

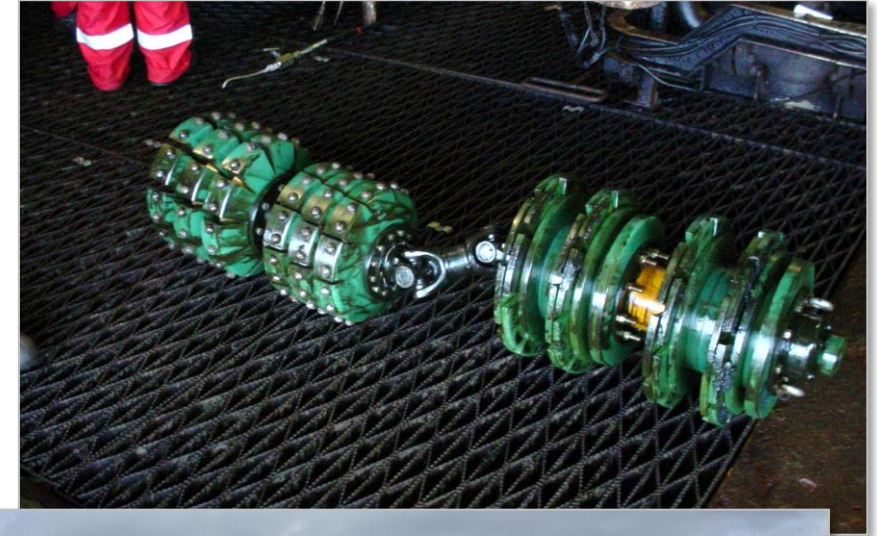


# Success Factors for Intelligent Pigging Campaigns

- *Loss of data because the pig came to a stop or ran too slow;*
- *Unreliable data because of sensor lift-off, waxed-up odometer wheel;*
- *Random pig-bits fell off and now pose a crevice corrosion risk inside the line;*

# EXPERIENCE

- Hudson to Tern 8" and 10" pipeline loops, 22km each.
- Buchan to Forties C 55km x 12" oil export;
- Tartan to Claymore 24" x 27km oil export;
- Saltire to Piper 10km x 7.4km multiphase export;
- Clyde to Fulmar 11km x 16" multiphase export line
- Fulmar to Judy wye 14" x 15km oil export & on to 34" Norpipe & Teesside.
- Knarr 12" x 105km gas export line dewatering & baseline intelligent pigging.





# WHICH IS MORE LIKELY?



**PE Pipeline Engineering**

**Launcher/Receiver Information**

	launcher	
orientation off trip:	<input type="checkbox"/> horizontal <input type="checkbox"/> vertical <input type="checkbox"/> inclined	
total overall length, block valve to end closure (A)		
length of oversize barrel (B)		
location of kicker line (C)		
diameter of kicker line (D)		
diameter of oversize barrel (E)		
diameter of nominal/neck pipe (F)		
length of nominal/neck pipe (G)		
type/length of reducer (H)		
type/inner diameter or block valve		
Height of launcher from ground level (centre)		
available working space behind launcher (I & J)		
is hoist available	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> yes <input type="checkbox"/> no
	capacity	capacity
	lift height	lift height
Is launcher equipped with:		
pig signaler?	<input type="checkbox"/> yes <input type="checkbox"/> no	
Sphere launching pins?	<input type="checkbox"/> yes <input type="checkbox"/> no	
internal basket?	<input type="checkbox"/> yes <input type="checkbox"/> no	
Is receiver equipped with:		
pig signaler?	<input type="checkbox"/> yes <input type="checkbox"/> no	
internal basket?	<input type="checkbox"/> yes <input type="checkbox"/> no	

please mark the locations of available vent valves of launcher!!



<b>SUBJECT:</b>	<b>DAILY PROGRESS REPORT NUMBER:</b>	<b>015</b>	<b>FOR</b>	<b>Tues</b>	
<b>1.0 Safety</b>					
<b>1.1 Accidents and Incidents</b>					
<b>Classification</b>	<b>Descr.</b>	<b>Rpt. No.</b>	<b>Today</b>	<b>Prev.</b>	<b>Total Cumulative</b>
Material Damage			0	0	0
Near Miss			0	0	0
NLTA			0	0	0
LTA			0	0	0
Pollution			0	0	0
Incidents			0	0	0
Other			0	0	0
<b>Total</b>			<b>0</b>	<b>0</b>	<b>0</b>
<b>1.2 Meetings, Drills and Exercises</b>					
			<b>Today</b>	<b>Prev.</b>	<b>Total Cumulative</b>
Induction Tours			0	7	7
Safety Committee Meetings			0	1	1
General Safety Meetings			0	0	0
Security meeting			0	0	0
Project KO meeting			0	1	1
Tool-Box Talks			2	36	38
Drills			0	1	1
<b>Total</b>					
<b>1.3 Safety Comments</b>					
Safety Observations:					





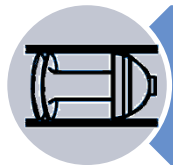


# SUCCESS FACTORS



**Schedule &  
3<sup>rd</sup> Parties**

When is the right time to pig & what other events have an effect on our job?



**Tooling &  
Equipment**

What tools are we using, do we have spares, where are they & what condition are they in?



**People**

Just as we are not crane drivers or control room operators, we depend on these people to successfully do our jobs. If do not understand the problems they face, how can I expect them to have any patience for mine?



## Schedule & 3<sup>rd</sup> Parties

- Have we allowed enough corrosion to have taken place that we'll measure a meaningful change in wall thickness since last time?
- How long will it take to clean the pipeline to an acceptable surface so the sensors can do their job?
- Do we have enough velocity for the pig and do we need to take advantage of a workover & well cleanup?
- Overall offshore duration: 21-day limit, are we going to need a crew-change? Is there enough bedspace?
- Manual valves needing turned or a subsea launch/receive? ROV and diving vessels are notorious for schedule slippage.



## Schedule & 3<sup>rd</sup> Parties

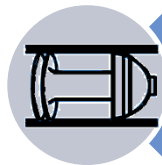
- Are there any other jobs offshore that mean deckspace is limited?
- When are supply boats scheduled and do contractors know when the gear needs to be at the quayside?
- Intelligent pig supplier plays 'not clean enough' card during launch decision to avoid liability from loss of data.
- Can we run more than one cleaning pig at a time? How do we ensure they don't catch up & risk damage to downstream ESDV & pig-trap throat valve?





## Schedule & 3<sup>rd</sup> Parties

- Is the pipeline clear of internal obstructions: injection quills, 3D bends, step-changes, dents from fishing or upheaval buckling?
- How big should our gauge plate be? Should we run a profiler-pig? Does we even have one?



## Tooling & Equipment

- Are there pig launching & receiving baskets, where are they, when were they last maintained, do we need new ones & how long will they take to fabricate?
- Pig trap door seals. When were they last opened, were there any anomalies, do we have spares, do we need new ones & how long will they take to get?
- Flexible risers? Is the ID a problem & how do we get a scraper through without damaging the stainless internal carcass?



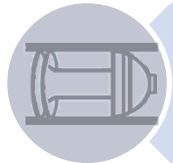
- How much wax is coming out, is it clean enough to launch the intelligent pig yet or needs more cleaning? How many cleaning pigs you got left?
- UT inside water injection line, launch in a slug of diesel to help waterproof connections. Uncertain of effectiveness but it's a logistical issue & hands contractor a reason not to guarantee data.
- How much wax, sand and LSA/NORM are we expecting to handle? Are we ready with extra handling crew, logistics support, risk-assessments & measures actioned?
- How do we estimate pig location: by fluid volume pumped, density changes, mechanical/radioactive source/sound signallers?

# SUCCESS FACTORS



Schedule &  
3<sup>rd</sup> Parties

- The platform crew, to whom you're an inconvenience, will have to adjust their rota to cater for pigging operations.



Tooling &  
Equipment

- If you're not offshore, do you need a site engineer to be your eyes and ears on the platform?

- If you're not in the room when a decision is taken, you're out of sight, out of mind.



People

- Site Engineer understands significance of wax consistency, the platform's Area Technician may not, so you may not get photo or video.

# SUCCESS FACTORS



- Have we briefed the platform crew about the wax, sand, LSA/NORM we're expecting them to handle?
- Vertical or horizontal pig launchers? We need a crane driver?



***‘Uh-oh; we didn’t think of that’***

- The things that go wrong - at least, *some* of them.

# FAILURE FACTORS

***Nobody checked warehouse for door spares & there's a months-long lead time.***

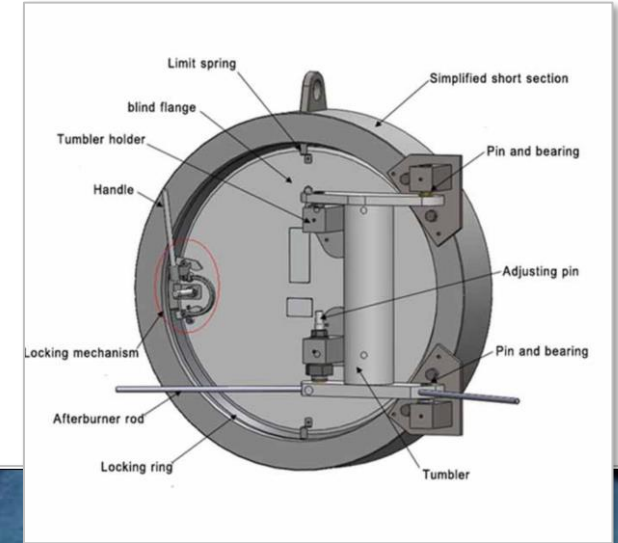
- Schedule-wrecking, but can not a show-stopper if numerous other problems also need solving.

***Pig battery only capacity for half-pipeline length. Which half do we shoot first?***

- Two mobilisations; crew fatigue, loss of familiarity in event of crew-change.

***Long, waxy line with multiple pigs running at once, risk of damage to downstream ESDV & pig trap inlet.***

- Extensive risk assessment required & tracking measures to ensure location known at arrival.



# FAILURE FACTORS

## *Bi-Directional cleaning pig bypass ports left open.*

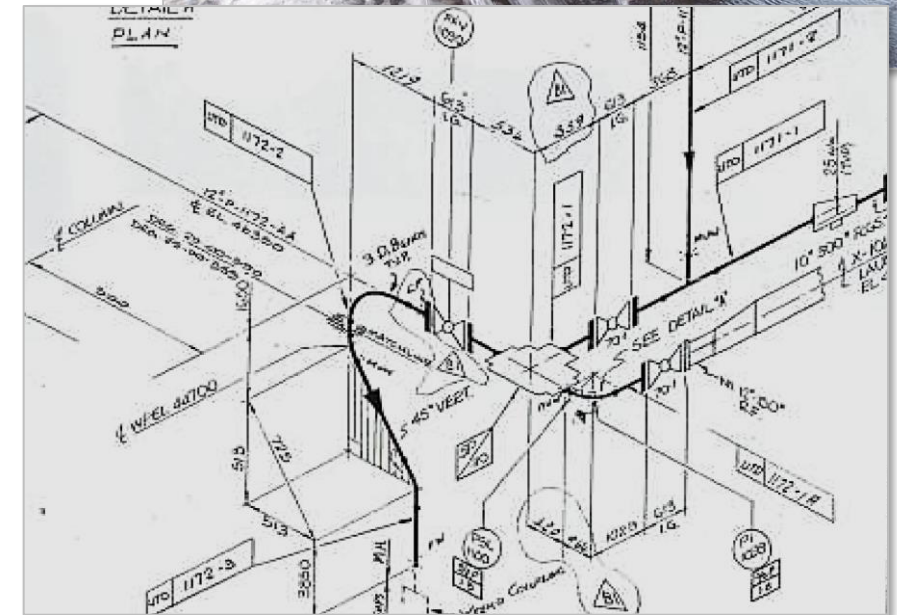
- Run-time several factors longer than expected.

## *Pigs temporarily hanging up in 3D bends, un-diagnosed until after expected arrival time.*

- Numerous causes inc. small launcher volume not launching with enough velocity for pig to pass through horizontal pipework into vertical riser.

## *Pulling-eye on pigs inconsistent.*

- Difficulty pulling pig out of trap, especially for short pigs with no basket.



# FAILURE FACTORS

*Platform shifted job forward 2 days, chopper booking changed - but nobody told contractor.*

*Foam or Bi-Di pigs breaking up on arrival, parts disappearing up kicker line towards main separator.*

- Valve line-up left through receiver for too long (foam), unidentified sharp corners (barred-tee); either causes delays & potential shut-down to retrieve the bits.

*'Umbrella' style driving discs on intelligent pig risk not inflating fully in low flow/differential pressure.*

- Does the pig build account for flow conditions?





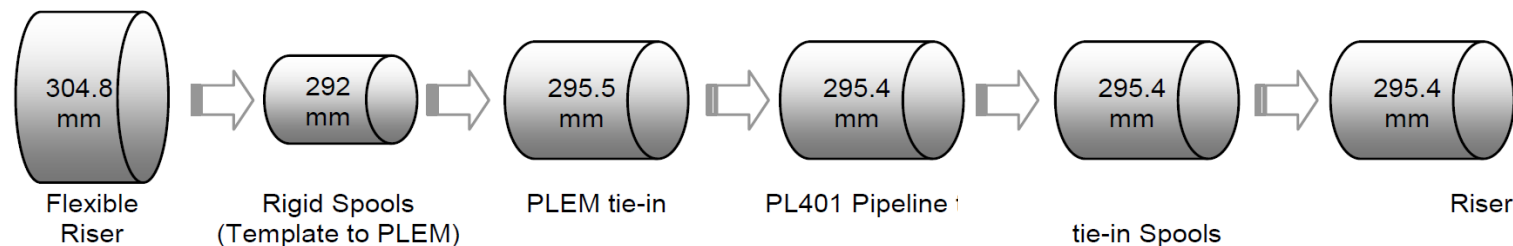
# FAILURE FACTORS

## *Multi-diameter sections of pipeline making pig selection difficult.*

- Pin-wheel scrapers are sized & sprung to push hard against the pipe wall but might damage the internals of a flexible.

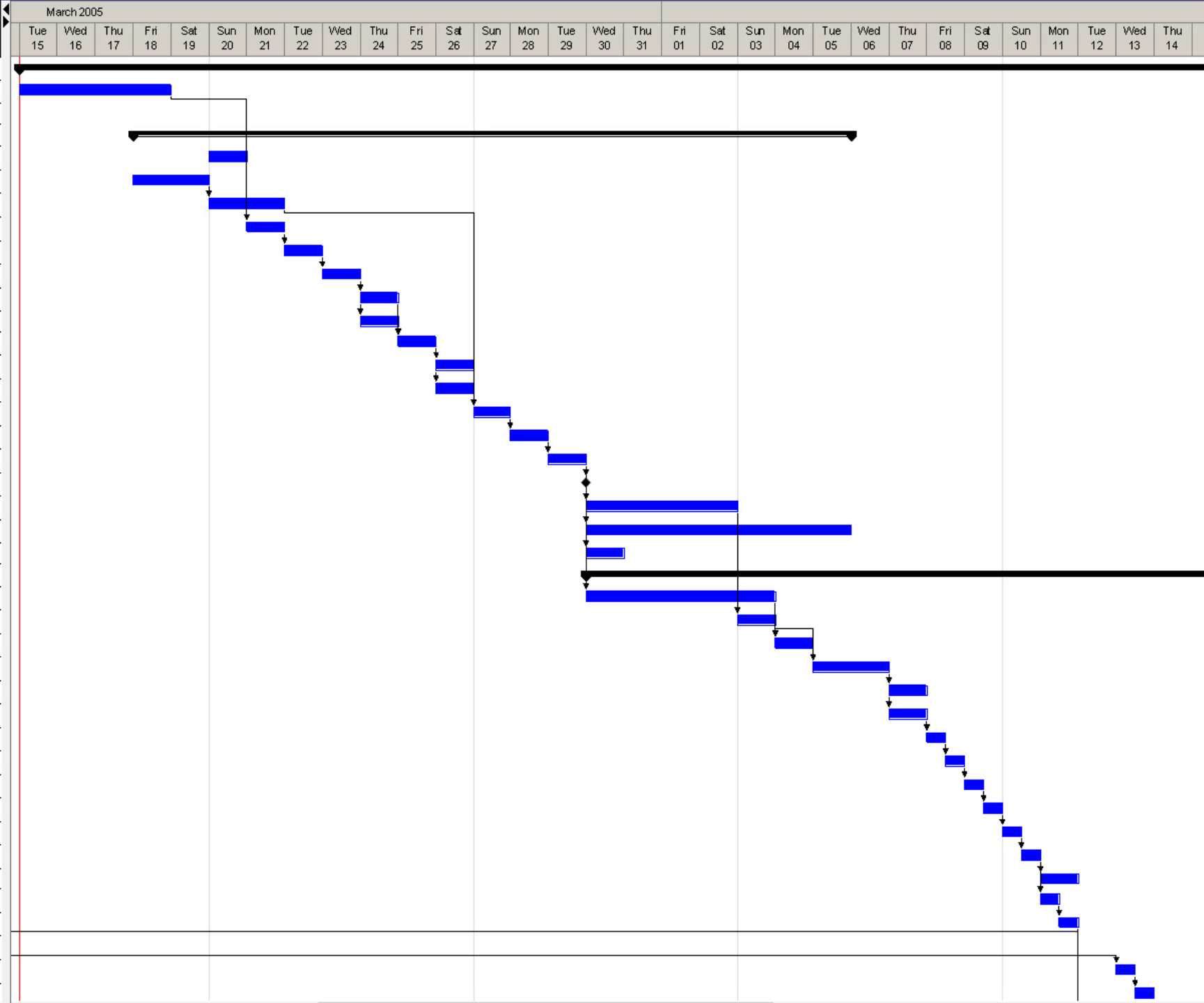
## *Pig-basket cracks up partway through job.*

- Used-once, thin-wall with shoddy welding, demobilised then forgotten about, nobody recognises what it is, rusting away in the back of the warehouse.

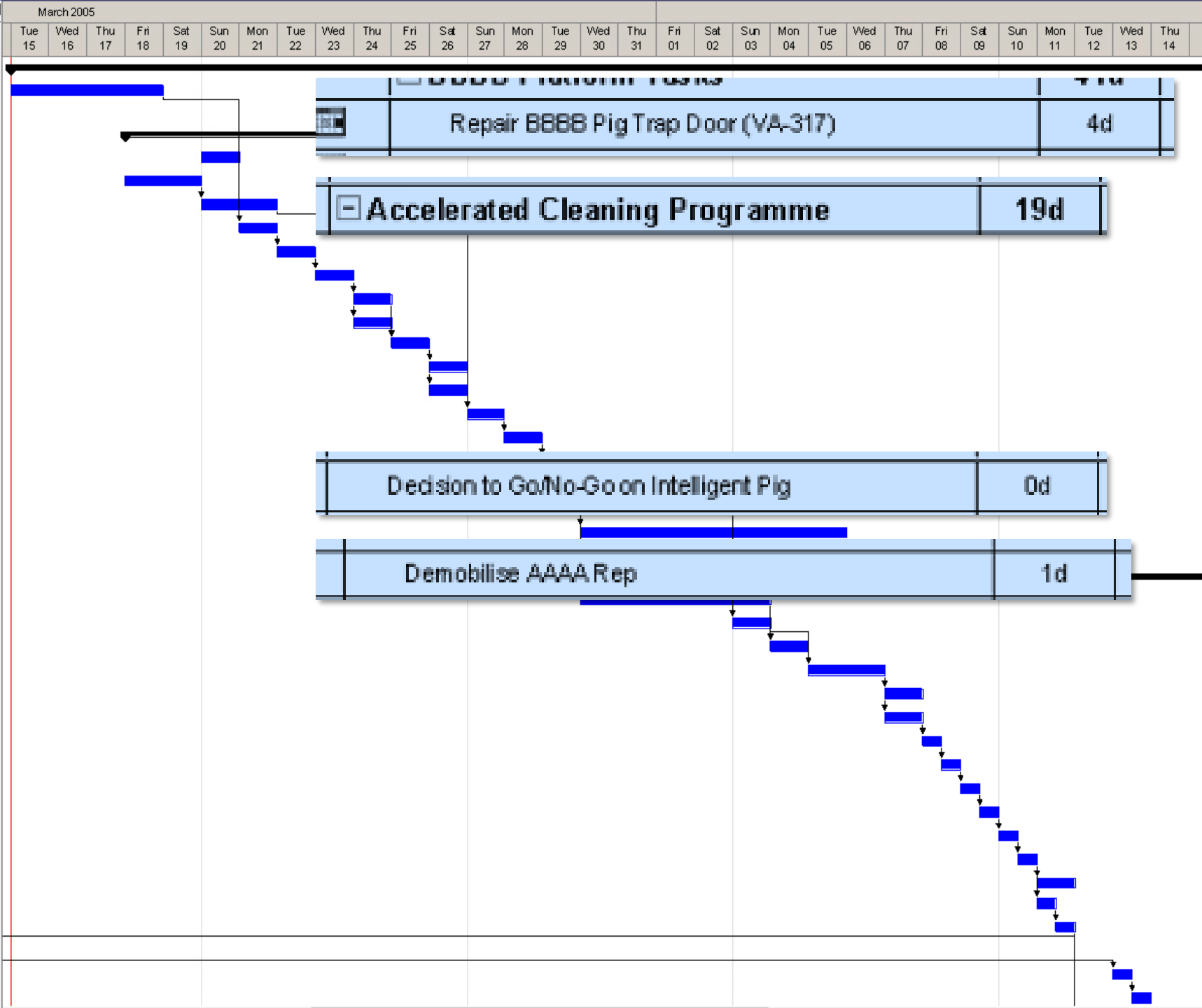


# Final Thoughts

ID	Indicators	Task Name	Duration	Start	Finish
1		<b>BBBB Platform Tasks</b>	<b>41d</b>	<b>15.03.05</b>	<b>25.04.05</b>
2		Repair BBBB Pig Trap Door (VA-317)	4d	15.03.05	19.03.05
3		BBBB Shutdown	7d	18.04.05	25.04.05
5		<b>Accelerated Cleaning Programme</b>	<b>19d</b>	<b>18.03.05</b>	<b>06.04.05</b>
6		Mobilise AAAA Rep Offshore: Induction & Toolbox Talk	1d	20.03.05	21.03.05
7		Transport 3# PII Dual-Tandem/Descaling Pigs to Logistic	2d	18.03.05	20.03.05
8		Mobilise 3# PII Dual-Tandem/Descaling Pigs to AAAA	2d	20.03.05	22.03.05
9		Launch & Assess 1st Pig (Bare Foam/Swab)	1d	21.03.05	22.03.05
10		Launch & Assess 2nd Pig (Bare Foam/Swab)	1d	22.03.05	23.03.05
11		Launch & Assess 3rd Pig (Bare Foam/Swab)	1d	23.03.05	24.03.05
12		Launch & Assess 4th Pig (Criss-Cross Foam/Swab)	1d	24.03.05	25.03.05
13		Demobilise AAAA Rep	1d	24.03.05	25.03.05
14		Launch & Assess 5th Pig (Criss-Cross Foam/Swab)	1d	25.03.05	26.03.05
15		Launch & Assess 6th Pig (Criss-Cross Foam/Swab)	1d	26.03.05	27.03.05
16		Mobilise AAAA Rep Offshore: Induction & Toolbox Talk	1d	26.03.05	27.03.05
17		Launch & Assess 7th Pig (Dual-Tandem/Descaling)	1d	27.03.05	28.03.05
18		Launch & Assess 8th Pig (Dual-Tandem/Descaling)	1d	28.03.05	29.03.05
19		Launch & Assess 9th Pig (Dual-Tandem/Descaling)	1d	29.03.05	30.03.05
20		Decision to Go/No-Go on Intelligent Pig	0d	30.03.05	30.03.05
21		Return Pigs at BBBB to BBBB Shipping (Logistics Base)	4d	30.03.05	03.04.05
22		Optional/Extra Cleaning Pigs as Appropriate	7d	30.03.05	06.04.05
23		Demobilise AAAA Rep	1d	30.03.05	31.03.05
25		<b>Intelligent Pigging Campaign</b>	<b>16.5d</b>	<b>30.03.05</b>	<b>15.04.05</b>
26		Preparation of Equipment	5d	30.03.05	04.04.05
27		Return pigs from BBBB Shipping (Logistics) to Peterhead	1d	03.04.05	04.04.05
28		Mobilise PII Equipment from Cramlington to Peterhead/E	1d	04.04.05	05.04.05
29		Mobilise PII Equipment from Peterhead offshore	2d	05.04.05	07.04.05
30		Mobilise PII crew to AAAA: Induction/Toolbox Talks	1d	07.04.05	08.04.05
31		Mobilise AAAA & PII crew to BBBB: Induction/Toolbox Te	1d	07.04.05	08.04.05
32		Unpack/Check Equipment on AAAA/BBBB	0.5d	08.04.05	08.04.05
33		Load, run & receive 1st 14/16" Dual-Tandem Pig type SP	0.5d	08.04.05	09.04.05
34		Load, run & receive 1st 14/16" D Descaling Pig	0.5d	09.04.05	09.04.05
35		Load, run & receive 2nd 14/16" Dual-Tandem Pig type S	0.5d	09.04.05	10.04.05
36		Load, run & receive 2nd 14/16" D Descaling Pig	0.5d	10.04.05	10.04.05
37		Load, run & receive 3rd 14/16 Dual-Tandem Pig type SP	0.5d	10.04.05	11.04.05
38		Optional: Mobilise additional PII crew to AAAA	1d	11.04.05	12.04.05
39		Load, run & receive 3rd 14/16" D Descaling Pig	0.5d	11.04.05	11.04.05
40		Load, run & receive Profile vehicle	0.5d	11.04.05	12.04.05
41			0d		
42		(Optional) Load, run & receive 4th 14/16 Dual-Tandem Pi	0.5d	13.04.05	13.04.05
43		(Optional) Load, run & receive 4th 14/16" D Descaling Pig	0.5d	13.04.05	14.04.05



ID	Indicators	Task Name	Duration	Start	Finish	March 2005																											
						Tue 15	Wed 16	Thu 17	Fri 18	Sat 19	Sun 20	Mon 21	Tue 22	Wed 23	Thu 24	Fri 25	Sat 26	Sun 27	Mon 28	Tue 29	Wed 30	Thu 31	Fri 01	Sat 02	Sun 03	Mon 04	Tue 05	Wed 06	Thu 07	Fri 08	Sat 09	Sun 10	Mon 11
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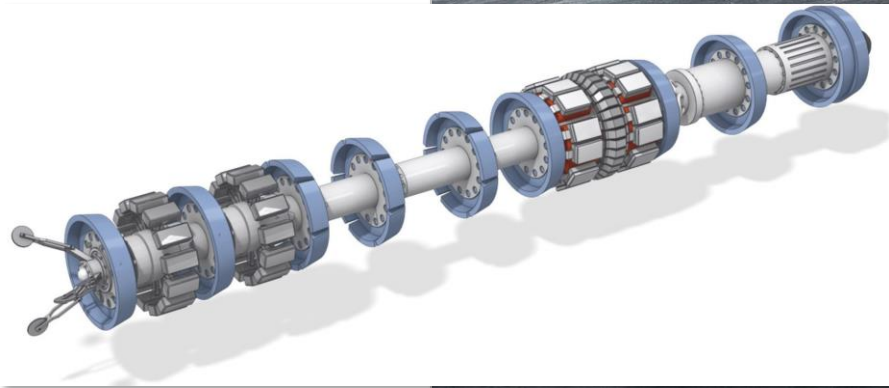
# NEW TOOLS

I did all this in with telephone, fax and email but now we have Teams, shared Whiteboards and platforms with their own 4G network.

We no longer have to carry paper & pen out onto a rainy deck, struggling to keep it dry.

Now our checklists and procedures can be uploaded to the cloud, downloaded to an intrinsically-safe tablet and as the site engineer checks a box and takes a photo, we can see it onshore seconds later.





# Questions ?





# ROSEN ENGINEERING SUPPORT



## 42 Albyn Place

**Martin Harley**

