



PAPERBOARDS AND SPECIALTY PAPERS DIVISION

ITC Limited-PSPD
Unit - Bollaram









Inception of In-House Automation A March towards Industry 4.0

KBS Krishna, Srikanth Ganala, Shaik Junaid



Safety Pause

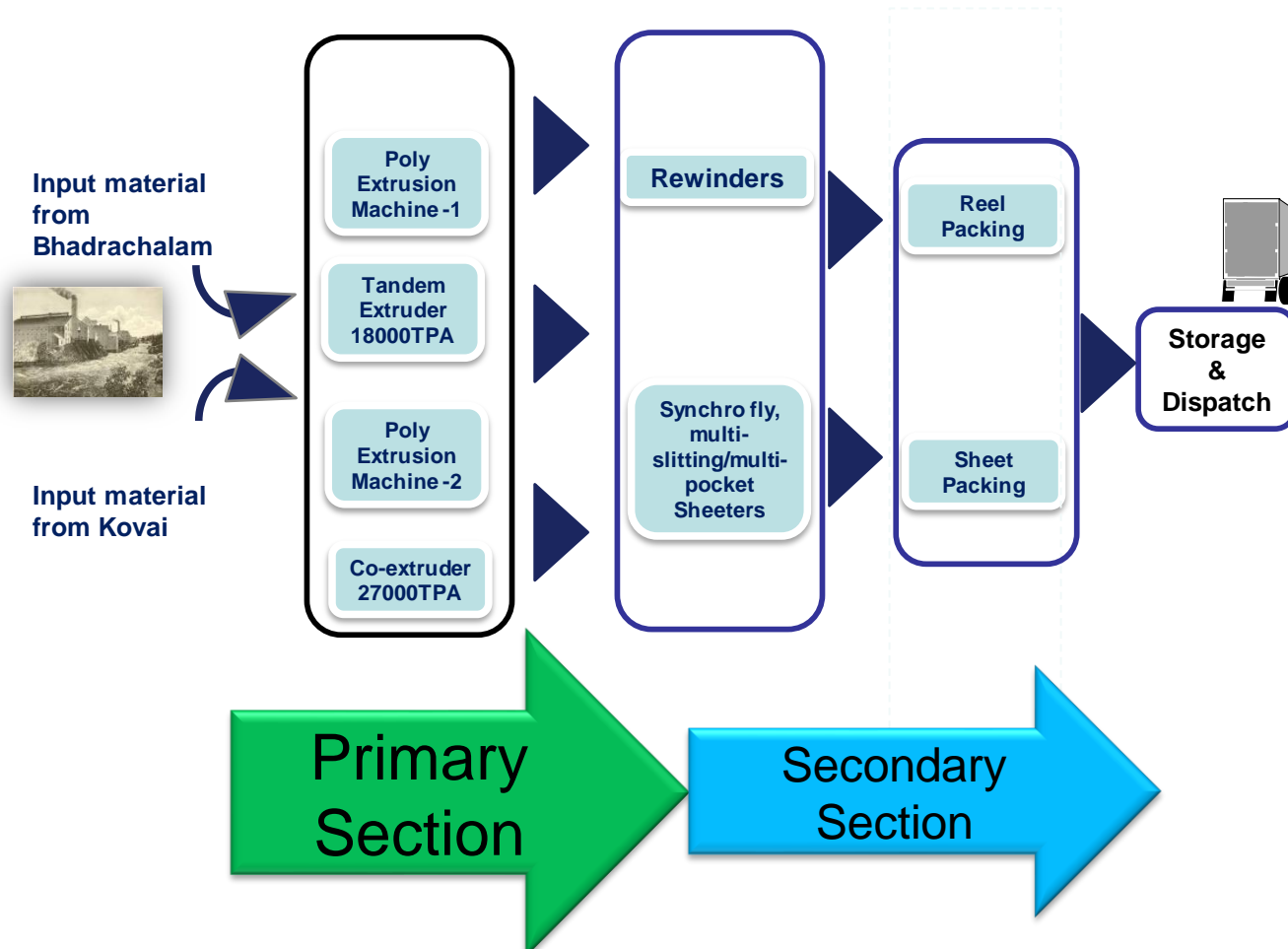
THE THREE TYPES OF DISTRACTED DRIVING AND HOW TO AVOID THEM

 <p>VISUAL</p>	 <p>MANUAL</p>	 <p>COGNITIVE</p>
		
<p>Keep your eyes on the road.</p> <p>Pull over to read directions.</p> <p>Put your phone in “Do Not Disturb” mode.</p>	<p>Keep your phone out of reach.</p> <p>Make all adjustments before driving.</p> <p>Don’t reach for items while driving.</p>	<p>Avoid phone calls, even hands-free.</p> <p>Stay focused on the road.</p> <p>Keep your emotions in check.</p>

Introduction

- ❖ ITC Limited, PSPD, Unit Bollaram is situated at Bollaram, in Sangareddy district of Telangana State
- ❖ Established in year 1994
- ❖ Production capacity of 45000 Tons per annum
- ❖ 2 Poly Extrusion machines
- ❖ 3 Sheeters and 2 Rewinders

Overview of the Plant



Abstract

- Industry 4.0 is referred to as the fourth industrial revolution. Automation and Data capturing plays a vital role marching towards Industry 4.0. As a first step, all the legacy machines and systems are Automated which will be a foundation for Industry 4.0
- Inception of In-House Automation – A March towards I4.0
 - Automation of Poly 1 Machine
 - Upgradation of Sheeter Machine
 - Web Scanning System

Case Study 1 – Automation of Poly 1 Machine

- Enhancement of asset database for Process Digitalization in-order to connect all machines, Systems and all Working pieces with Process Optimization features.
- The legacy panels were running on contactor and relay logics with hundreds of cables running across the machines which is bottleneck for data collection to understand current operating condition and detect faults and failures.

Scenario before automation:

- Heating System
 - Single Loop controllers which has neither data generation compatibility nor data storage capacity.
 - Manual adjustment of Process parameters wrt individual zone
- Machine Control which is hardwired relay/contactor logic
 - Bottleneck for Process Digitalization
 - No data generation capability.

- Installation of
 - PLC's which has data generation compatibility for both Machine control system and Heating System.
 - SCADA (Supervisory Control and DATA acquisition) which can integrate Machine control system and Heating system.
- Digitalization of Machine Operation and heating system with Man-Machine interface.

A glimpse of data acquisition from SCADA installation

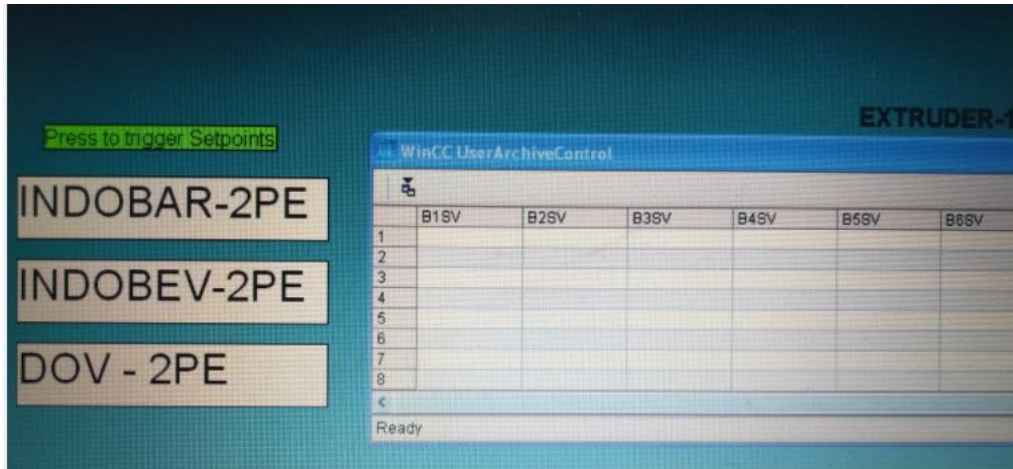


Digitalized Process



Fault Diagnostic System to gain Self-awareness

Benefits from SCADA installation



Automated Recipes Management

Data Management

DATE_TIME	LINE SPEED	EXT 1 Screw RPM	EXT 2 Screw RPM	CORONA 1	CORONA 2	EXT 1 Melt Pressure	EXT 2 Melt Pressure	LAM 1 I/L Temp	LAM 2 I/L Temp	Flame 1	Flame 2	Reel length
21/09/2017 06:00	131.0	0.3	38.3	0.0	6.3	0.0	0.0	29.4	21.7	0.0	4925.8	3073.0
21/09/2017 06:03	120.3	0.3	34.9	0.0	6.4	0.0	0.0	29.4	21.8	0.0	4993.5	3437.0
21/09/2017 06:03	120.3	0.3	34.9	0.0	6.4	0.0	0.0	29.4	21.8	0.0	4993.5	3437.0
21/09/2017 06:03	120.3	0.3	35.2	0.0	6.4	0.0	0.0	29.4	21.8	0.0	4970.9	3460.0
21/09/2017 06:04	120.3	0.3	35.0	0.0	6.4	0.0	0.0	29.4	22.0	0.0	4937.1	93.0
21/09/2017 06:05	120.3	0.3	35.0	0.0	6.3	0.0	0.0	29.4	22.3	0.0	4948.3	220.0
21/09/2017 06:06	97.2	0.3	14.8	0.0	0.9	0.0	0.0	29.4	22.2	0.0	700.5	328.0
21/09/2017 06:07	120.7	0.3	35.4	0.0	6.3	0.0	0.0	29.4	21.8	0.0	5016.1	426.0
21/09/2017 06:08	120.7	0.3	35.2	0.0	6.4	0.0	0.0	29.4	21.5	0.0	4993.5	556.0

- Continuous data logging of critical process parameters
(Frequency:Every Minute)
- Event Logging
- Alarm and Recipe Management
- Process deviation detection
- Detecting faults and failure
- Databased analysis for Decision making

Case Study 2 – Pasaban Sheeter Upgrade

- Below problems are faced with existing system (OEM)
 - ✓ No data can be fetched machine
 - ✓ No machine parameter can be logged
 - ✓ Frequent breakdown related to electrical system
 - ✓ High cost and lead time of spares due to import
 - ✓ Existing spares got obsolete and High cost of upgradation

Implementation Phase

- Development of operating program considering Safety, Productivity and Quality in data Compatible Siemens PLC as legacy program is not accessible.
- Synchronization of drive system and Motion controller.
- Application of PDCA cycle to tune motion controller for every 10% incremental speed.

Pasaban PLC (Before)



Not data compatible

Siemens PLC(After)

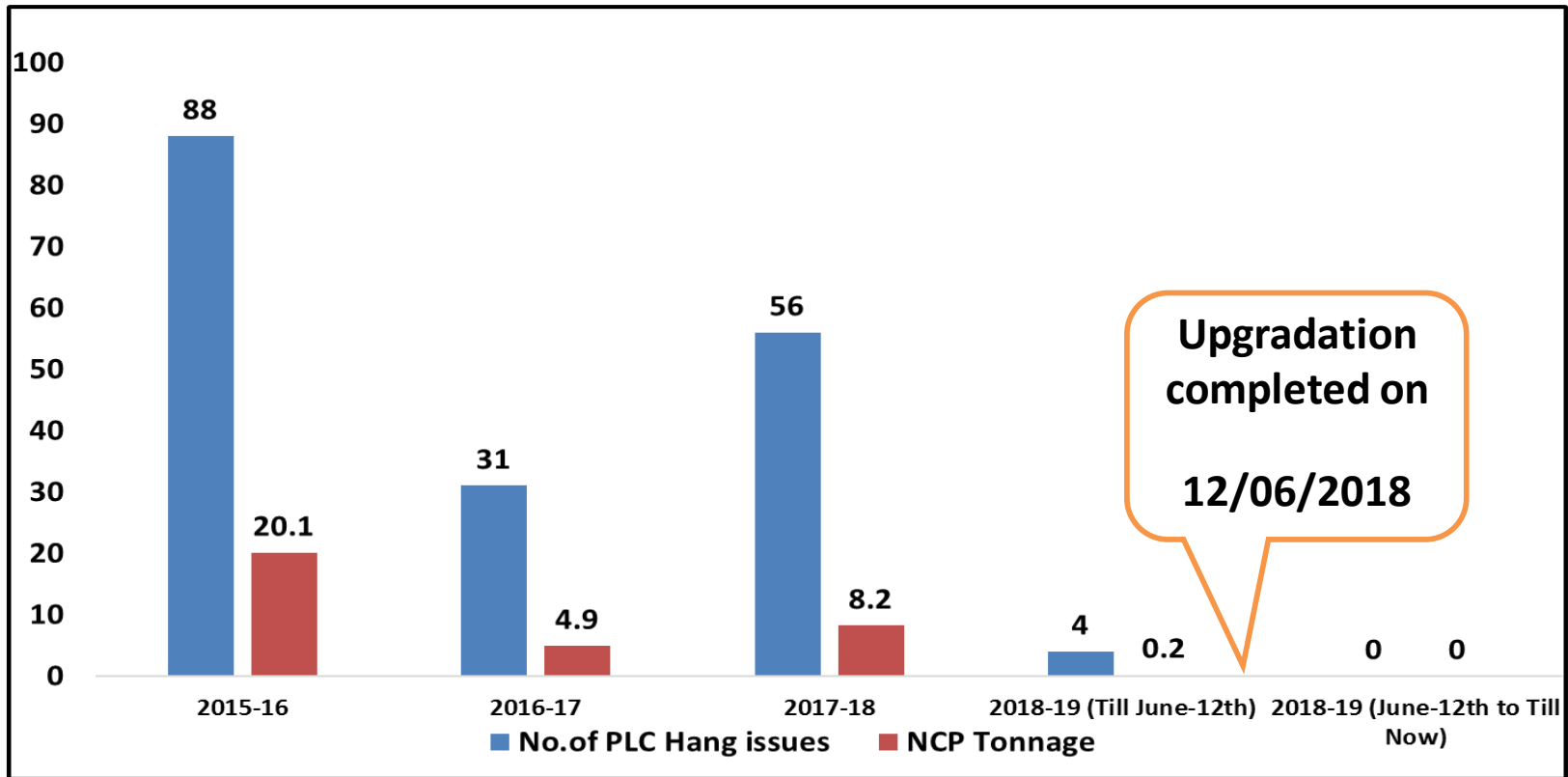


Data Compatible



Advantages of Modified system

- Maintenance is planned based upon machine run data
- Customer complaints are analyzed with auto captured data
- Daily report generation to analyze machine performance
- MTBF improvement, Set up time reduction by 30% reducing Process loss by 0.5%
- Low cost of upgradation
- R&M Cost reduction



Every PLC Hang issue results in NCP which has been completely eliminated after upgradation



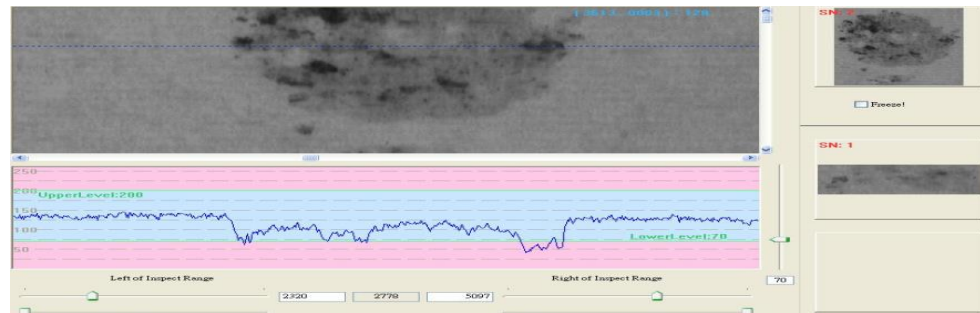
Case Study 3 – Web Inspection System

- Identification of the below Physical defects in running machine is a constraint
 - Scratch, Blade line
 - Calendar stamping
 - Crease
 - Die lines
 - White patches
 - Yellow spots
 - Oil spots
 - Black patches, Black spots

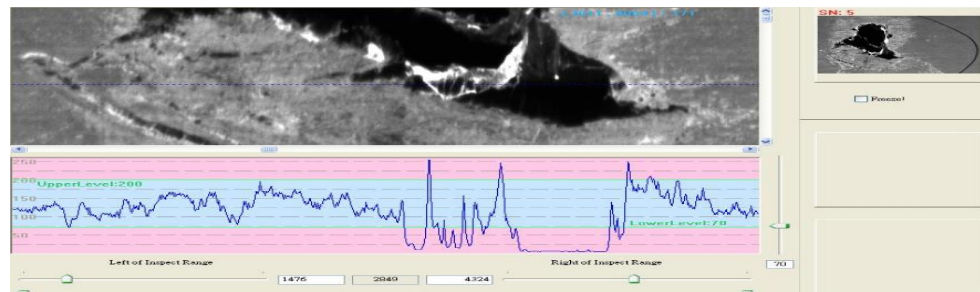
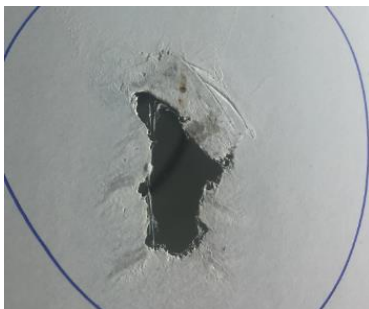
- Swift high-resolution CCD camera
- Digital Image processing
- Precision optical equipment.



Actual Image




Inspected Image with grey scale

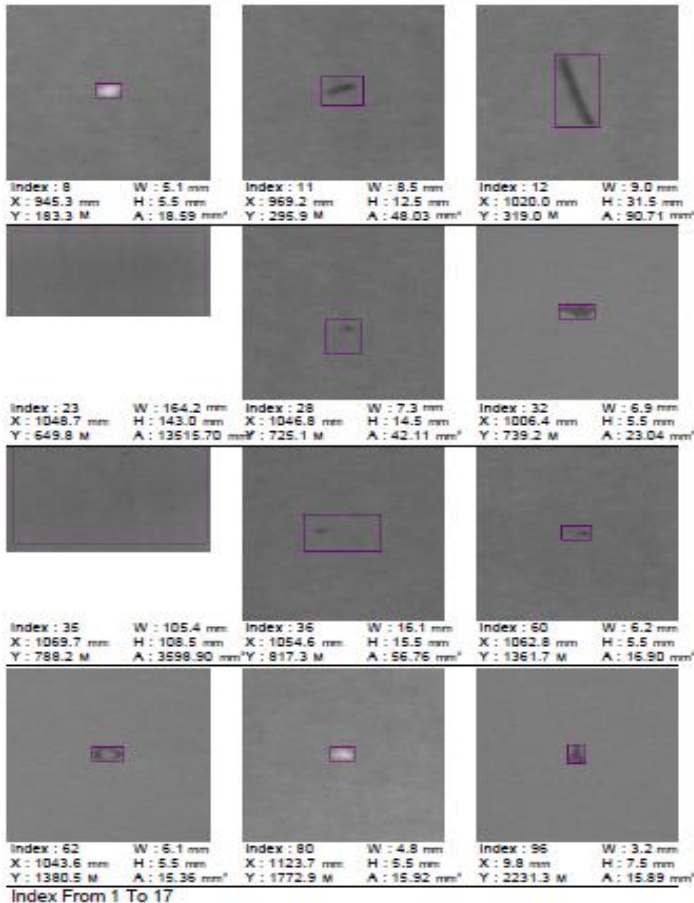



- Quality inspection detects abnormal, repeat and random defects avoiding manual intervention and provide complete statistics with defect classification.
- Database is created with defect type along with position coordinates of defect. The advanced database is designed with functions in terms of defect image search, image amplification, yield statistics
- Defect Range: 1mm^2 - 100mm^2
- Lighting: Transition / Reflection light

Images of Web Inspection Report Output

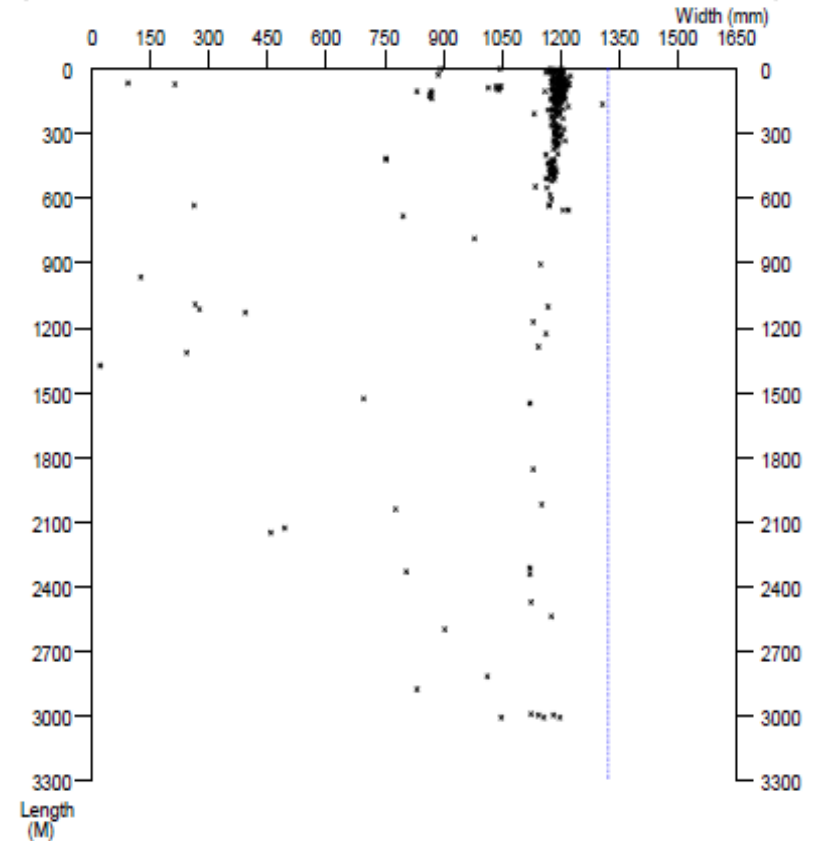

Webscan-5000 Defect Inspection System Defect Image List
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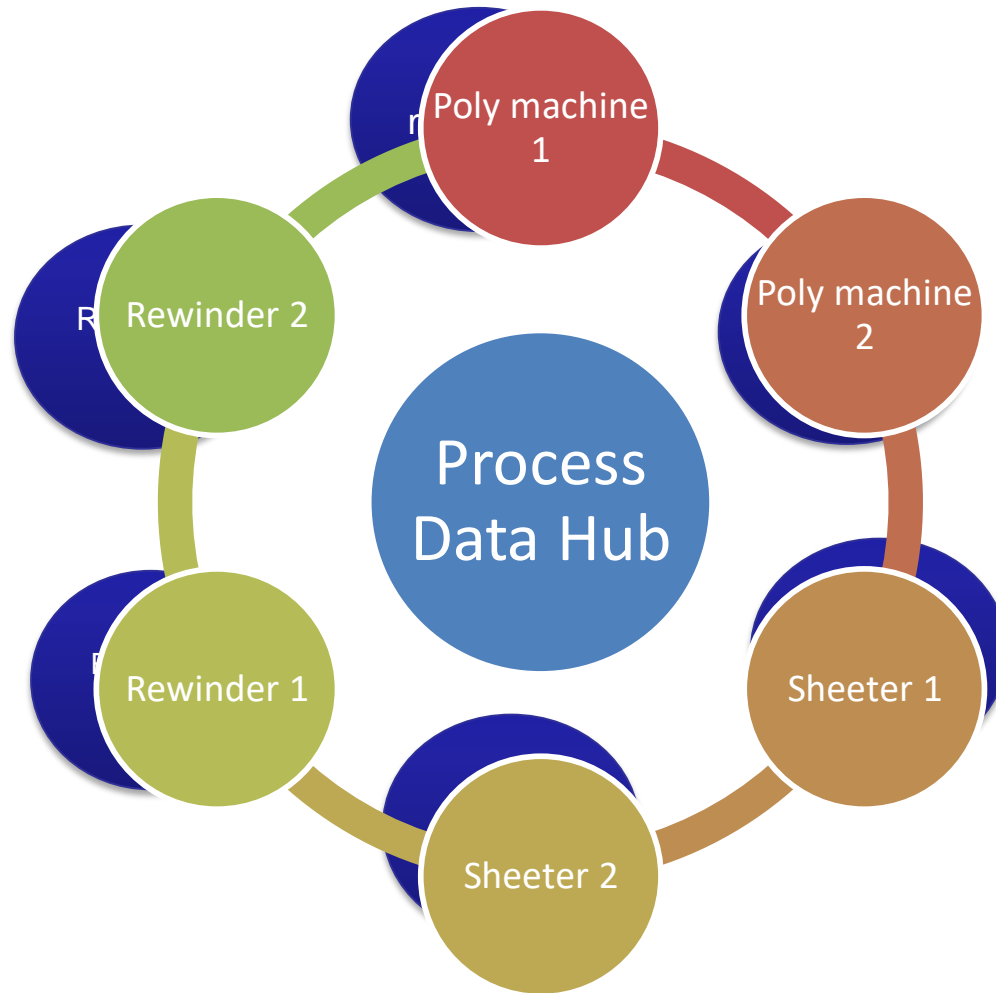
Product Type	: Face_Side_Only	Total Width	: 1136 mm	Defect Count	: 17
Lot No.	: 19042018	Total Length	: 3451.25 M	Inspect Time	: 12:10:49
Serial No.	: 0420-00048	Gap Info	: 0,0,0mm	Produce Date	: 2018-04-20
Operator	: DefaultUser				




Webscan-5000 Defect Inspection System XY Map
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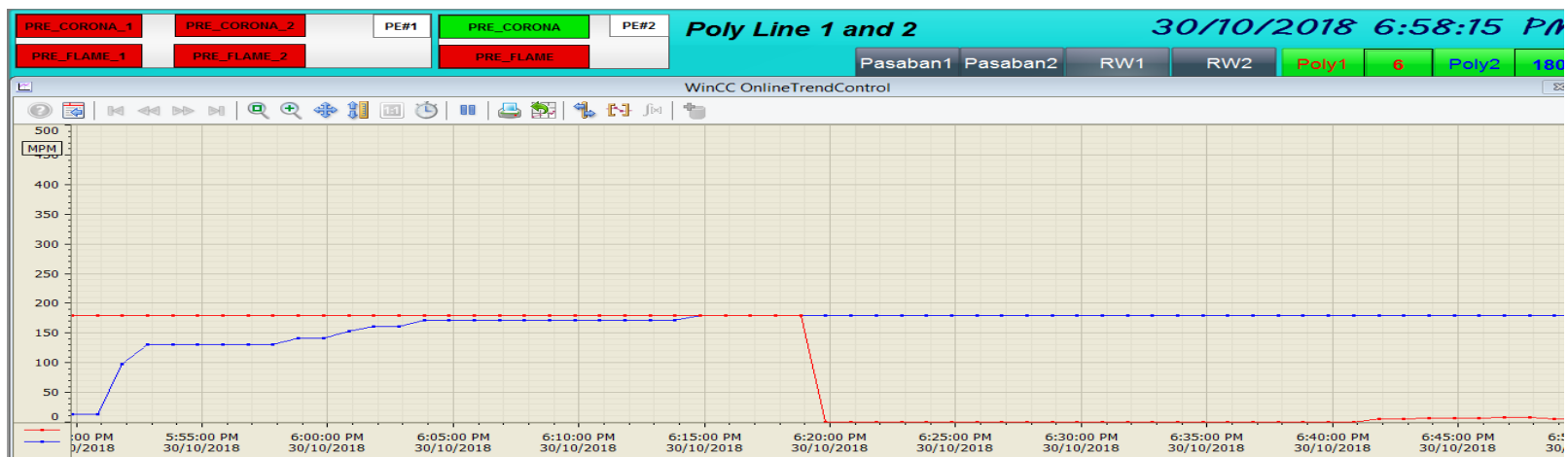
Product Type	: Face_Side_Only	Total Width	: 1320 mm	Defect Count	: 263
Lot No.	: 19042018	Total Length	: 3022.5 M	Inspect Time	: 18:20:58
Serial No.	: 0419-00034	Gap Info	: 0,0,0mm	Produce Date	: 2018-04-19
Operator	: DefaultUser				





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- Data from the machines is to be captured from each individual location
- Marching towards Industry 4.0, an internal link is build up within all the machines.
- This helps in accessing the critical monitoring points of all the machines at a single point



Thank You