Flexitallic

Global Leader in Innovative Gaskets and Seals

"Avoiding Loss of Containment when Assembling Flanged Connections"

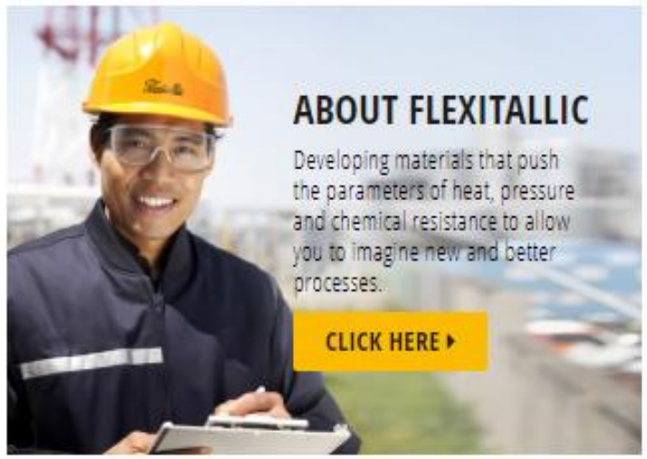
NEPIC – BEST PRACTICE IN INDUSTRIAL ASETT MANAGEMENT – HARDWICK HALL – 20TH Nov 2019

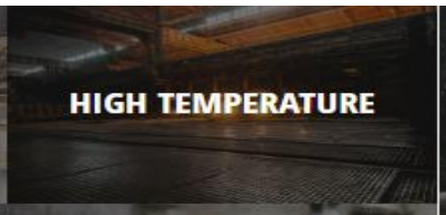
Gary Milne, Director, Academy of Joint Integrity – Flexitallic (UK) Ltd
gmilne@flexitallic.eu

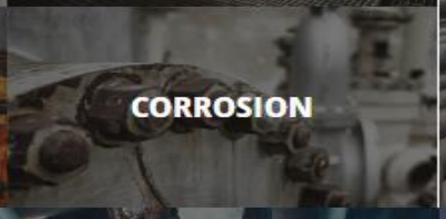
Graham Horton, Mechanical Maintenance Manager
graham.horton@nufarm.com

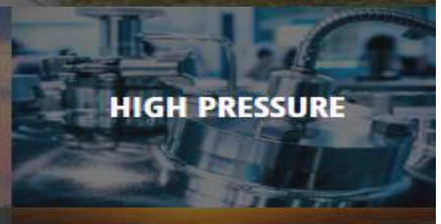
MAKING THE WORLD SAFER & CLEANER THROUGH ENGINEERED SEALING SOLUTIONS

The Flexitallic Group









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Installation Related Causes of Visible Leaks

Uneven Loading & Non-Uniform Gasket Stress……..Leaks

Insufficient Gasket Stress means… Leaks

Ensure Operator Competence with an Academy Flange Assembly training course at your site…..designed for your site.

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COMAH Sites - Industry Concerns:

Site Safety
COMAH Compliance
Primary Loss of Containment
Pipe work /Flange Leakages/Emissions
Site / Contractors competence
Torque Figures – No provenance
Gasket Specifications
Human Factor Error
Audit trail – life cycle activity
Culture – resistance to change
Aged Installations - Corrosion

The Academy of Joint Integrity

Academy – Integrity Partner – COMAH compliance experience
Nu farm case study: Eliminate costly Flange Leakages

Flange Integrity Journey: Nufarm

Nufarm

Grow a better tomorrow

Flange Integrity Journey - Nufarm

- Intro Nufarm
- Problem Statement
- Strategy and Implementation
- Results
- Next steps

Nufarm UK Ltd, Wyke, Bradford
Agrochemical Manufacturer – Top Tier COMAH site

Site History and Context

- Wyke is a historic site dating back to the 19th Century
- Significant investment in the 1970's through to 1997
- Therefore asset base both structural and production is aged (20 to 50 years old) and in need of care and attention

    - 13927 assets in the CMMS (not including motors or manual valves)
    - 98 Asset types
    - 150000 Meters of pipework
    - 75000 Flanges
    - 436 PSM Assets
    - 1347 Motors
    - 543 Pumps
    - 100 Glass Lined Mild Steel vessels
    - 46 functional plants

Why did Nufarm UK Ltd introduce Flange Management

LOPC – Loss of Primary Containment

Nufarm created a steering group in 2016 to tackle the issue of loss of primary containment. Over a twelve month period a total of 65 actions were created.

They identified systemic issues with the following:

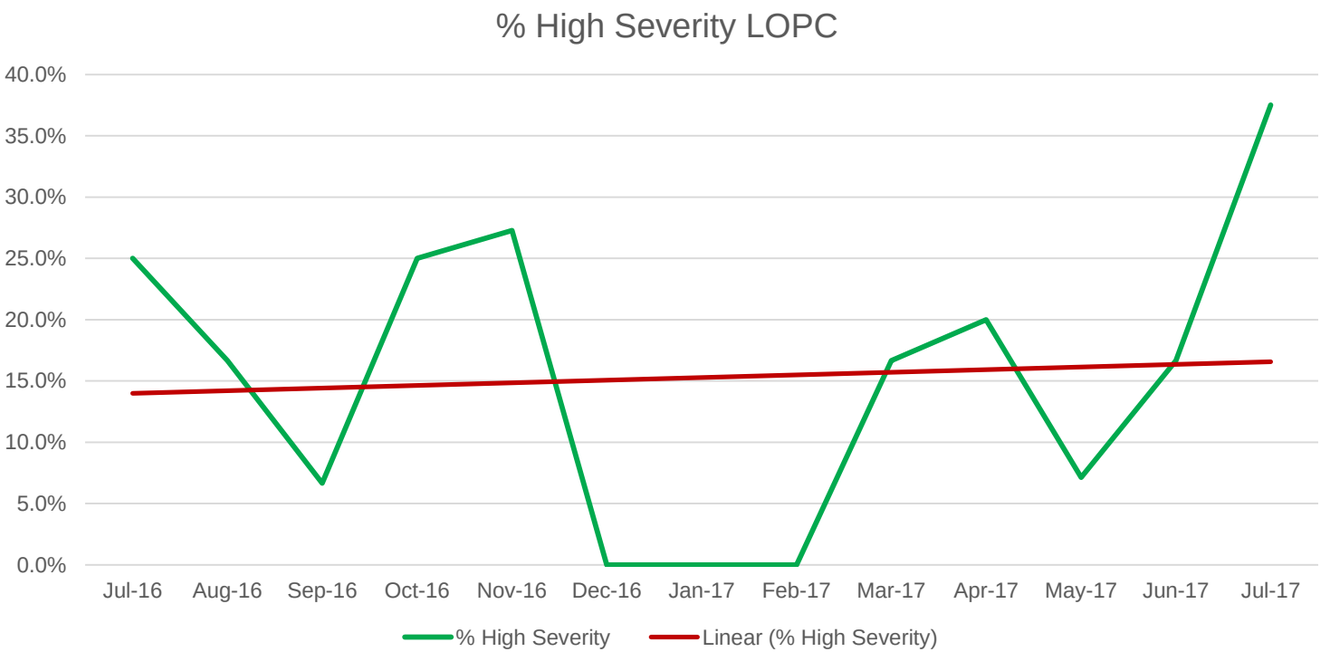
- The integrity of flanged joints
- Hose and bellow management
- Care of glass lined equipment
- Pipe alignment
- Piping Standards

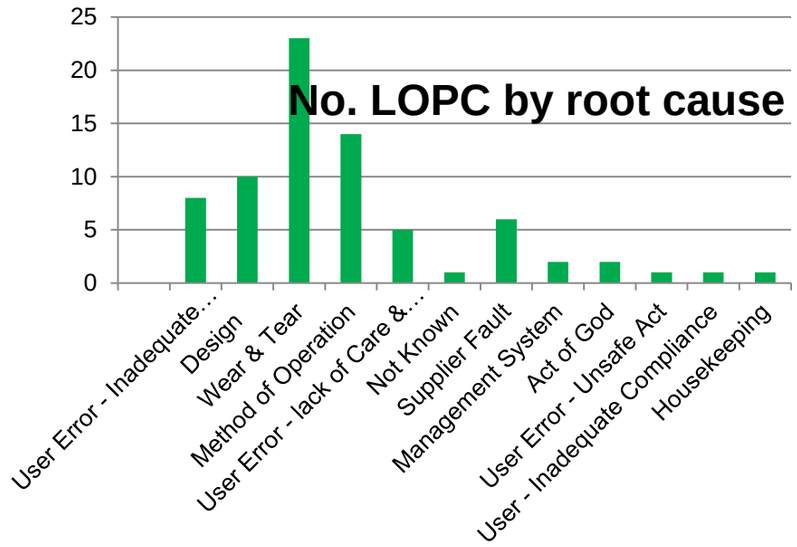
Paul Else Nufarm Site Manager's Mission Statement for LOPC Improvement Team:

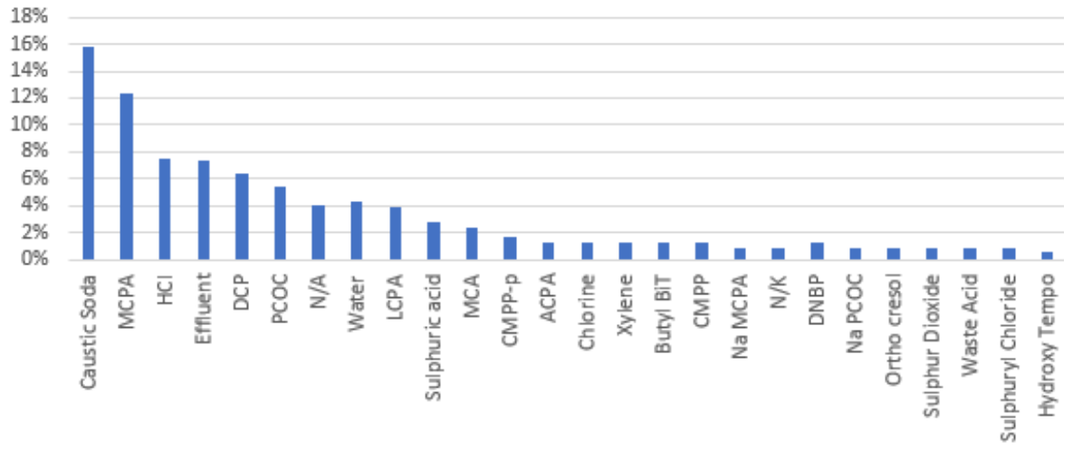
"Maintaining the integrity of primary containment systems is critically important to achieving our target of zero harm to people or the environment".

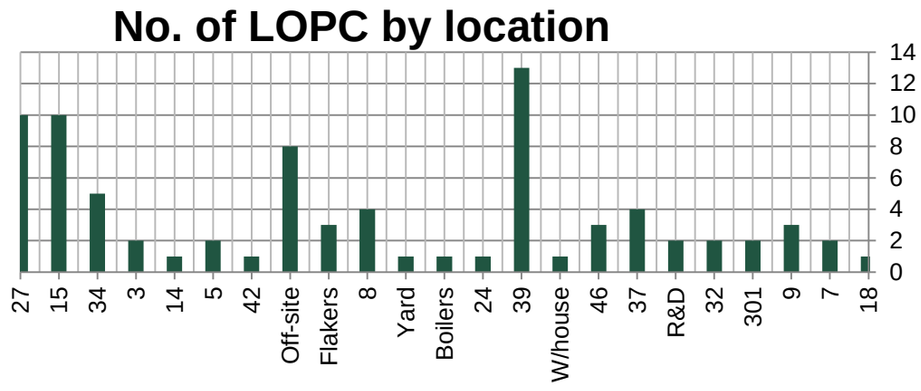
Therefore, there was a requirement to provide a ready reference for joint making practices regarding pipe material, alignment, torque value and gasket selection.

LOPC Stats July 2016 to July 2017









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Strategy

- Engineering Standard Created
  – incorporating tagging system, flange record sheets, flange register
- Training – culture change!
- Tools
- Implementation – Structured and steady approach to implementation to allow embedding the training, developing competence and increasing confidence in flange management

Engineering standard

CONFIDENTIAL

Flange management

Owner	G Horton
Valid from	2 October 2017
Issue	1
Pages	11

Purpose of the standard

Maintaining the integrity of primary containment systems is critically important to achieving our target of Zero harm to people or the environment.

This standard provides a ready reference for joint making practices regarding pipe material, torque value, gasket / seal selection and installation specifications for most process duties encountered on site.

The guidance provided within this document sets the minimum acceptable standard for flange management within "critical fluid" systems.

Improvements in systems governing flanged joints have significantly reduced the incidence of pipe work leaks that could lead to environmental or process safety events from occurring. Measures introduced within this standard include:

- Clarification and rationalisation of gasket and bolting specifications
- Storage and handling of gaskets and bolting, training and validation of personnel in joint making
- Procedures that manage the control of critical joint bolt loads, tagging of flanged joints and competency
- Identification and recording of personnel involved with each joint.

Where possible, the information within this standard is based on the following guidance and legislation:

- ASME PCC-1-2013 Guidelines for pressure boundary bolted flange joint assembly
- BSEN 1591-4:2013 Qualification of personnel competency in the assembly of the bolted connections of critical service pressurised systems
- HSE Report 253 Piping systems integrity management review
- Energy Institute Guidelines for the management of the integrity of bolted joints and pressurised systems

Project work

Engineering Instruction: Project guidance – design, construction and commissioning (add hyper link) is to be followed for all new plant. Once the plant is handed over to operations this will then be subject to flange management.

Causes of loss of containment in pipe work

HSE Report 253 Reviews piping systems integrity and of the various incident reports, has shown that common causes of loss of containment in pipe work include the following (with the most prominent ones stated first)

- leakage at bolted flanged joints
- leakage at corroded pipe (especially under lagging)
- leakage at small bore pipe work (e.g. due to fatigue)
- failure of supports
- leakage at bellows (relatively more vulnerable than pipe)
- modifications
- wrong materials used

Flange Record Sheet

Nufarm	Flange Bolt Record Sheet	FORM NO:
		ISSUE: DATE:
Equipment:		
Plant:		
Date:		
P&ID:		

Flange & Bolt Identification			Tightening Record									
			Tick ✓ as appropriate					1) Broken by (Eng) 2) Assembled (Eng) 3) Torqued by (Eng) 4) Re-Torque by (Eng)				
Line and Flange No.	Size/ Rating/ Material	Unique Tag Number	Alternative (State method in comments)	Torque	Re-torque	Gasket type	Applied Value	Print Name	Signature	5) Plant hand over Signature (FLM)	Date	Comment
								1)				
								2)				
								3)				
								4)				
								1)				
								2)				
								3)				
								4)				
								1)				
								2)				
								3)				
								4)				
								1)				
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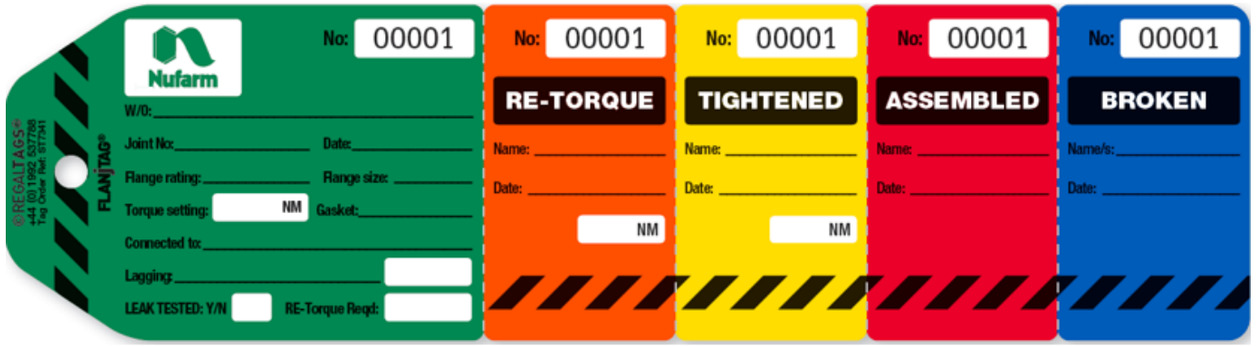
Tagging System



Completed Example

Flange Bolt Record Sheet

Permit:

WO:

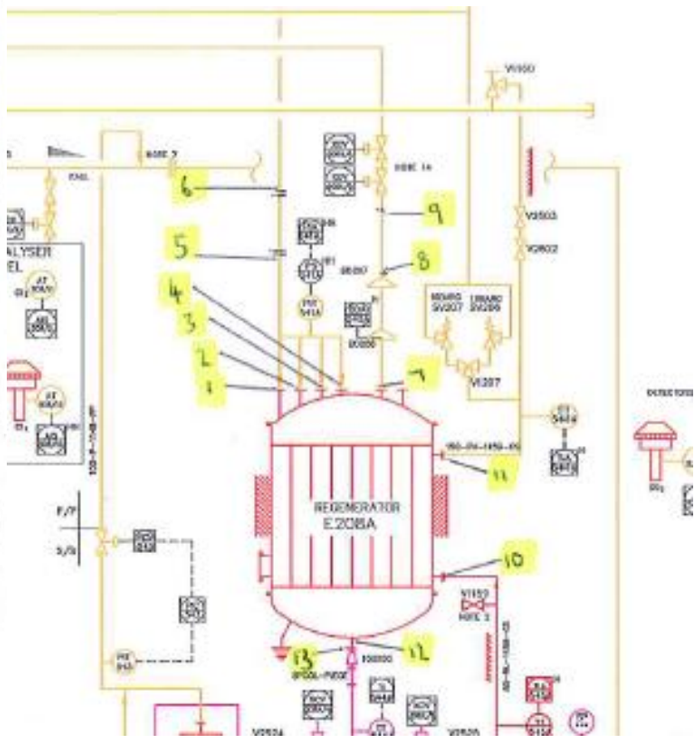
Equipment: Regenerator E208A

Plant: 27

Date:

P&ID: 27/P/208

Flange & Bolt Identification								Tightening Record				
Line and Flange No.	Size/ Rating/ Material	Unique Tag Number	Tick ✓ as appropriate: Alternative (State method in comments)	Torque	Re-torque	Gasket type	Applied Value	1) Broken by (Eng) / 2) Assembled (Eng) / 3) Torqued by (Eng) / 4) Re-Torque by (Eng) — Print Name	Signature	5) Plant hand over Signature (FLM)	Date	Comment
Gas Inlet 1	100/150 /PVDF	717		√	√	White Gylon	30 ft-lb	1) OHIRST 2) LBenn 3) LBenn 4) LBenn	OHirst LBenn LBenn LBenn	SH	8/2/19	
Gas Inlet 2	100/150 /PVDF	718		√	√	White Gylon	30 ft-lb	1) OHIRST 2) R Coss 3) R Coss 4) LBenn	OHirst R Coss R Coss LBenn	SH	8/2/19	
Gas Inlet 3	100/150 /PVDF	719		√	√	White Gylon	30 ft-lb	1) OHIRST 2) LBenn 3) LBenn 4) LBenn	OHirst LBenn LBenn LBenn	SH	8/2/19	
Gas Inlet 4	100/150 /PVDF	720		√	√	White Gylon	30 ft-lb	1) OHIRST 2) R Coss 3) R Coss 4) LBenn	OHirst R Coss R Coss LBenn	SH	8/2/19	
Gas Inlet 5	100/150 /PVDF	721		√	√	White Gylon	30 ft-lb	1) OHIRST 2) LBenn 3) LBenn 4) LBenn	OHirst LBenn LBenn LBenn	SH	8/2/19	



Flange Register

Tag Ref No.	Plant	Equipment	Line ID	Ref P&ID	Date Joint Broken	Date Joint Assembled	Date Joint Tightened	Date Joint Retorque	Date Joint Tested	
632	7	R1	Flange 1	07/P/02	21/01/19 JP	04/02/19 JP	04/02/19 JP	05/02/19 JP	05/02/2019	
633	7	R1	Flange 2	07/P/02	21/01/19 JP	04/02/19 JP	04/02/19 JP	05/02/19 JP	05/02/2019	
634	7	R1	Flange 3	07/P/02	21/01/19 EB	04/02/19 JP	04/02/19 JP	05/02/19 JP	05/02/2019	
635	7	R1	Flange 4	07/P/02	21/01/19 EB	04/02/19 JP	04/02/19 JP	05/02/19 JP	05/02/2019	
636	7	R1	Flange 5	07/P/02	21/01/19 PS	04/02/19 JP	04/02/19 JP	05/02/19 JP	05/02/2019	
637	7	R1	Flange 6	07/P/02	21/01/19 JP	04/02/19 JP	04/02/19 JP	05/02/19 JP	05/02/2019	
638	7	R1	Flange 7	07/P/02	21/01/19 RC	04/02/19 JP	04/02/19 JP	05/02/19 JP	05/02/2019	
639	7	R1	Flange 8	07/P/02	21/01/19 RC	04/02/19 JP	04/02/19 JP	05/02/19 JP	05/02/2019	
640	7	R1	Flange 9	07/P/02	21/01/19 JP	04/02/19 PS	04/02/19 PS	05/02/19 JP	05/02/2019	
641	7	R1	Flange 10	07/P/02	21/01/19 JP	04/02/19 PS	04/02/19 JP	05/02/19 JP	05/02/2019	
642	7	R1	Flange 11	07/P/02	21/01/19 JP	04/02/19 JP	04/02/19 JP	05/02/19 JP	05/02/2019	
643	7	R1	Flange 12	07/P/02	21/01/19 JP	04/02/19 JP	04/02/19 JP	05/02/19 JP	05/02/2019	
644	7	R1	Flange 13	07/P/02	21/01/19 JP	04/02/19 JP	04/02/19 JP	05/02/19 JP	05/02/2019	
645	7	R1	Flange 14	07/P/02	21/01/19 JP	04/02/19 JP	04/02/19 JP	05/02/19 JP	05/02/2019	
646	7	R1	Flange 15	07/P/02	21/01/19 KS	04/02/19 JP	04/02/19 JP	05/02/19 JP	05/02/2019	
626	7	R2	Flange 1	07/P/02	21/01/19 RC	25/01/19 JP	25/01/19 JP	05/02/19 JP	05/02/2019	
627	7	R2	Flange 2	07/P/02	21/01/19 RC	25/01/19 JP	25/01/19 JP	05/02/19 JP	05/02/2019	
628	7	R2	Flange 3	07/P/02	21/01/19 EB	25/01/19 JP	25/01/19 JP	05/02/19 JP	05/02/2019	
629	7	R2	Flange 4	07/P/02	21/01/19 EB	25/01/19 JP	25/01/19 JP	05/02/19 JP	05/02/2019	
630	7	R2	Flange 5	07/P/02	21/01/19 RC	25/01/19 JP	25/01/19 JP	05/02/19 JP	05/02/2019	
631	7	R2	Flange 6	07/P/02	21/01/19 EB	25/01/19 JP	25/01/19 JP	05/02/19 JP	05/02/2019	
672	34	L001	Flange 1	34/P/002	23/01/19 PT	25/01/19 LB	25/01/19 LB	N/A	05/02/2019	
673	34	L001	Flange 2	34/P/002	23/01/19 PT	25/01/19 LB	25/01/19 LB	N/A	05/02/2019	
674	34	L001	Flange 3	34/P/002	23/01/19 PT	25/01/19 LB	25/01/19 LB	N/A	05/02/2019	
675	34	L001	Flange 4	34/P/002	23/01/19 PT	25/0/19 MD	25/0/19 MD	N/A	05/02/2019	
676	34	L001	Flange 5	34/P/002	23/01/19 PT	25/0/19 MD	25/0/19 MD	N/A	05/02/2019	
677	34	L001	Flange 6	34/P/002	23/01/19 PT	25/0/19 MD	25/0/19 MD	N/A	05/02/2019	
678	34	L001	Flange 7	34/P/002	23/01/19 PT	25/01/19 OH	25/01/19 OH	N/A	05/02/2019	
679	34	L001	Flange 8	34/P/002	23/01/19 PT	25/01/19 OH	25/01/19 OH	N/A	05/02/2019	
680	34	L001	Flange 9	34/P/002	23/01/19 PT	25/01/19 PT	25/01/19 PT	N/A	05/02/2019	
681	34	L001	Flange 10	34/P/002	23/01/19 PT	25/0/19 MD	25/0/19 MD	N/A	05/02/2019	

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Torque Pocket Book Reference Guide

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Torque Handbook

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FT/LB to NM Conversion Table:

Foot Pounds (ft. lbs.)	Newton Meters (N-m)	Foot Pounds (ft. lbs.)	Newton Meters (N-m)	Foot Pounds (ft. lbs.)	Newton Meters (N-m)	Foot Pounds (ft. lbs.)	Newton Meters (N-m)	Foot Pounds (ft. lbs.)	Newton Meters (N-m)
1 =	1.3	32 =	43.4	63 =	85.4	94 =	127.4	125 =	169.5
2 =	2.7	33 =	44.7	64 =	86.8	95 =	128.8	126 =	170.8
3 =	4.1	34 =	46.1	65 =	88.1	96 =	130.2	127 =	172.2
4 =	5.4	35 =	47.4	66 =	89.5	97 =	131.5	128 =	173.5
5 =	6.8	36 =	48.8	67 =	90.8	98 =	132.9	129 =	174.9
6 =	8.1	37 =	50.7	68 =	92.2	99 =	134.2	130 =	176.2
7 =	9.5	38 =	51.5	69 =	93.6	100 =	135.6	131 =	177.6
8 =	10.8	39 =	52.9	70 =	94.9	101 =	136.9	132 =	179.0
9 =	12.2	40 =	54.2	71 =	96.3	102 =	138.3	133 =	180.3
10 =	13.6	41 =	55.6	72 =	97.6	103 =	139.6	134 =	181.7
11 =	14.9	42 =	56.9	73 =	99.0	104 =	141.0	135 =	183.0
12 =	16.3	43 =	58.3	74 =	100.3	105 =	142.4	136 =	184.4
13 =	17.6	44 =	59.7	75 =	101.7	106 =	143.7	137 =	185.7
14 =	18.9	45 =	61.0	76 =	103.0	107 =	145.1	138 =	187.1
15 =	20.3	46 =	62.4	77 =	104.4	108 =	146.4	139 =	188.5
16 =	21.7	47 =	63.7	78 =	105.8	109 =	147.8	140 =	189.8
17 =	23.0	48 =	65.1	79 =	107.1	110 =	149.1	141 =	191.2
18 =	24.4	49 =	66.4	80 =	108.5	111 =	150.5	142 =	192.5
19 =	25.8	50 =	67.8	81 =	109.8	112 =	151.8	143 =	193.9
20 =	27.1	51 =	69.2	82 =	111.2	113 =	153.2	144 =	195.2
21 =	28.5	52 =	70.5	83 =	112.5	114 =	154.6	145 =	196.6
22 =	29.8	53 =	71.9	84 =	113.9	115 =	155.9	146 =	198.0
23 =	31.2	54 =	73.2	85 =	115.2	116 =	157.3	147 =	199.3
24 =	32.5	55 =	74.6	86 =	116.6	117 =	158.6	148 =	200.7
25 =	33.9	56 =	75.9	87 =	118.0	118 =	160.0	149 =	202.0
26 =	35.2	57 =	77.3	88 =	119.3	119 =	161.3	150 =	203.4
27 =	36.6	58 =	78.6	89 =	120.7	120 =	162.7	151 =	204.7
28 =	38.0	59 =	80.0	90 =	122.0	121 =	164.0	152 =	206.1
29 =	39.3	60 =	81.4	91 =	123.4	122 =	165.4	153 =	207.4
30 =	40.7	61 =	82.7	92 =	134.7	123 =	166.8	154 =	208.8
31 =	42.0	62 =	84.1	93 =	126.1	124 =	168.1	155 =	210.2

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Ansi 150 CS/SS with Blue Gylon Gasket:

Garlock Bolt Torque Values for .062" thick Compressed Sheet or GYLON®
ASTM A193 B7 bolts with lubricant (0.160 k-factor) - ANSI B16.5 Class 150# Flanges

Nominal Pipe Size (in)	Raised Face Contact I.D. (in)	Raised Face Contact O.D. (in)	Gasket Contact Area (sq.in.)	Number Of Bolts	Size of Bolts (in)	Bolt Torque at 60ksi Stress (ft.lbs.)	Comp Force Per Bolt @ 60ksi (lbs.)	Max. Gasket Stress Avail. (psi)	Internal Pressure (psig)	Min. Rec'd Gasket Stress (psi)	Min. Rec'd Torque/Bolt (ft.lbs.)	Max. Rec'd/Avail. Gasket Stress (psi)	Preferred Torque/Bolt (ft.lbs.)
0.5	0.84	1.38	0.94	4	0.50	50	7560	32170	<300	3600	6	15000	23
0.75	1.06	1.69	1.36	4	0.50	50	7560	22235	<300	3600	8	15000	34
1	1.31	2.00	1.79	4	0.50	50	7560	16894	<300	3600	11	15000	44
1.25	1.66	2.50	2.74	4	0.50	50	7560	11036	<300	3600	16	11036	50
1.5	1.91	2.88	3.65	4	0.50	50	7560	8285	<300	3600	22	8285	50
2	2.38	3.62	5.84	4	0.63	101	12120	8301	<300	3600	44	8301	101
2.5	2.88	4.12	6.81	4	0.63	101	12120	7119	<300	3600	51	7119	101
3	3.50	5.00	10.01	4	0.63	101	12120	4843	<300	3600	75	4843	101
3.5	4.00	5.50	11.19	8	0.63	101	12120	8665	<300	3600	42	8665	101
4	4.50	6.19	14.18	8	0.63	101	12120	6838	<300	3600	53	6838	101
5	5.56	7.31	17.68	8	0.75	181	18120	8199	<300	3600	79	8199	181
6	6.62	8.50	22.31	8	0.75	181	18120	6498	<300	3600	100	6498	181
8	8.62	10.62	30.21	8	0.75	181	18120	4798	<300	3600	136	4798	181
10	10.75	12.75	36.90	12	0.88	293	25140	8176	<300	3600	129	8176	293
12	12.75	15.00	49.01	12	0.88	293	25140	6155	<300	3600	171	6155	293
14	14.00	16.25	53.43	12	1.00	441	33060	7425	<300	3600	214	7425	441
16	16.00	18.50	67.71	16	1.00	441	33060	7812	<300	3600	203	7812	441
18	18.00	21.00	91.85	16	1.13	655	43680	7609	<300	3600	310	7609	655
20	20.00	23.00	101.27	20	1.13	655	43680	8626	<300	3600	273	8626	655
24	24.00	27.25	130.75	20	1.25	929	55740	8526	<300	3600	392	8526	929

NOTE: Torque calculations are based on using a bolt thread lubricant with a "k" factor of 0.160.

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Torque Wrench Calibration Records

Torque Wrench Calibration 2018				
Serial Number	Model	Cert no/issuer	Date of calibration	Expiry
79108371B76	Norbar 400	23567	12/11/2018	01/12/2019
79108371B86	Norbar 400	23571	12/11/2018	01/12/2019
79108374B42	Norbar 400	23568	12/11/2018	01/12/2019
79108374B36	Norbar 400	23575	12/11/2018	01/12/2019
79108374B39	Norbar 400	23569	12/11/2018	01/12/2019
79108371B71	Norbar 400	23570	12/11/2018	01/12/2019
79108300B98	Norbar 300TH	23574	12/11/2018	01/12/2019
79108301B01	Norbar 300TH	23577	12/11/2018	01/12/2019
79108300B99	Norbar 300TH	23572	12/11/2018	01/12/2019
7910830B97	Norbar 300TH	23573	12/11/2018	01/12/2019
79108301B00	Norbar 300TH	23576	12/11/2018	01/12/2019
2012/137643	Norbar 300TH	23581	12/11/2018	01/12/2019
2013/147959	Norbar 300TH	23580	12/11/2018	01/12/2019
2013-211523	Norbar 200TH	23583	12/11/2018	01/12/2019
2013-160532	Norbar 60TH	23586	12/11/2018	01/12/2019
2015-190952	Norbar 300	23579	12/11/2018	01/12/2019
2011-314737	Norbar 300	23582	12/11/2018	01/12/2019
2013-212129	Norbar 200	23584	12/11/2018	01/12/2019
2013-215069	Norbar 330	23585	12/11/2018	01/12/2019
2013-182260	Norbar 100TH	23587	12/11/2018	01/12/2019
2006-189597	Norbar SL0	23588	12/11/2018	01/12/2019

CERTIFICATE

45 Colbourne Avenue
Nelson Park Industrial Estate
Cramlington
NE23 1WD
UK

+44 (1) 670 700 000

info@htlgroup.com
htlgroup.com

htl group

Hand Torque Wrench

Certificate No:23583

Customer Name:	Nufarm UK LTD	Order No:	Calibration Van
Date:	12-11-2018	Next Due:	11-11-2019

Test Equipment

Type:	NORBAR Q2216	Serial No:	71874
Range:	0 - 1000 lb.ft		
Calibrated:	02-12-2017	Next Due:	01-12-2018

Tool Details

Tool Model:	Norbar 200TH	Tool Serial No:	2013-211523

Readings

Range: 30-150 lb.ft / 41-203 Nm

	lb.ft							Nm						
Set Point	1	2	3	4	5	Ave		Set Point	1	2	3	4	5	Ave
50	49	50	49	50	50	50		68	66	68	66	68	68	68
100	98	98	99	100	98	99		136	133	133	134	136	133	134
150	150	150	150	150	151	150		203	203	203	203	203	205	203

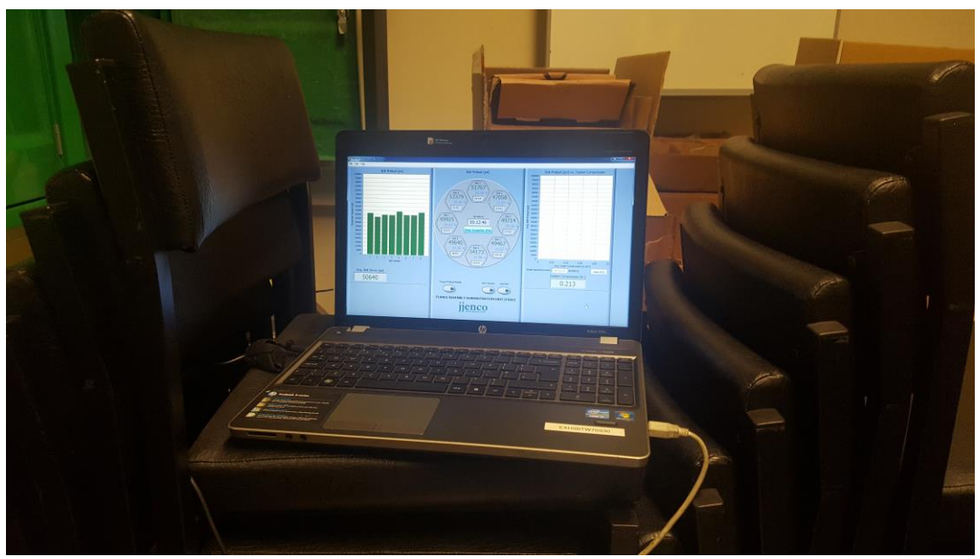
Calibrated By: Michael Venus Signature:

ecITB UVDB empowered by Achilles

Nufarm

Flexitallic/Academy – delivered Training on site – to all personnel involved in making and breaking of bolted joints.

JI010 – Dismantle, Assemble and Hand Torque Flanged Joints – tailored to Nufarm procedures.



Total of 55 personnel trained – Mechanical, C&I, Project Managers and Core Contractors

Certification

The Academy of Joint Integrity™

Andy Smith of Nufarm UK Limited

Has attended a workshop covering **'Latest Standards in Flange Assembly and Sealing Technology'**

1. Safety/Legislation and Industry Best Practice
2. Sealing Technology – Theory/Practical/Typical Failures
3. Assembly Procedures
4. Tightening Methods
5. Flange Assembly Demonstration Unit – Practical Assessment
6. Inspection/Identification – all components
7. Lessons Learnt/Site Inspection
8. Audit Trail, Record Keeping

Issue Date: 8th November 2017

Expiry Date: 8th November 2020

Serial Number: 2252

energy INSTITUTE APPROVED TRAINING PROVIDER

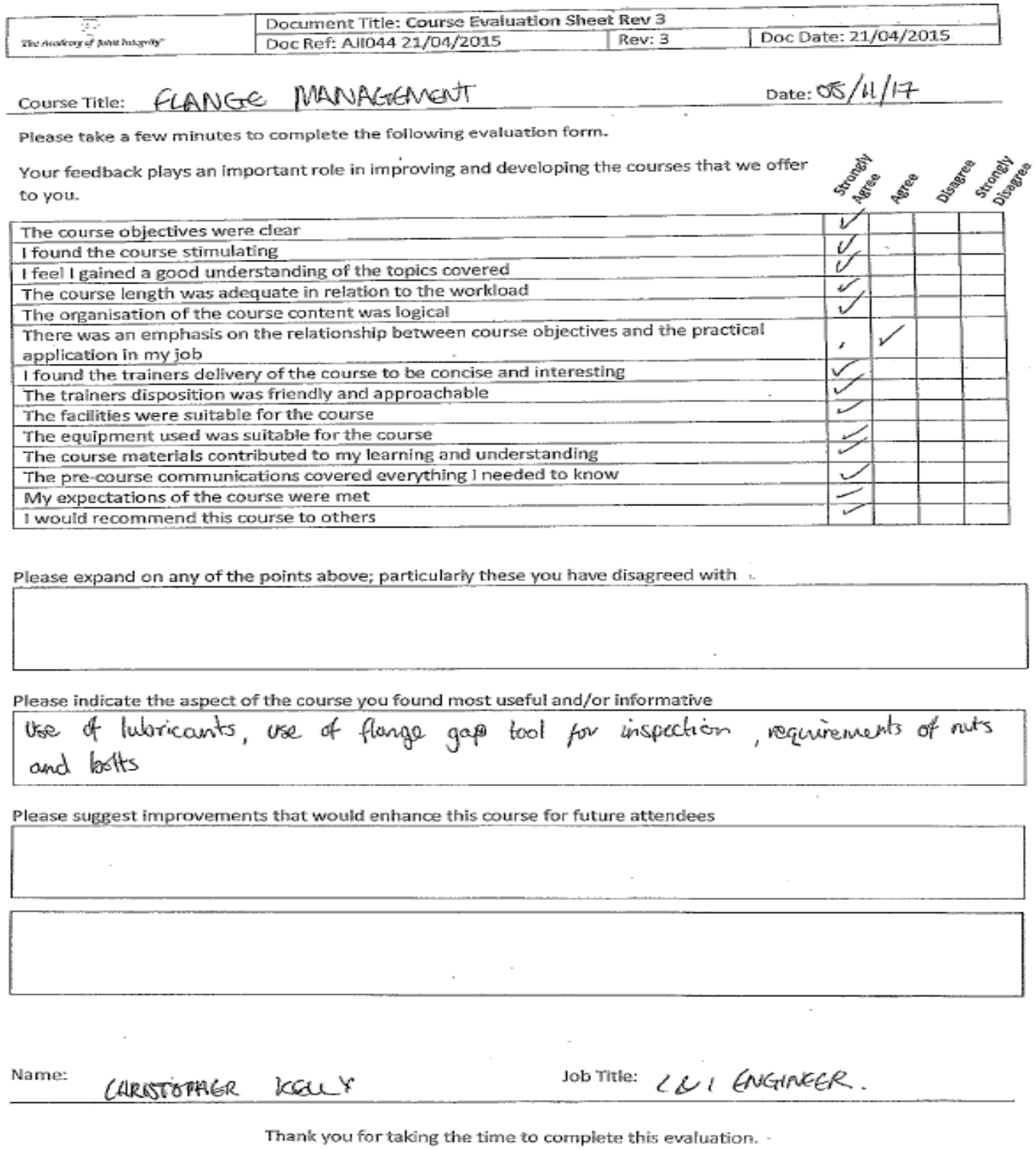
The Flexitallic Group

Nufarm

Course Feedback

Common themes:

- Coefficient of friction effects on torque settings
- Gasket relaxation – PTFE
- Pipe alignment and importance of bracketry
- Re-torqueing of plastic, PTFE lined and glass-lined equipment after a thermal cycle
- Visual impact of using the Academy Flange Demonstration Unit visuals displaying hand spanner/ versus torque tightening



The Academy of Joint Integrity	Document Title: Course Evaluation Sheet Rev 3		
	Doc Ref: AJI044 21/04/2015	Rev: 3	Doc Date: 21/04/2015

Course Title: FLANGE MANAGEMENT Date: 05/11/17

Please take a few minutes to complete the following evaluation form.

Your feedback plays an important role in improving and developing the courses that we offer to you.

	Strongly Agree	Agree	Disagree	Strongly Disagree
The course objectives were clear	✓			
I found the course stimulating	✓			
I feel I gained a good understanding of the topics covered	✓			
The course length was adequate in relation to the workload	✓			
The organisation of the course content was logical	✓			
There was an emphasis on the relationship between course objectives and the practical application in my job		✓		
I found the trainers delivery of the course to be concise and interesting	✓			
The trainers disposition was friendly and approachable	✓			
The facilities were suitable for the course	✓			
The equipment used was suitable for the course	✓			
The course materials contributed to my learning and understanding	✓			
The pre-course communications covered everything I needed to know	✓			
My expectations of the course were met	✓			
I would recommend this course to others	✓			

Please expand on any of the points above; particularly these you have disagreed with

Please indicate the aspect of the course you found most useful and/or informative

Use of lubricants, use of flange gap tool for inspection, requirements of nuts and bolts

Please suggest improvements that would enhance this course for future attendees

Name: CHRISTOPHER KELLY Job Title: C&I ENGINEER.

Thank you for taking the time to complete this evaluation.

Implementation Time Line

June 2017 – Action to implement LOPC initiative

July 2017 to Sept 2017 - Engineering Standard, flange record sheets, register and flange tag creation

October 2017 – Training provider engagement for tender – Flexitallic chosen as preferred provider – Academy of Joint Integrity – FADU & Experience.

October 2017 – Torque wrench procurement

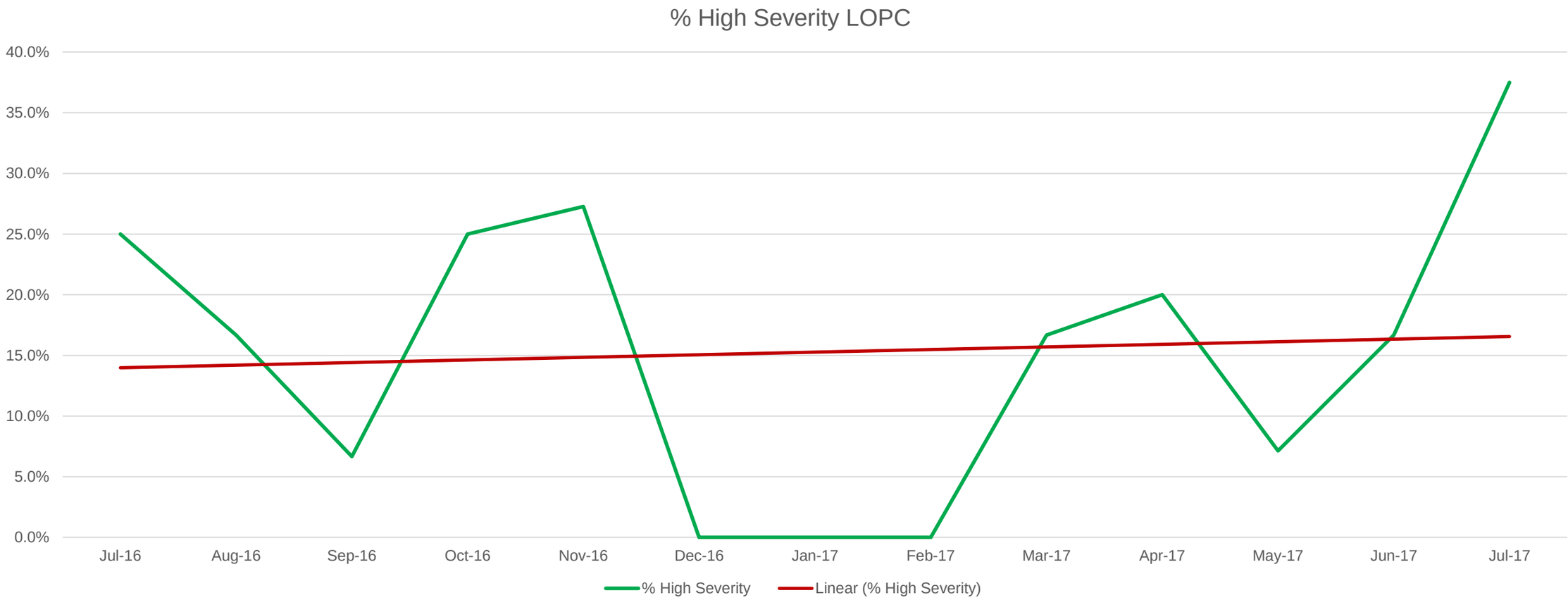
November 2017 to March 2018 – Academy /Training roll out across all shifts

May 2018 – Go live date – 75 flanges made in the first month

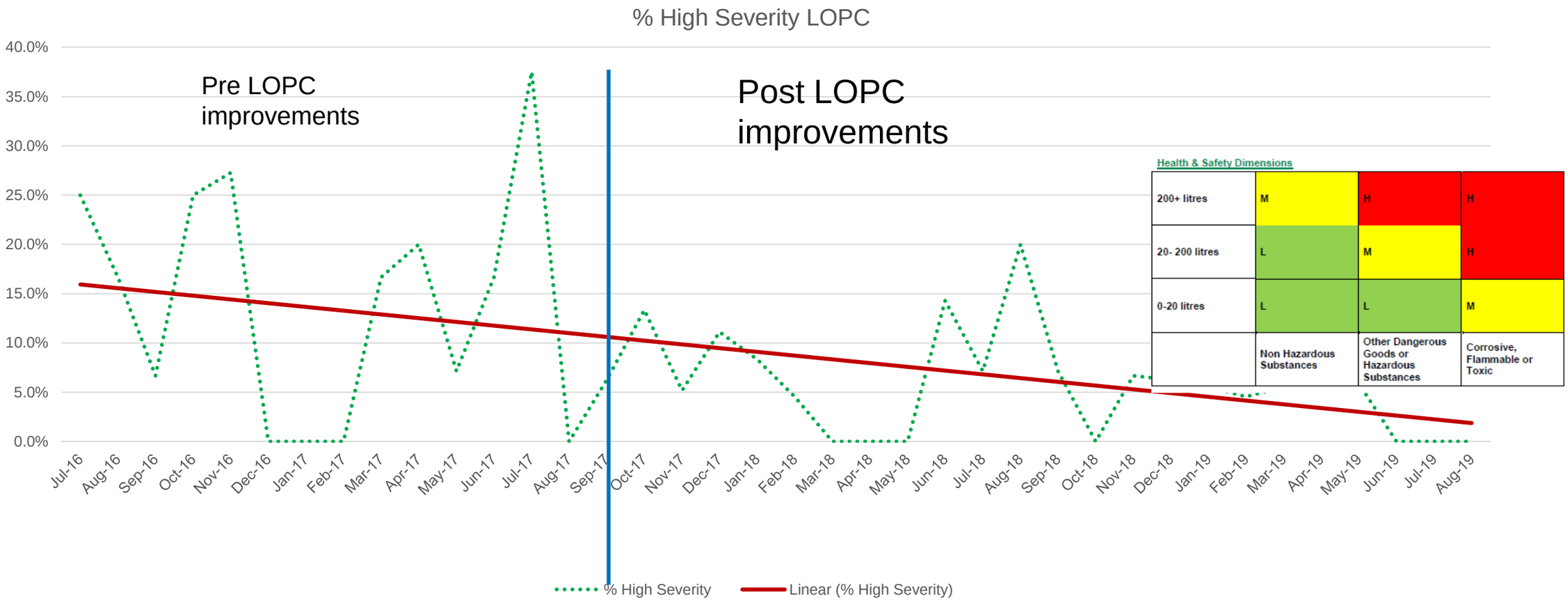
December 2018 – Mechanical HSE inspection, endorsed our system

Nov 2019 – 1274 flanges managed, ZERO leaks, 5277 signatures

LOPC Stats Pre-Implementation



LOPC Statistic Since Implementation



Health & Safety Dimensions

200+ litres	M	H	H
20- 200 litres	L	M	H
0-20 litres	L	L	M
	Non Hazardous Substances	Other Dangerous Goods or Hazardous Substances	Corrosive, Flammable or Toxic

Next Steps/Challenges Ahead

- 150 Km of pipework on site with approx. 75000 flanges
- Redundant/aged pipework – NDT testing of pipework to assess priorities, 1.5 Km of pipework replaced since October 2017
- Legacy gaskets
- Legacy pipework bracketry and supports
- Pipe bridge upgrades
- Fabric maintenance
- Maintain competence ref work force