



From Project to Project...

Stephanie Houghton

How I Got Here....

- ▶ Graduated with MEng Chemical Engineering with Environmental Engineering from Edinburgh University
- ▶ Applied to TATA Steel
- ▶ Started work 5/9/11 as a Graduate Chemical Engineer





TATA STEEL

#STEELMATTERS



POWERING BRITAIN

Our Hartlepool site is renowned for its world-leading line pipe operation, which has produced

1 million tonnes of line pipe

for North Sea oil and gas projects in the last 20 years.



SPENDING POWER

Nearly all **1p, 2p, 5p and 10p** UK coins in circulation originate from steel made in Port Talbot and are further processed at our Wednesfield site.

STEEL IS THE FOUNDATION TO OUR SOCIETY

Our UK made steel is everywhere around us, even in places you might not expect like crash barriers, food cans, aerosols, aeroplane undercarriages, tumble dryers, tractors and office furniture.




LANDMARKS AND LEGENDS

Nearly **1000 tonnes** of steel galvanised at our Shotton site went into The Shard, which is Western Europe's tallest building. **300 tonnes** of steel tubes produced at our Corby and Hartlepool plants were used in The Kalpies, two monumental steel sculptures standing 30 metres high in Falkirk, Scotland.



LIGHTER, FASTER, SAFER TRANSPORT

Tata Steel UK supplies almost **50%** of UK carmakers' steel requirements – everything from body panels and chassis to engine components and wheels.



BACKING WINNING BRANDS

Many leading car manufacturers use our steel. The Zodiac Line at our Llanwern plant for example supplies Nissan with coil that is used to produce the exterior body panels of some of its models.


LEAN AND GREEN

Steel is the most recycled packaging material and can be used and recycled infinitely with no loss of quality.

Tata Steel has its own rail terminal which supplies steel coil for customers in the West Midlands, the main steel-consuming region of the UK.

19 trains a week transporting

750,000 tonnes




which means **30,000** fewer lorry journeys a year!



KEY MARKETS

Key markets served by Tata Steel's UK business include automotive, construction, lifting and excavating, energy and power and aerospace.




BREAKING RECORDS

Port Talbot hot strip mill produced a record **3.2 million tonnes** last year, helping to improve manufacturing efficiencies.



GOING GLOBAL


Our Hartlepool and Corby sites make steel tubes for globally famous construction projects, including parts of the **22,000 tonnes** of steel products used in total in London's Wembley Stadium. Other iconic structures using our steel tubular products include the London Eye, Arsenal's Emirates Stadium, the Singapore Sports Hub, the Middle East Louvre and the New York Freedom Tower.



22,000 TONNES

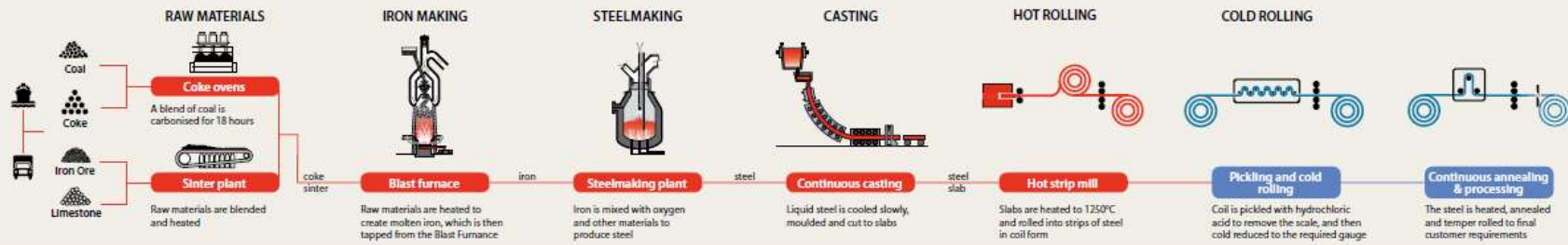
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Steelmaking process



Port Talbot Works



Miners' Memorial
The memorial is sited near the old pit shaft. 87 men died in the last explosion on the 10th March 1890. The memorial consists of a mandrel, a shovel and an axe. P. D. Allen, Managing Director, British Steel plc, unveiled the Miners' Memorial on the 10th March 1990 to mark the centenary of the explosion.

Abbey Wall
Port Talbot Works is built on the land of two ancient monastic farms. This 12th century farm wall was retained during construction and now forms an important piece of our history. Local folklore dictates that should this wall ever collapse; the works will cease to operate. For this reason, it was recently underpinned!

KEY FACT:
Over 30,000 visitors pass through these gates every year.

30 mph limit on site, rail traffic takes priority

For more detailed information about the steelmaking process, please visit our web site: www.tatasteel.com or find us/follow us: www.facebook.com/tatasteelwales www.twitter.com/tatasteelwales



Projects I've Worked On

Graduate:

- Site-wide Steam Distribution Model
- BF4 Rebuild – SIL Systems

Process Engineering Department:

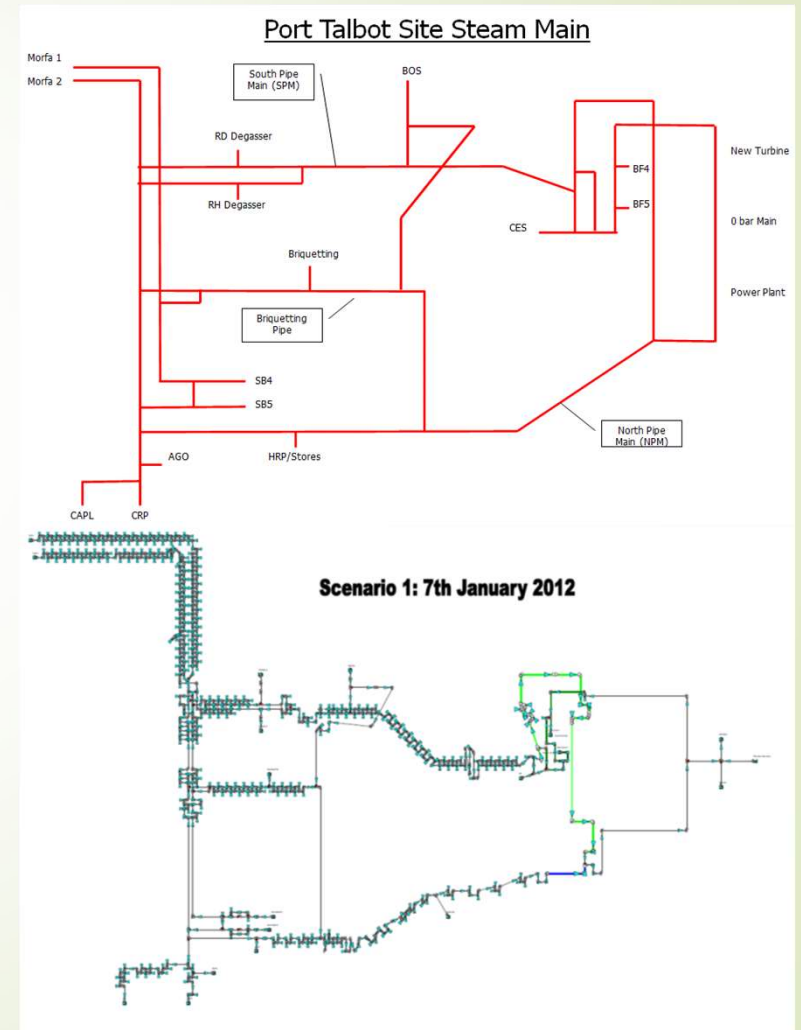
- Water Treatment Trial
- Energy Efficiency Wave – Llanwern Zodiac

Current Work:

- Sinter Plant De-dust System
- Sinter Plant De-dust System Filter Replacement Project

Site-wide Steam Distribution Model

- Brief: Carry out a process study on how the site-wide 11 barg steam ringmain system would 'evolve' from CAPEX projects.
- Used a previously created model to run different scenarios and analyse the resultant pressures and temperatures at the different steam users.



BF4 Rebuild – SIL Systems, P&ID Checks

- Brief: To collate the relevant information for the SIL systems on the BF4 Rebuild; To carry out P&ID Checks on the BF4 Gas Plant.
- Collated information (loop drawings, SIL calculations, instrument data) on the SIL systems that had been identified by LOPAs.
- Carried out P&ID Checks on the BF4 Gas Plant and fed back findings to project team.

LOPA SUMMARY SHEET, CCC-LOPA1A (this loop is in)	
Site/Installation	BF4 Rebuild, Blast Furnace Gas
Input event Description	Prevention of loss of cooling to gas cleaning plant by tripping of water (Furnace Cooling WADIP ref No. 1.1.1.1, 1.1.1.2, 1.2.1.1, 1.2.1.2, 1.2.1.3, 1.2.1.4, 1.2.1.5, 1.2.1.6, 1.2.1.7, 1.2.1.8, 1.2.1.9, 1.2.1.10, 1.2.1.11, 1.2.1.12, 1.2.1.13, 1.2.1.14, 1.2.1.15, 1.2.1.16, 1.2.1.17, 1.2.1.18, 1.2.1.19, 1.2.1.20, 1.2.1.21, 1.2.1.22, 1.2.1.23, 1.2.1.24, 1.2.1.25, 1.2.1.26, 1.2.1.27, 1.2.1.28, 1.2.1.29, 1.2.1.30)
Input event Type	Safety / Disturbance
Event Consequences	On the Safety & event loop
Tolerable Event Frequency (1/yr)	1.00E-05
Event Severity Category	2
Safety Function Loop Number, if known	CCC-LOPA1A - Furnace Cooling 0
Safety Function Trip Action (if applicable)	Loss of water recirculation (loop 0 & 1) P&ID 2.0 Open function 0 & 2
P&ID / Drawing number	C-WB10 RB 8601 - FRFB001

Initiating Event (IE)	
Ref	Description
A	Power Failure
B	Mechanical failure of pump (s)
C	Motor Load in excess
D	Failure of Leak Detection Valve Level Control
E	Emergency Bleed Valve Fail Open
F	High flow in excess
G	Failure of water recirculation system when required
H	Nitrogen Pressurisation Tank Over Pressure

Conditional Events (if applicable)			
Ref	Description	Probability	Justification
1	Probability of upsets	0.01	Emergency response has been only 1 hour late. This gives an opportunity for the operator to intervene and prevent escalation.
2	Probability of furnace upsets/system blocked	1	Assumes water control gives a major loss of capacity.

Independent Layers of Protection			
Ref	Description	Probability	Justification
1	Manual Pump Start-up	0.01	If a contractor drops out of the works area, the pump will not start. The pump operator is in the room during the start-up and will be notified (audible) of any start-up (if flow is 100% full).
2	Interdiction System	0.1	The interdiction system would prevent or again permit as supplied by the interlock system.
3	High Water Make-up plus Inter-Circuit flow monitoring and furnace leak detection system	0.01	Make-up water into furnace system. Low water level in furnace at water level interlock system is required to alarm and interlock. The interlock system is required to have a failure mode which is not a failure. Furnace water level system is required to have a failure mode which is not a failure. Furnace water level system is required to have a failure mode which is not a failure.
4	Inter-Circuit flow monitoring Top Gas Hydrogen and/or temperature data	0.1	Major leak into furnace. Furnace water level system is required to have a failure mode which is not a failure. Furnace water level system is required to have a failure mode which is not a failure.
5	Leak Stop Detection Device	0.1	Leak stop detection device.
6	Water Level in Leak Detection Tank	0.01	If a leak occurs, the water level in the tank will rise and the alarm will sound.
7	Nitrogen Pressurisation Tank Safety Valve	0.01	If a nitrogen pressurisation tank fails, the pressure will be relieved.

PFDavg Calculation										
Initiating Case	Frequency (1/yr)	Conditional Modification	Independent Layer of Protection	1	2	3	4	5	6	7
A	0.01	0.01	1	0.01	0.1	0.1	0.1	0.1	0.1	0.1
B	0.01	0.01	1	0.01	0.1	0.1	0.1	0.1	0.1	0.1
C	0.01	0.01	1	0.01	0.1	0.1	0.1	0.1	0.1	0.1
D	0.01	0.01	1	0.01	0.1	0.1	0.1	0.1	0.1	0.1
E	0.01	0.01	1	0.01	0.1	0.1	0.1	0.1	0.1	0.1
F	0.01	0.01	1	0.01	0.1	0.1	0.1	0.1	0.1	0.1
G	0.01	0.01	1	0.01	0.1	0.1	0.1	0.1	0.1	0.1
H	0.01	0.01	1	0.01	0.1	0.1	0.1	0.1	0.1	0.1

Notes / Comments:

- Note 1 - P&ID: Detail back-up requires failure rate of 0.01
- Note 2 - P&ID: The leak detection flow monitoring and water level supply requires failure rate of 0.01
- Note 3 - P&ID: The gas pressure alarm monitoring requires failure rate of 0.01
- Note 4 - P&ID: Low level in high detection tank and alarm to address water required failure rate 0.01
- Note 5 - P&ID: Nitrogen pressurisation tank safety valve requires failure rate 0.01

Safety Integrity Level

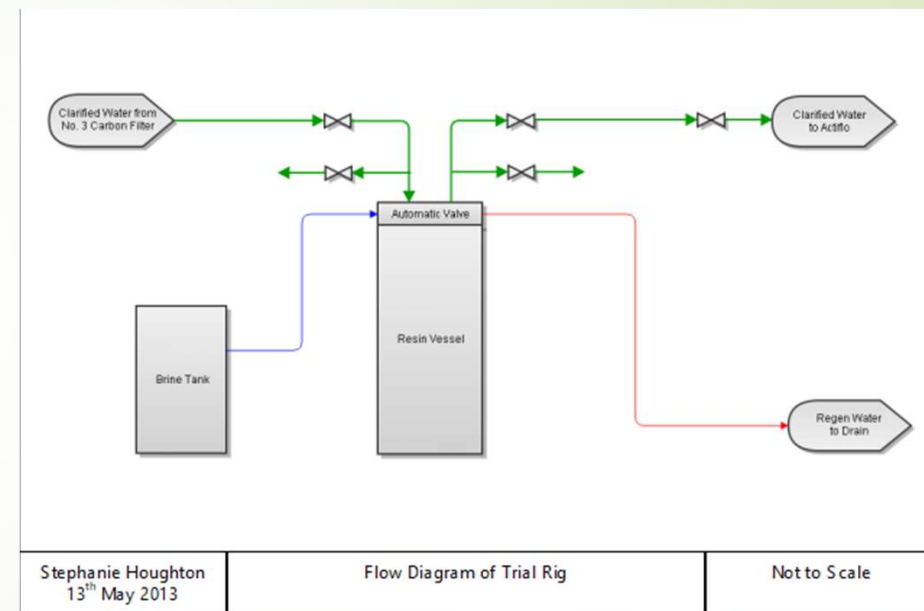
1	<= 0.0001 to <= 0.001	0.0001 to 0.0001
2	<= 0.001 to <= 0.01	0.001 to 0.001
3	<= 0.01 to <= 0.1	0.01 to 0.01
4	<= 0.1 to <= 1	0.1 to 0.1
5	<= 1 to <= 10	1 to 1
6	<= 10 to <= 100	10 to 10
7	<= 100 to <= 1000	100 to 100
8	<= 1000 to <= 10000	1000 to 1000
9	<= 10000 to <= 100000	10000 to 10000
10	<= 100000 to <= 1000000	100000 to 100000
11	<= 1000000 to <= 10000000	1000000 to 1000000
12	<= 10000000 to <= 100000000	10000000 to 100000000
13	<= 100000000 to <= 1000000000	100000000 to 1000000000
14	<= 1000000000 to <= 10000000000	1000000000 to 10000000000
15	<= 10000000000 to <= 100000000000	10000000000 to 100000000000
16	<= 100000000000 to <= 1000000000000	100000000000 to 1000000000000
17	<= 1000000000000 to <= 10000000000000	1000000000000 to 10000000000000
18	<= 10000000000000 to <= 100000000000000	10000000000000 to 100000000000000
19	<= 100000000000000 to <= 1000000000000000	100000000000000 to 1000000000000000
20	<= 1000000000000000 to <= 10000000000000000	1000000000000000 to 10000000000000000
21	<= 10000000000000000 to <= 100000000000000000	10000000000000000 to 100000000000000000
22	<= 100000000000000000 to <= 1000000000000000000	100000000000000000 to 1000000000000000000
23	<= 1000000000000000000 to <= 10000000000000000000	1000000000000000000 to 10000000000000000000
24	<= 10000000000000000000 to <= 100000000000000000000	10000000000000000000 to 100000000000000000000
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27	<= 10000000000000000000000 to <= 100000000000000000000000	10000000000000000000000 to 100000000000000000000000
28	<= 100000000000000000000000 to <= 1000000000000000000000000	100000000000000000000000 to 1000000000000000000000000
29	<= 1000000000000000000000000 to <= 10000000000000000000000000	1000000000000000000000000 to 10000000000000000000000000
30	<= 10000000000000000000000000 to <= 100000000000000000000000000	10000000000000000000000000 to 100000000000000000000000000

FUNCTIONAL SAFETY ASSESSMENT	
Title: Furnace high pressure protection bleeder valve	
SIF Ref No.	Sheet 1 of 2
Project No.	C.WB10
Project Title	No. 4 Blast Furnace Rebuild
Works	Port Talbot
Plant Installation	Gas Cleaning Plant
P&ID No.	C.WB10.RB.8601-FRFB001
Loop Number	GP-LOPA 1

STAGE 1 FUNCTIONAL SAFETY ASSESSMENT	
1. HAZARD SUMMARY	
Hazard Study report Ref: HAZOP_BF4 Rebuild_Gas Plant Rev0 200511 final.doc – Scenario 1.2.1.1 No:	
1. Hazardous Event/Situation (Cause, flow, emission, etc.)	2. Consequences (Injuries, Death, Lost Production environment, failure)
3. Caused by (High-Operations, failure)	4. Prevented or Corrected by
1. Loss of gas pressure monitoring at top of the gas cleaning plant conditioning tower	
2. Rupture of gas cleaning plant conditioning tower leading to possible release of toxic gas.	
3. Furnace slip Restriction in gas plant Poor melt removal Pressure transmitter, PT226, reads low	
4. i) Pressure monitoring by 4 other independent pressure sensors at the top of the furnace, actuating respective bleeder valves. ii) Pressure monitoring at the conditioning tower clean gas main will operate the Semi-Clean Gas Bleeder valve to relieve pressure in the gas plant iii) Bleed	


Water Treatment Trial

- Brief: To determine whether a resin would help to minimize the fouling of Reverse Osmosis membranes used in our water treatment plant.
- Designed a trial plant, set up the plant within the treatment plant and ran trials to determine the effectiveness of the resin.



Energy Efficiency Wave – Llanwern Zodiac

- Brief: To determine energy efficiency projects for the Zodiac Plant at Llanwern works.
- Participated in brainstorming & analysing the potential of the ideas generated.
- Progressed ideas so that they are straight forward to implement.

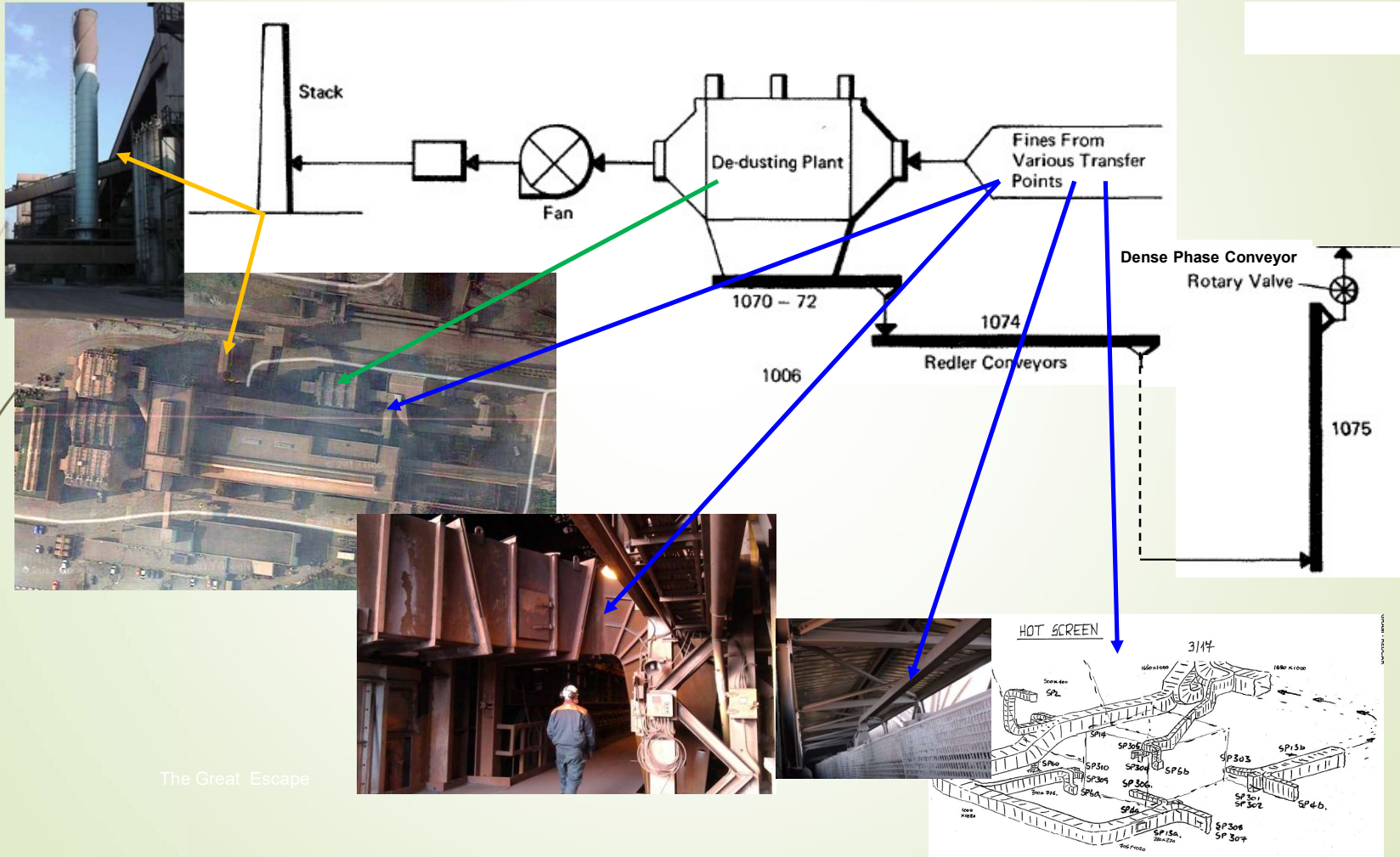
Analysis				Opportunities	
Cooling Performance					
SJC Capability		RJC Capability			
<u>Design</u>	<u>Actual</u>	<u>Design</u>	<u>Actual</u>		
3.4 MW	1.1 MW	3.1 MW	1.9 MW		
					
Total Cooling capability		<u>Design</u>	<u>Actual</u>		
		6.5 MW	3 MW		
Poor Cooling Performance – Potential Process Bottleneck!					
Potential Consequences of Poor Cooling Capability:					
<ul style="list-style-type: none"> ▪ Compromise line speed. ▪ High strip temperature en ▪ Operate fans at maximum 					
<ul style="list-style-type: none"> ▪ Re-align cooling capability back to design standard. ▪ Analysis highlights potential scope for fan operational energy savings. 					
Next Steps					
<ul style="list-style-type: none"> ▪ Review heating and cooling cycle for product mix. ▪ Review cooling fan operational performance. ▪ Review heat exchanger nning regime. ▪ Review cooling performance product mix. ▪ Identify and review bottleneck ducts. 					



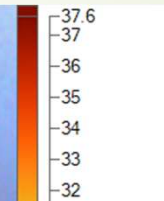


Current Work

The De-dusting "System"



Why Have a De-dust System?



The Great Escape

Understanding the System

Improving the System



Assessing the Current Condition of the System

De-dust Maintenance Work



De-dust Project

- “Sinter Plant De-dust System Filter Replacement Project”
- Replacing the existing De-dust System ESP (built 1970's) with a bag filter to meet new IED emissions limits.

