

Rapid Insights with Data Analytics – Georgia Pacific Experiments



Georgia-Pacific

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Agenda

- About Georgia Pacific
- Review Experiments
- Review Conclusions
- Discuss Future Plans

About Georgia-Pacific

Georgia-Pacific is one of the world's leading makers of tissue, pulp, paper, packaging, building products and related chemicals.

If you're a consumer, you may recognize our household brands, such as Brawny® paper towels, Quilted Northern® bath tissue and Dixie® cups and tableware.

If you're in the construction business, you're probably familiar with our engineered lumber products, gypsum panels and other quality building materials.

Even if you work in aerospace, mining or facilities management, Georgia-Pacific products may be part of your day.

Koch Companies

Flint Hills Resources
Koch Industries
Matador Cattle Company

INVISTA
Koch Minerals
Moles

Koch Chemical Technology Group
Koch Pipeline
Georgia Pacific

Koch Ag & Energy Solutions
Koch Supply and Trading

Georgia Pacific

Away from home
Packaging

Building and Construction
Paper

Consumer Products

Cellulose

Chemicals

Nonwovens



PI System at GP

- Customer about 15 years, some facilities longer
- PI is used across multiple divisions and facilities
- 500,000+ PI tags

Two “Experiments”

- Chemical Usage
- Sheet Breaks
- Goals
 - Present data faster and in easier to read format (Rapid Insights)
 - Learn OSI and Microsoft tools (AF, OLEDB Ent, PowerPivot, etc.)
 - Potentially improve process

In the slides that follow, production data has been altered to maintain confidentiality; however the methodology used for the analytics still apply...

PI System Sandbox

PI Server – Site 1



PI Server – Site 2



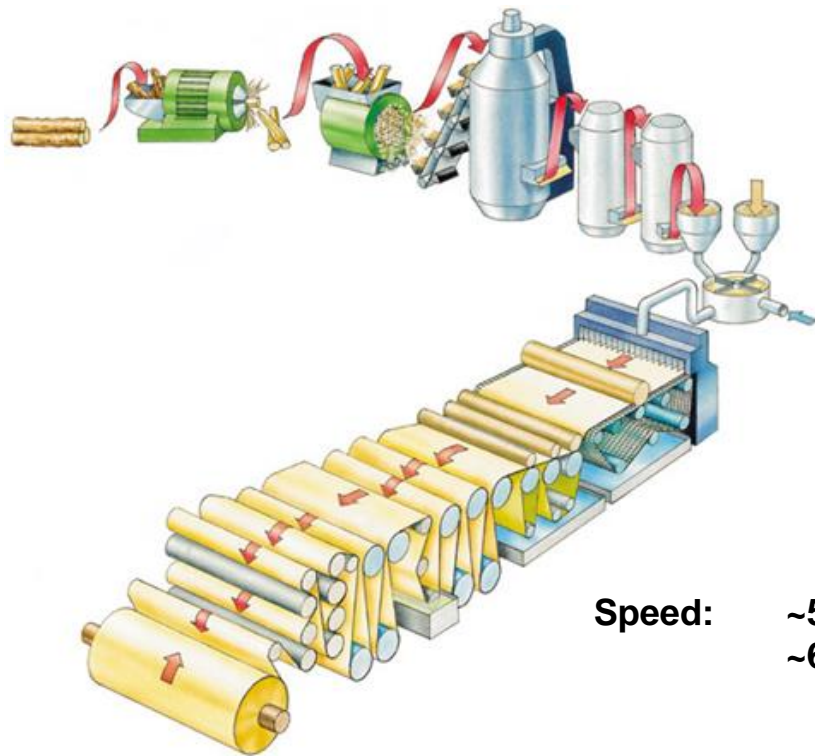
PI System – Sandbox for Experiments

Win 2008 R2 or Win 2012 (80GB disk and 16GB RAM)

Office Excel 64 bit - 2010 or 2013
PowerPivot or PowerView

PI Server (vCampus license is OK)
SQL 2012 (SQL Express is OK)
AF 2014 R2 (Server and Client)
EFGen
PI SMT
PI Builder
PI OLEDB Enterprise
PI DataLink 2014
PI ProcessBook 2014
PI Coresight 2014

Experiment #1 – Chemical Usage



- Totally Chlorine Free (TCF)
- Elemental Chlorine Free (ECF)
- Chlorine Bleaching
- Oxygen/Ozone Bleached
- Unbleached
- Broke
- Chemical additives

Speed: ~5000 linear feet/min
 ~60 mph

From Tag Data to Production Records

- Multiple production lines (paper machines)
- Multiple production runs (grade-runs) on each machine
- Thousands of tags
- Lab data
- Product recipe and specs

AF Model – Chemical Usage

General Child Elements Attributes Ports Analyses Version

Filter

Name Value

Category: <None>

Category: Cons

Category: Flow

Broke 0 %

BroProductSpecs

General Table Define Table Version

ProductSpecs

Filter

	Product	Property	Units	Target	LSL	USL	LAL	UAL
	Product 1	Basis weight	lbs/ream	10			8	
	Product 1	Attribute 1	g.3 in.	1200	900	1500	1050	1350
	Product 1	Attribute 2	g.3 in.	1200	900	1500	1050	1350
	Product 1	Attribute 3	g.3 in.	500	455	555	480	520
	Product 1	Brightness	MacBeth	50	45		48	55

Event Frames – Grade Runs

Chemical Search from Jan 2000					
Filter					
Name	[870.04:59:45]	Duration	Start Time	End Time	
Grade A		5:20:41	1/6/2012 4:40:29 PM	1/6/2012 10:0	
Grade A		19:31:22	1/10/2012 9:32:38 AM	1/11/2012 5:0	
Grade A		1:1:10:51	1/18/2012 9:30:55 AM	1/19/2012 10:	
Grade A		1:3:56:03	1/23/2012 9:47:06 PM	1/25/2012 1:4	
Grade A		1:18:12:54	1/31/2012 3:43:56 PM	2/2/2012 9:56	
Grade A		17:51:02	2/10/2012 11:29:43 AM	2/11/2012 5:2	
Grade A		1:3:26:44	2/13/2012 11:03:12 AM	2/14/2012 2:2	
Grade A		8:25:42	2/15/2012 12:20:17 PM	2/15/2012 8:4	

General			Child Event Frames	Referenced Elements	Attributes
Filter					
! Name	Value				
Category: <None>					
Category: Comment					
Category: Flow					
Category: Lab					
Brightness	55.8596				
Count	23 Count				
LAL	50				
LSL	70				
SDev	2.5496				
SDevPct	4.9982				
Target	80				
UAL	55				
USL	45				
CD Dry Tensile	126.5836				
CD Wet Tensile	547.3652				
MD Dry Tensile	523.2241				

Rapid Insight – Thousands of Grade Runs – What's Best?

Grade
Grade A
Grade B
Grade BB
Grade C-
Grade D
Grade D2

Year
2012 2013
2014

Month
1 2 3
4 5 6
7 8 9
10 11 12

Date
2012-03-20
2012-04-08
2012-04-30

Chemical 4
4 6 7
8 9 10
11 12 13
14 16

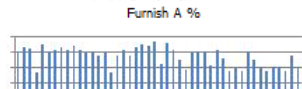
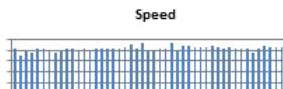
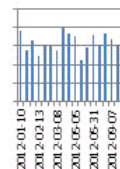
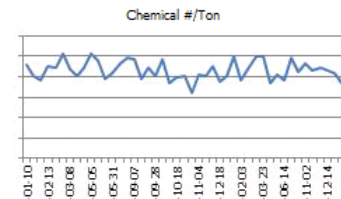
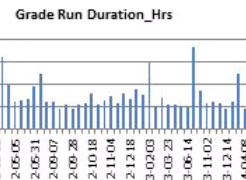
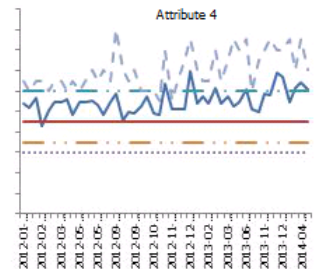
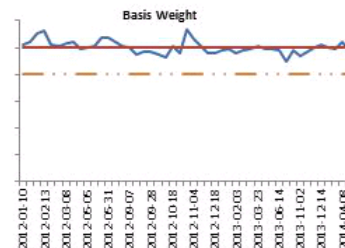
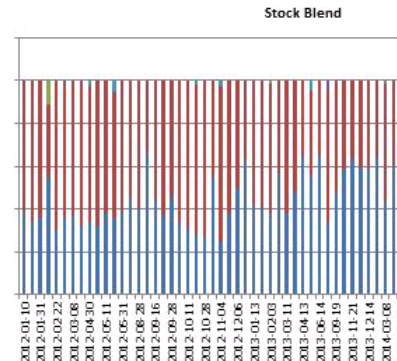
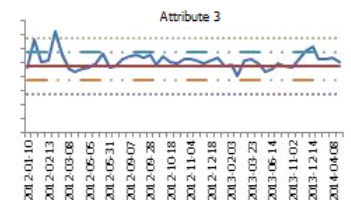
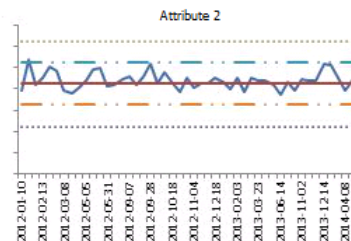
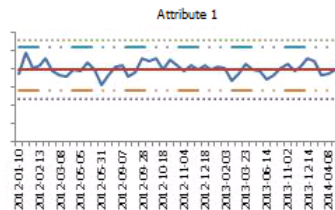
Attribute 1
5 10 15
20 25 30
35 40 55
0 45 50
60

Duration10
15 20
25 30
35 40
50 60
65 75
0 5
10 45

Attribute 2
0 5 10
15 20 25
30 35 40

ST 10 Pct
55 60
65 70
75
0 5

Stock Type 1..
20 25
30 35
40 45
55 60



Mining the Data

- Did I follow the recipe? Show me by grade...
- How often, how much, and when do I deviate from recipe?
- How does Broke in the stock affect this?
- How does Refiner (HPD/Ton) affect this?
- What is my best run?

Rapid Insight – Best Grade Runs

Grade
 Grade A
 Grade B
Grade BB
 Grade C
 Grade D
 Grade D2

Year
 2012 2013
 2014

Month
 1 2 3
 4 5 6
 7 8 9
 10 11 12

Date
 2012-06-29
 2012-08-28
 2012-09-16

Chemical 4
 6 7 9
 10 11 12
 13 14
 0 1 2

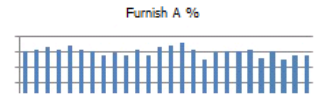
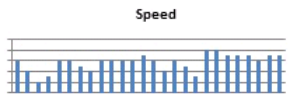
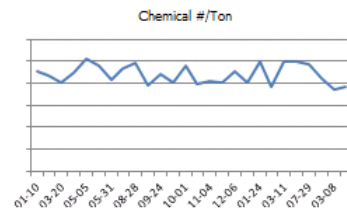
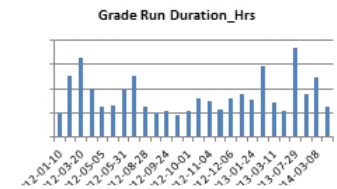
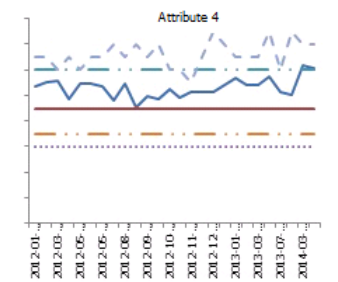
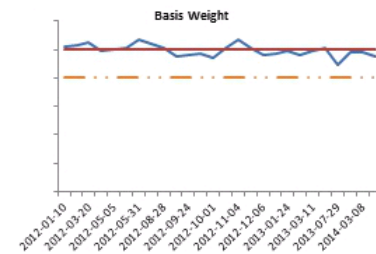
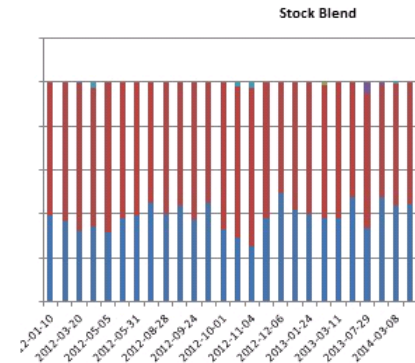
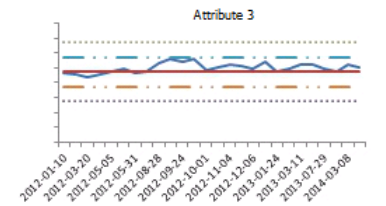
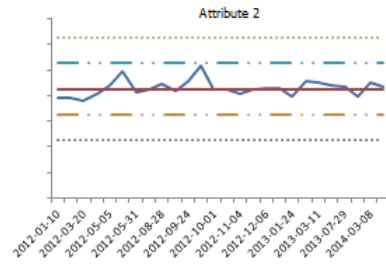
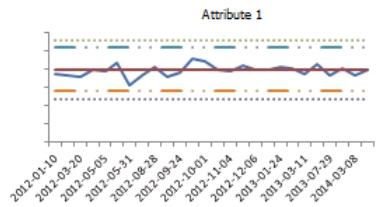
Attribute 1
 5 10 15
 20 25 30
 35 40 55
 0 45 50
 60

Duration10
 15 20
 25 30
 35 40
 50 60
 65 75
 0 5
 10 45

Attribute 2
 5 10 15
 20 25 30
 35 40 0

ST 10 Pct
 35 40
 45 50
 55 60
 65 70

Stock Type 1...
 20 25
 30 35
 40 45
 0



Experiment #2 – Sheet Breaks

PM_Template			
General Attribute Templates Ports Analysis Templates			
Filter			
	Name	Description	Default Value
Category: Break			
	Break		0
	Breaks_DailyCount		0
	Breaks_HourlyDuration		0 min
	Breaks_XTime_Count		0
Category: Forming Section			
Category: Press Section			
Category: Drying Section			
Category: Machine			
	PM		PM1
	Speed		0 fpm
Category: Product			
	BasisWt		0 lbs/ream
	Grade		0
Category: Calendaring Section			
Category: Time_Relative			
Category: Fourdrinier Table			
	Slice Lip Pressure		0
	Stream Rv Pressure		0

Machine_Template

General Attribute Templates Ports Analysis Templates

Name: SheetBreakTracking

Description:

Categories:

Analysis Type: ☐ Expression ☐ Rollup ☒ Event Frame Generation

Example Element: **Board Machine 17**

Event Frame Template: SheetBreak-Template

Name	Expression	Value
StartTrigger	'Break'=1	
EndTrigger	Type an express	

StartTrigger true for: 0 Minutes

☒ Generate child root cause event frame before parent event frame starts

Duration: 10 Minutes

Name: Root Cause

Categories:

Scheduling: ☒ Event-Triggered ☐ Periodic

Trigger on: Any Input

Sheet Break Data Mining

- Sheet breaks count by day, by grade, by machine
- Sheet breaks duration...
- Days without sheet breaks?
- Refiner Power (HPD/Ton) and its effect?
- Stock Blending Effects

Rapid Insight

Grade
2600
2700

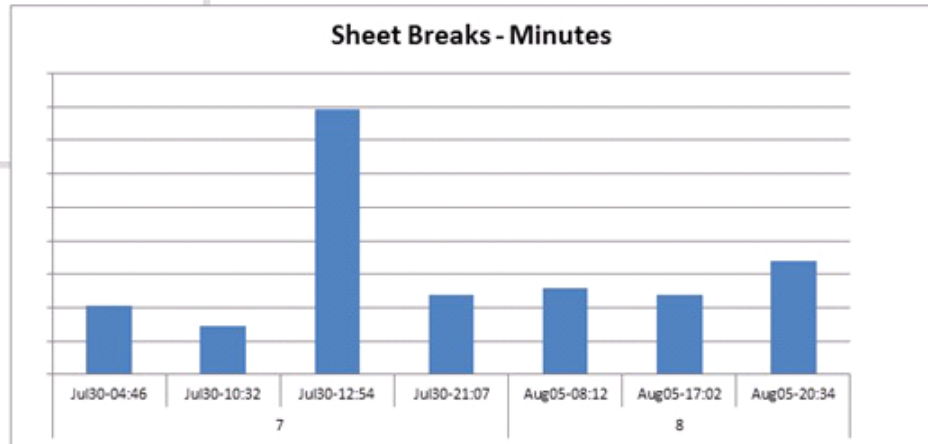
Speeds
.600 .700
500 800

Breaks_DailyCount
3 4 7 0
9

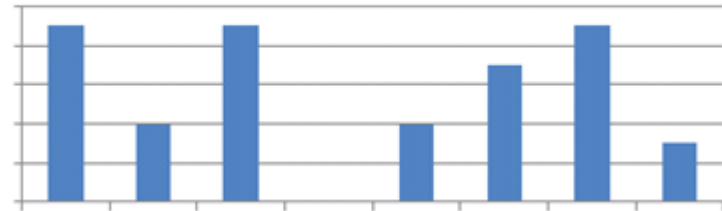
Year
2000

Month
7 8

Downtime_Hours
<1 <3
<2

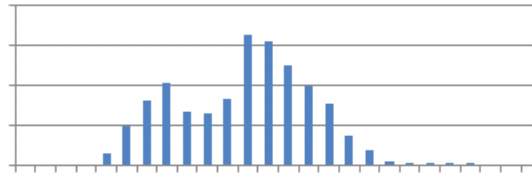


Sheet Breaks - Daily Count

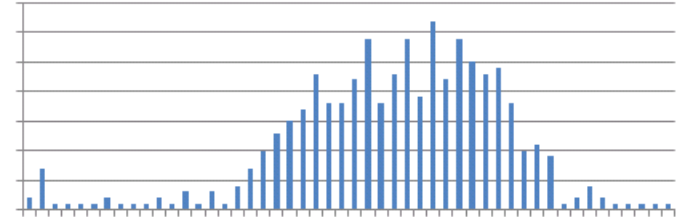


Rapid Insight

Num. of Days vs. Variable 1



Num. Days vs. Variable 2



Year

2000

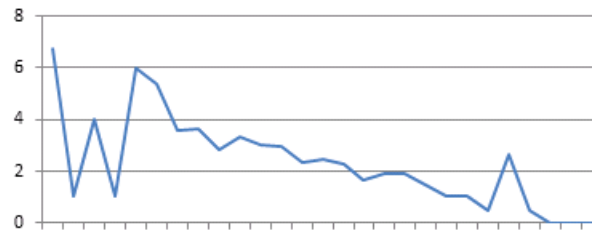
2001

2002

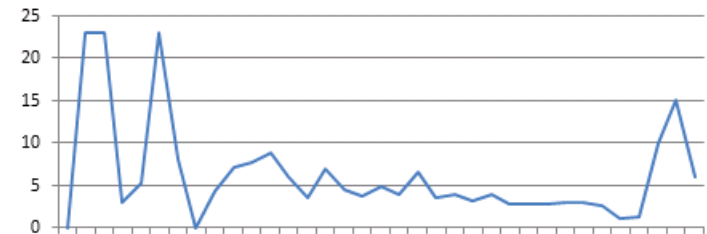
2003

2004

Break Count vs. Variable 1



Break Count vs. Variable 2

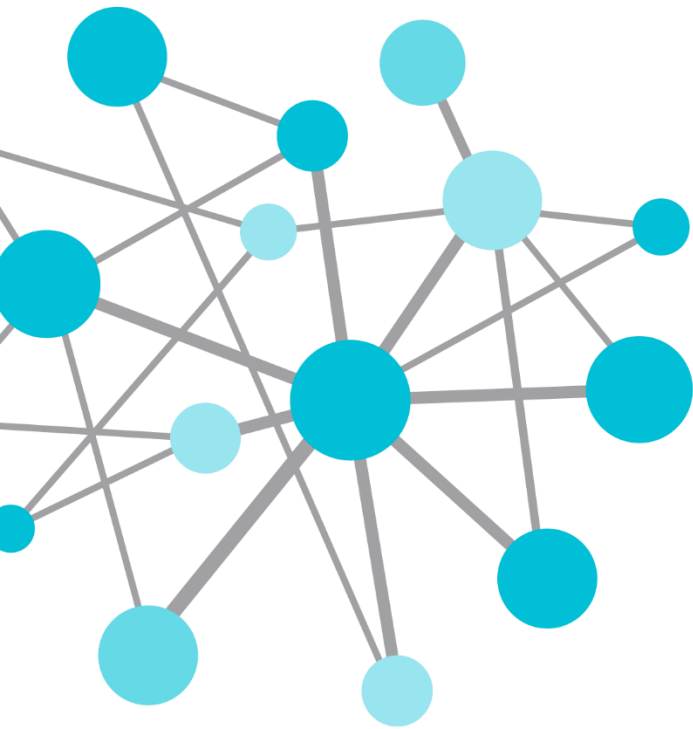


Experiments - Conclusion

- Easy to recognize outlying data
- Easy to analyze data from large time range
- Easy to manipulate slicers to select desired process parameters
- Still need to allocate process expert's time to help create model and analyze data

Experiments - Next Phase

- Use predictive analytics to forecast product properties based on current process changes.

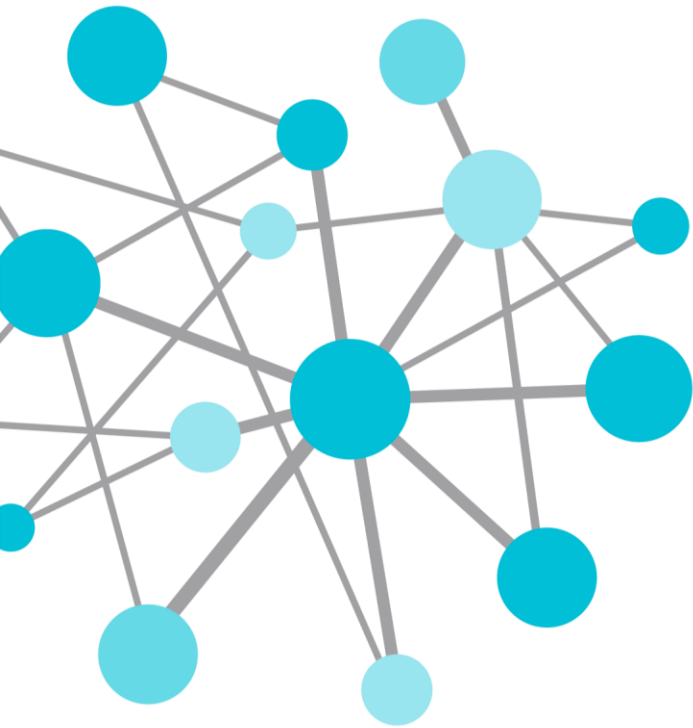


Questions

**Please wait for the
microphone** before
asking your question



**Please state your name
and your company**



THANK
YOU

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