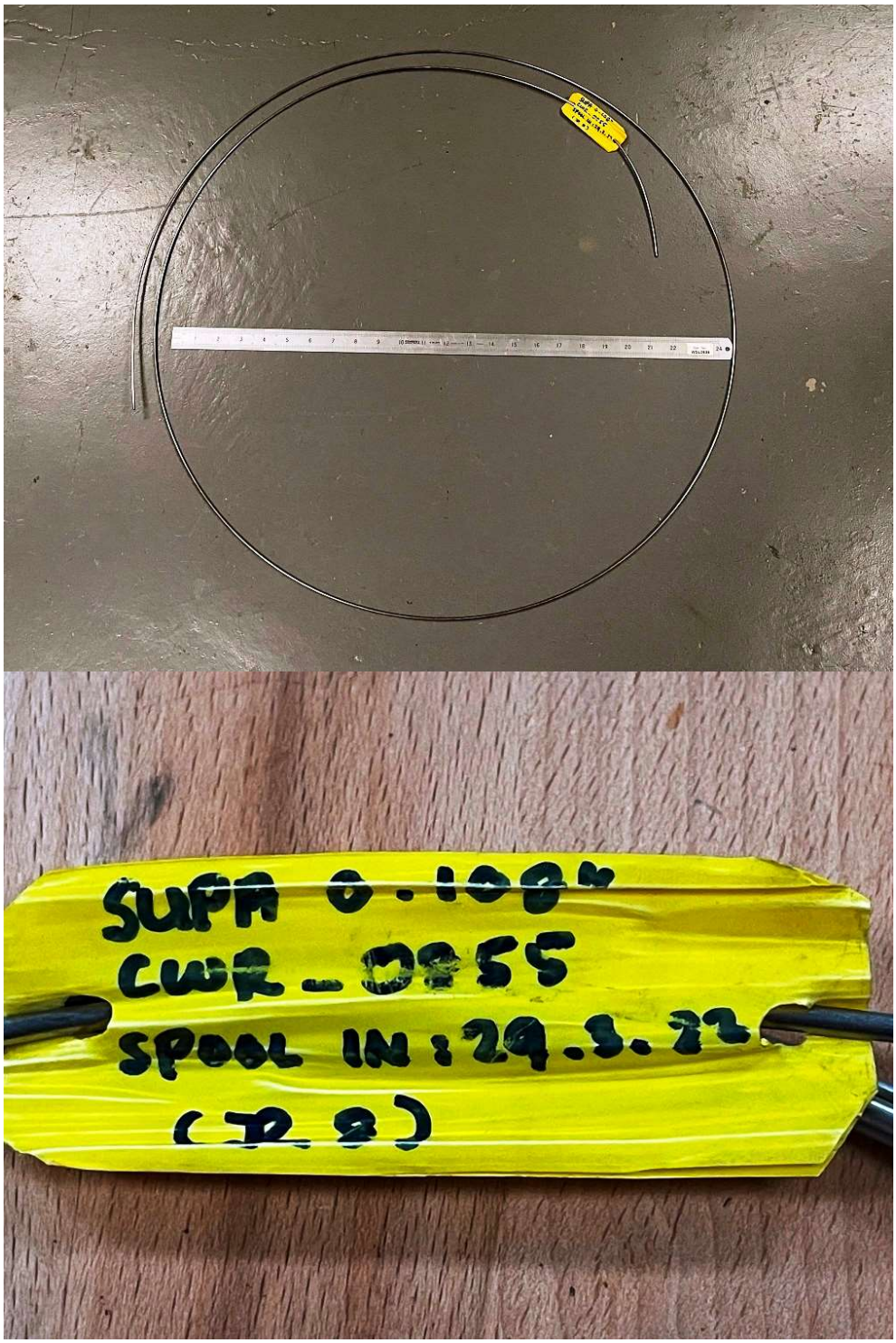


Figure 1, photographs of as received sample and identification tag, 24" steel rule for reference.

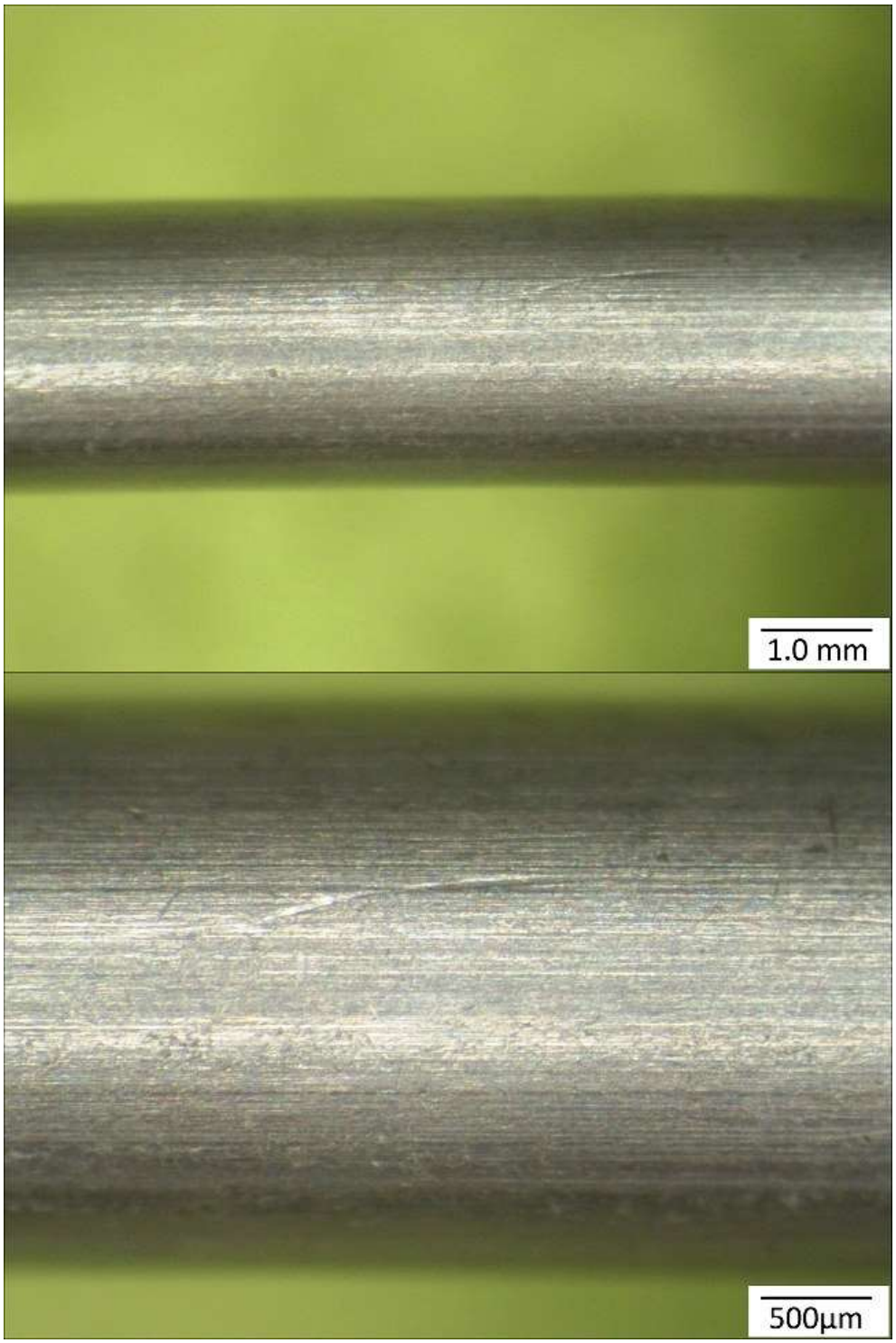


Figure 2, macro images of the surface of the line sample showing longitudinal score lines

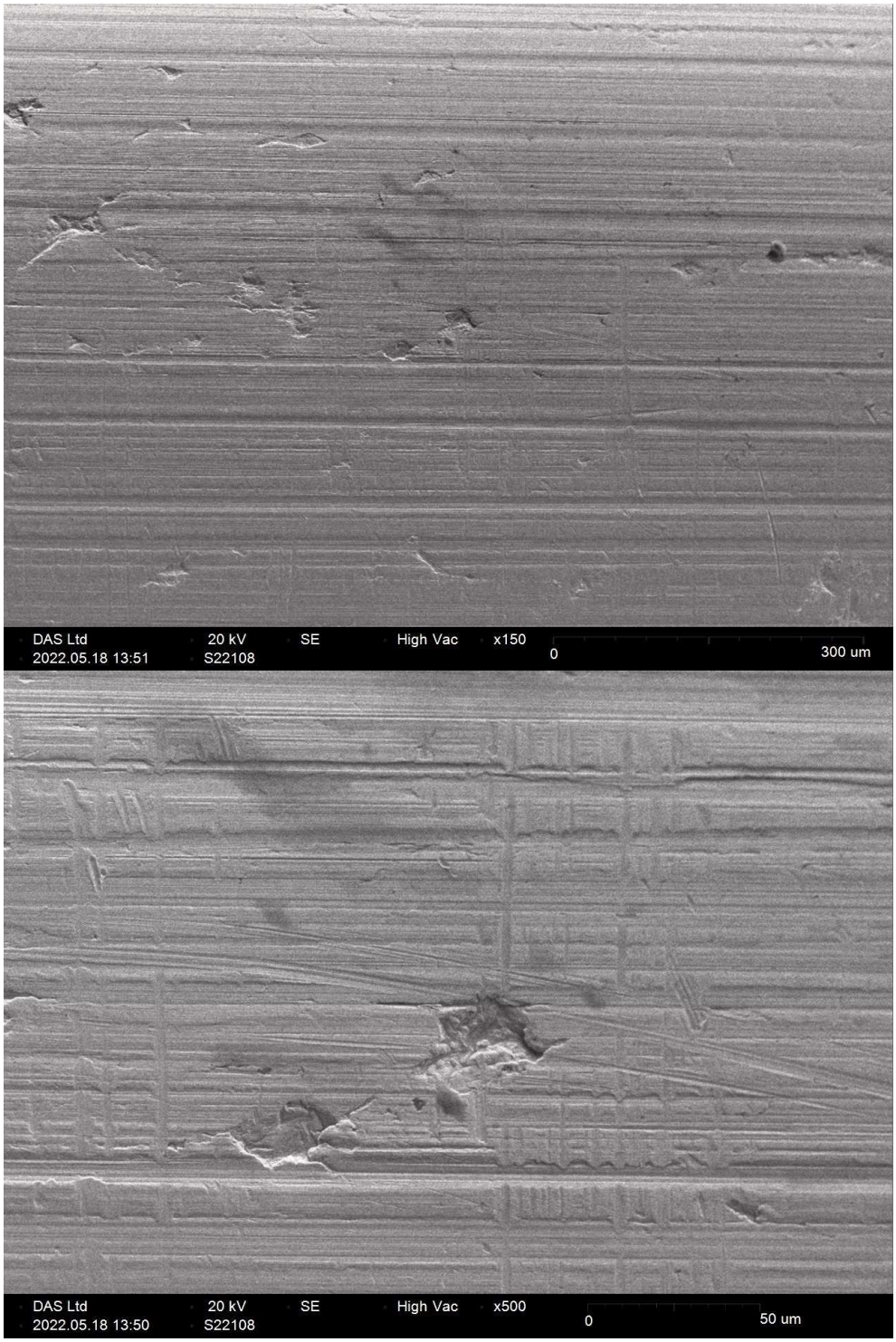
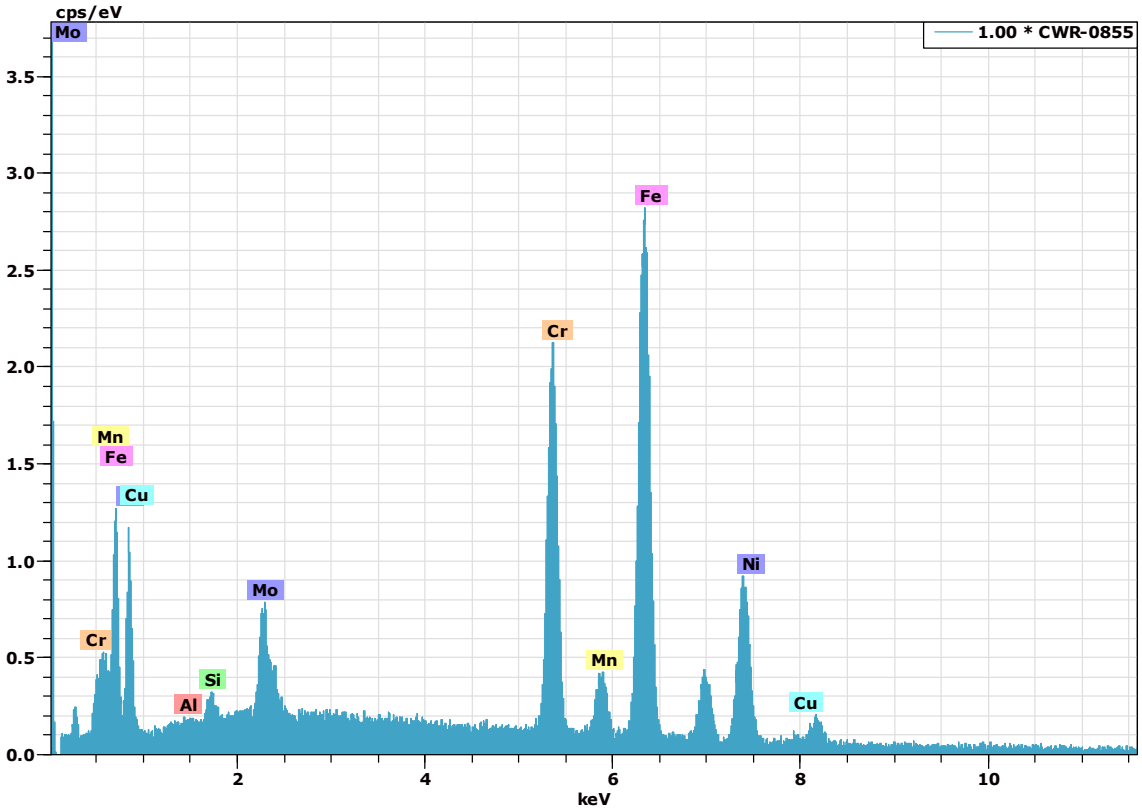
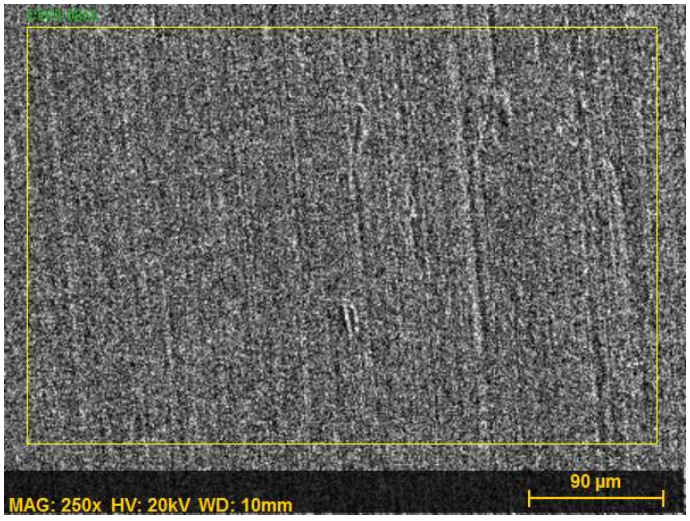


Figure 3, high resolution SEM images of the wire surface, x150 and x500 magnification





Spectrum: CWR-0855

Element	Series	norm. C [wt.%]	
Aluminium	K-series	0.13	
Silicon	K-series	0.64	
Nickel	K-series	24.74	
Copper	K-series	0.82	
Iron	K-series	46.29	
Manganese	K-series	0.89	
Chromium	K-series	20.10	
Molybdenum	L-series	6.39	
	Total:	100.00	100.00

Figure 4, EDS analysis of the ground surface confirmed the line to be SUPA 75

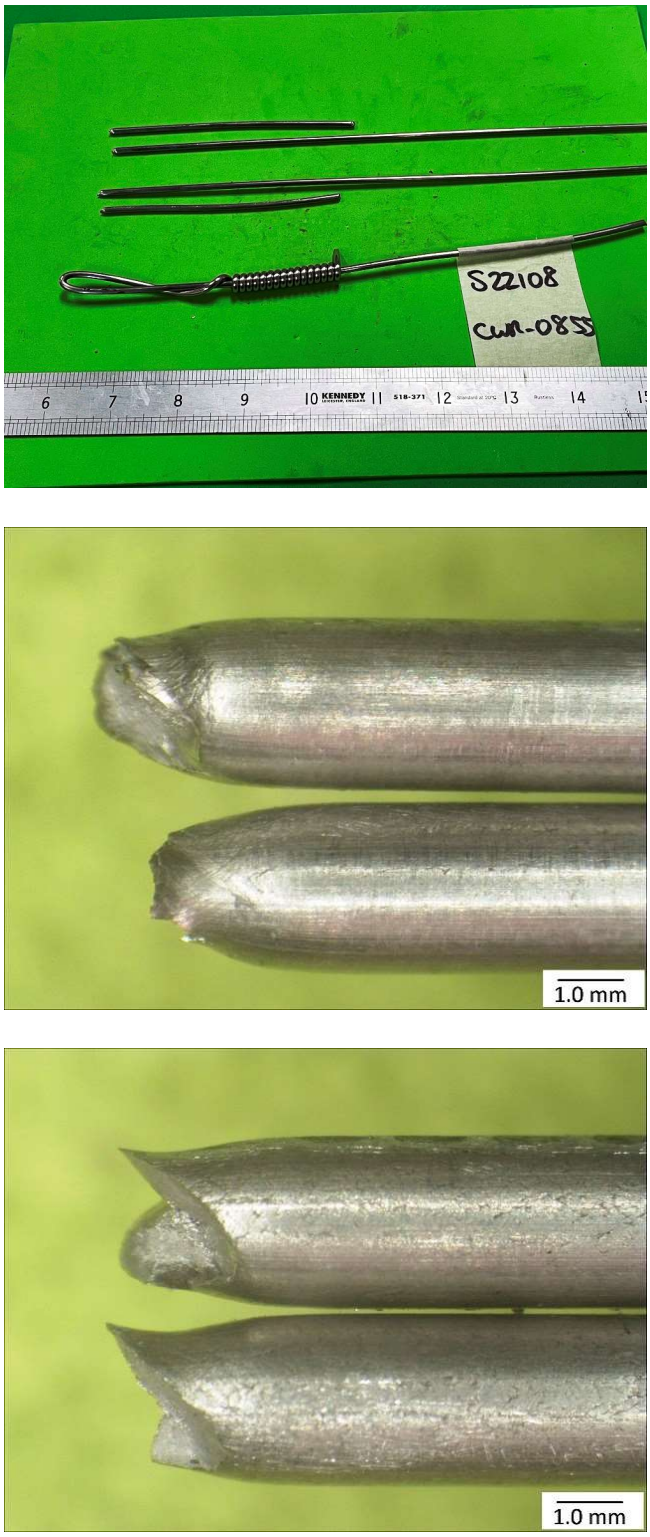


Figure 5, macro images of the breaking load samples after testing

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Parameter table:

Customer	:	DWS / SARATEC
Job no.	:	S22108D
Test standard	:	ANSI/API 9A, ISO 10425:2003, ASTM A370
Tester	:	SL

Results table:

No.	REEL No.	Diameter in	0.2% P.S. psi	UTS psi	Max Load lbf	Elongation %
1	CWR-0855	0.1078	237000	250939	2288	4.9
2	CWR-0855	0.1078	237000	251927	2297	4.5

No.	Wrap Test
1	PASS
2	PASS

Curve graph:

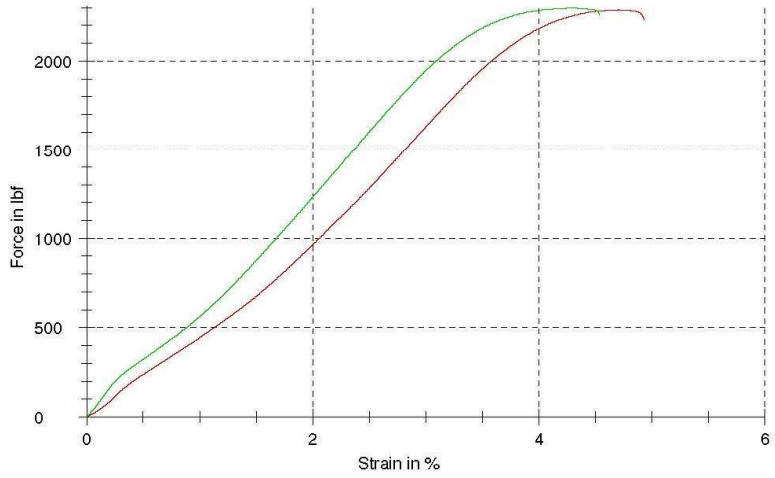

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Figure 6, breaking load assessment of the line samples

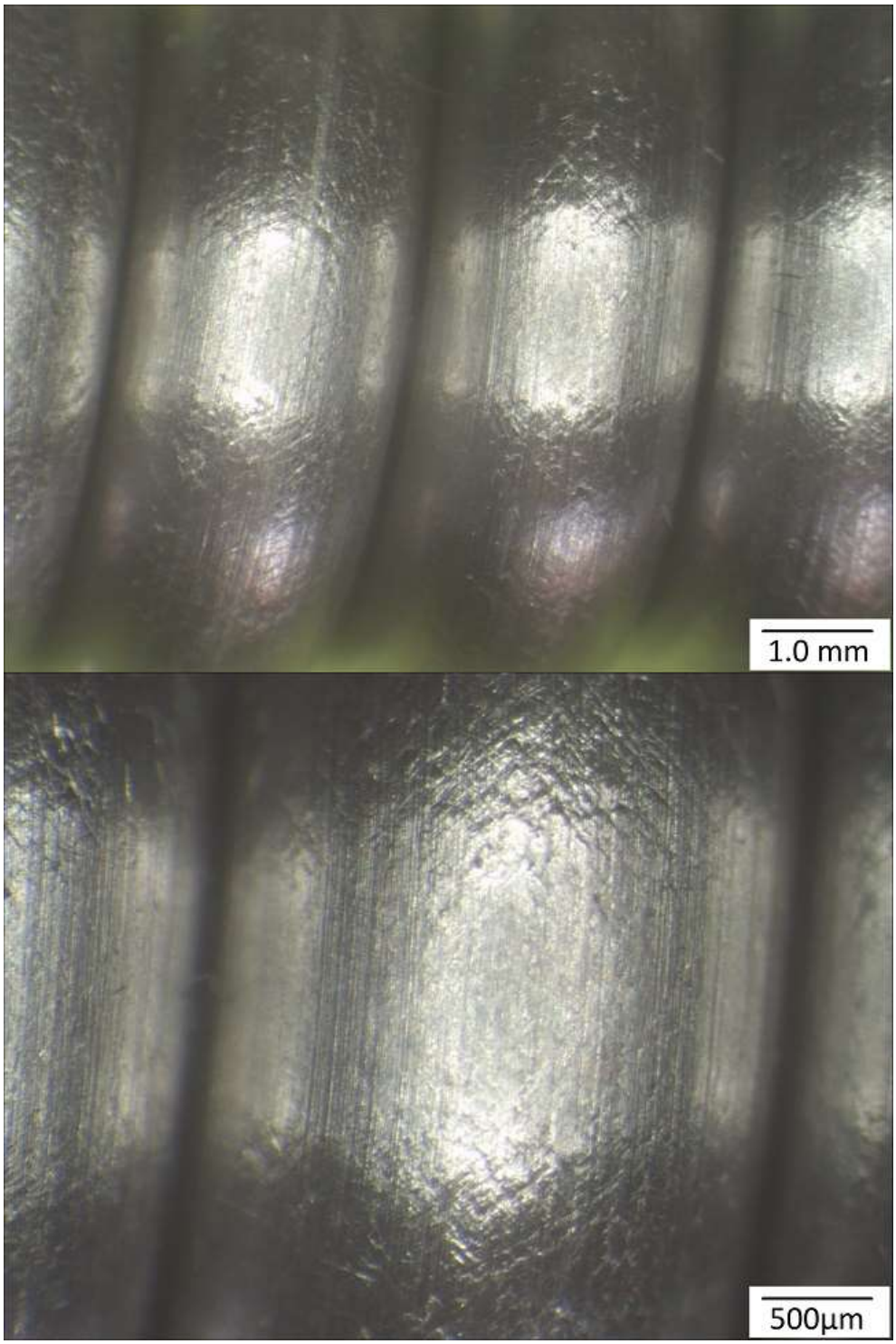

Figure 7, macro images of the wrap sample

APPENDIX

DONCASTER ANALYTICAL SERVICES LTD

INSPECTION CERTIFICATE 3.2

EN 10204: 2004

Certificate Number: 2103-064

CUSTOMER: **Danum Well Services Ltd.**
Unit 12,
Bullrush Business Park
Bullrush Grove,
Doncaster,
DN4 8SL

PO No.: **DWS 2110**

DAS No.: **20308**

MANUFACTURER TEST CERT: **5306**

PRODUCT:
0.108" diameter SUPA75 Measuring Line - 25,000ft

SPECIFICATION:
DWS/SUPA/05/15

Reel Number: **CWR-0855**

Manufacturer's Chemical Analysis (wt.%)

Heat / Cast No.	C	Si	Mn	P	S
279266	**0.020**	**0.390**	**0.730**	**0.025**	**0.001**
	Cr	Mo	Ni	Cu	N2
	20.210	**6.000**	**24.820**	**0.800**	**0.160**

Manufacturer's Results:

Diameter (inches)	U.T.S. (psi)	Breaking Load (lbf)	WRAPS
0.1080	**248,010**	**2,272**	**Pass**

D.A.S. Ltd. Results:

Diameter (inches)	U.T.S. (psi)	Breaking Load (lbf)	WRAPS
0.1079	**248,252**	**2,270**	**Pass**

We hereby certify that the material described above has been tested and complies with the terms of the order contract/specification.

M. Howells — S. Lee — **24th Mar '21** Date

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