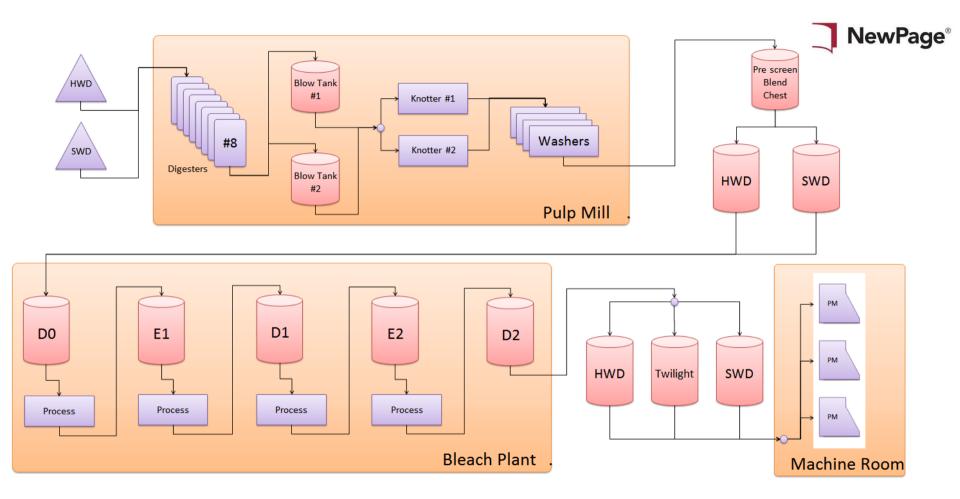


Improved washing and bleach plant performance through value-added data analysis

Presented by Dr. Roger Tembreull



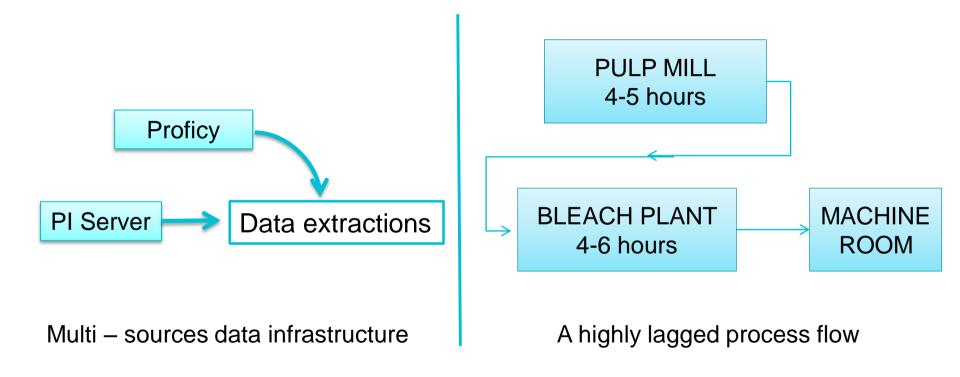




Business Challenge DATA 1990 2010 2000

Two technical challenges

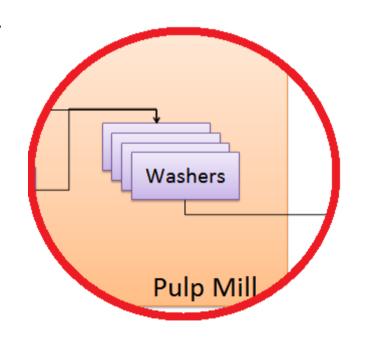




CASE STUDY: Brownstock Washer Efficiency



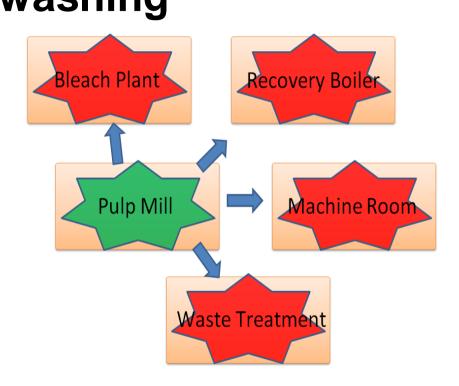
- Problem Low washing efficiency
 - Vacuum drum washers operating at more than two times original design on hardwood
 - Excessive carryover and high soda loss result



PROBLEM: Impact of poor brown washing



- -High soda loss / soda makeup
- -High bleach CIO2 & NaOH demand
- -High BOD load to waste treatment
- Low evaporator steam economy
- Reduced recovery boiler steam generation



PROBLEM:

High filtrate conductivity





Initial State

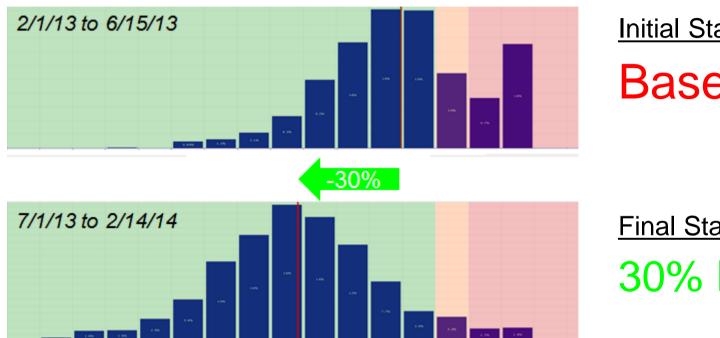
Hardwood #4
Filtrate
Conductivity
(primary metric)

Washer efficiency is measured using filtrate conductivity which is a measure of soda loss and a surrogate for carryover to the bleach plant

Max

PROJECT RESULTS





Initial State

Baseline mMho

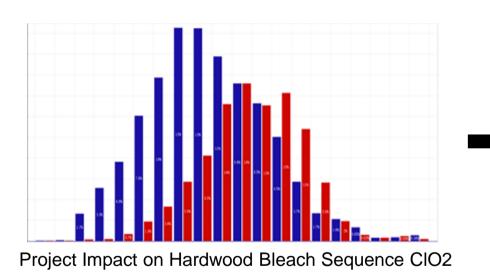
Final State

30% Reduction

Comparison of before & after shows a ~30% reduction in hardwood filtrate conductivity

PROJECT SAVINGS





✓ CIO2 & NaOH demand reduction

- ✓ Caustic makeup reduction
- ✓ Increased recovery boiler steam generation
- Lower BOD load to waste water treatment

6% Cost Reduction

= Additional Savings

Improving brown washer efficiency has reduced organic carryover to the bleach plant

Our Strategy



- 1. Use historical data to identify those **key variables** that we can *control* that drive washing efficiency
- 2. Find their optimal settings
- 3. Implement the new settings
- 4. Asses the impact

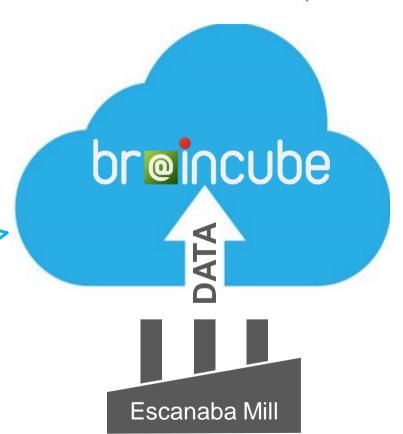
The Solution We Chose



Cloud based solution on the top of current data infrastructure

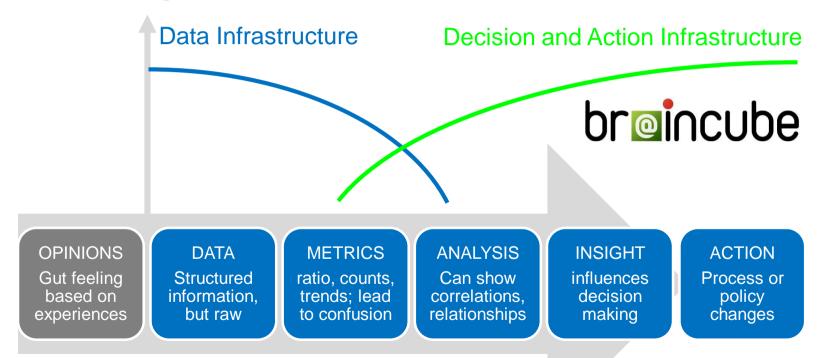
1700 PI tags

Brown washing + bleaching + select digester tags
30-min time lagged averages



A New Approach to Process Optimization

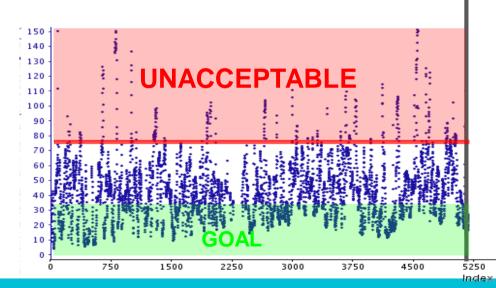




An easy and effective analysis

Classical way

Looking for a root cause



Efficient way

Identifying operating configurations that deliver stable performance

8250

€ @OSIsoftUC | #UC2014

6750

7500

6000

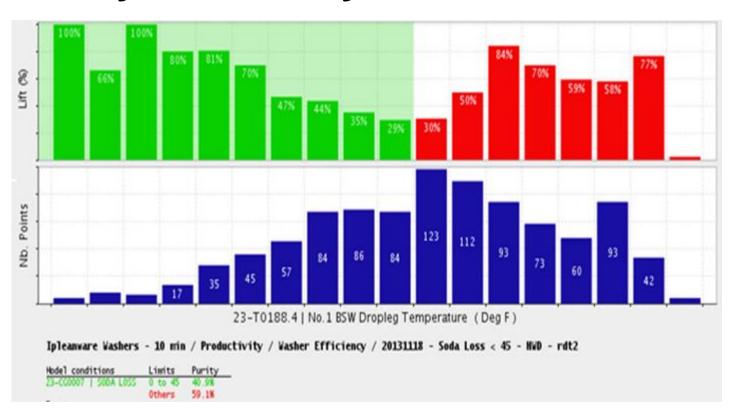
9000

9750

10500

Easy to find key variables





"Hyperlift" for Hardwood 1st Drop Leg Temperature

Hyperlift that shows the dramatic impact of 1st drop leg temp on soda loss

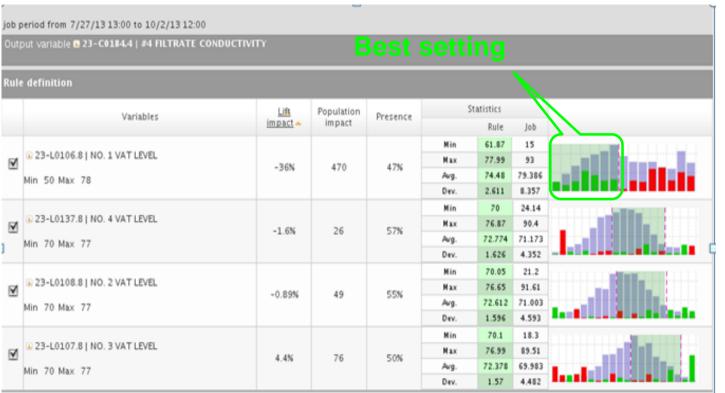
green = "good", red = "bad"

Braincube can
automatically rank and sort
all potential model inputs

Hypercubic analysis can be used to rank models that contain more than one variable

An unexpected solution





Model of Hardwood 4th Conductivity = f (Drum Speeds)

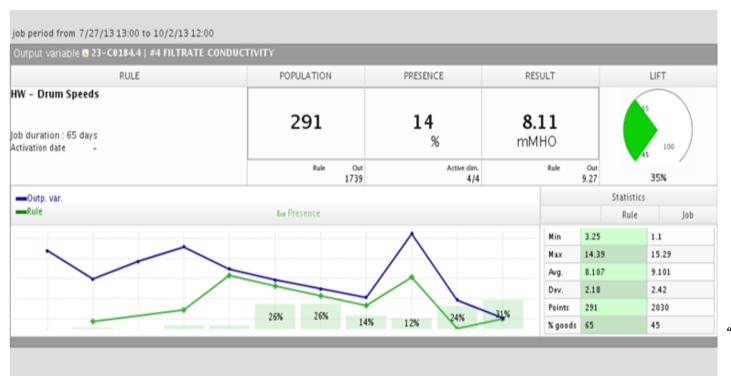
Braincube indicated that lowering brown washer speed would improve efficiency

This is counterintuitive because vat consistency increases as the drum speed decreases

Vat "level" here & throughout the presentation is drum speed in percent

Brown Washer Model





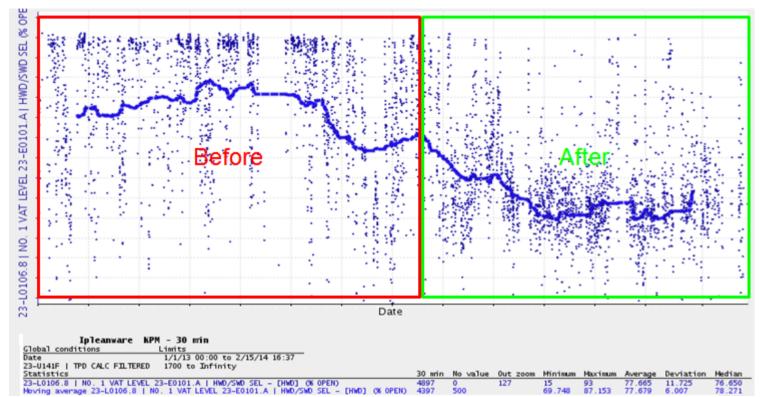
Statistically Model Historic Operating Performance

Braincube shows how variables we can control have affected past performance

When operating within the "rule" filtrate conductivity was reduced by 11%

We had to change our mind!



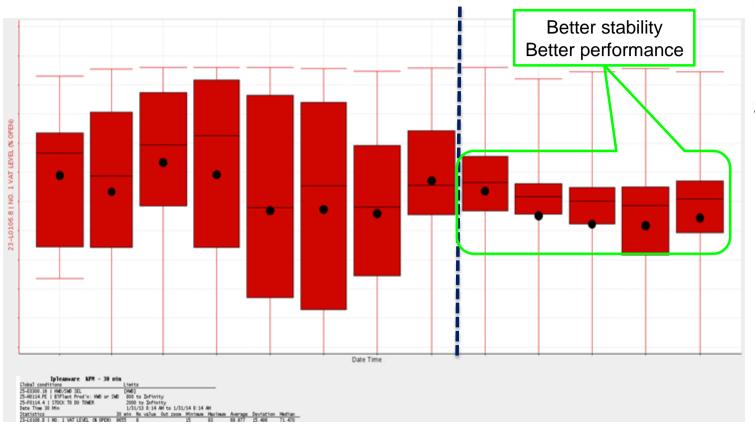


No.1 Drum Speed-Control (Hardwood)

Drum speed control was introduced in July for drums 2, 3 & 4 and, in August, No. 1 drum was placed in speed control

A new stable situation



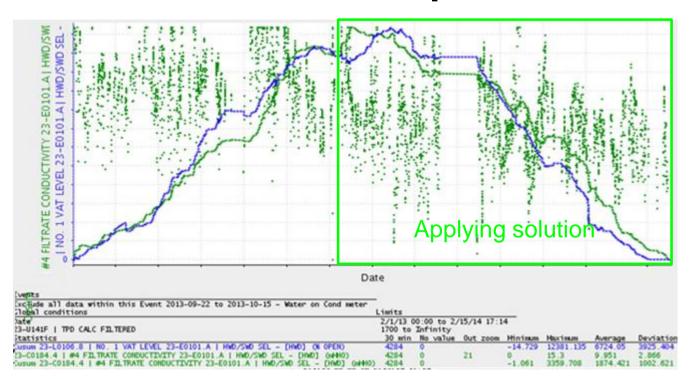


No. 1 Drum Speed Stability (Hardwood)

> Resulting stabilization of inputs

CUSUM Chart - A real optimization



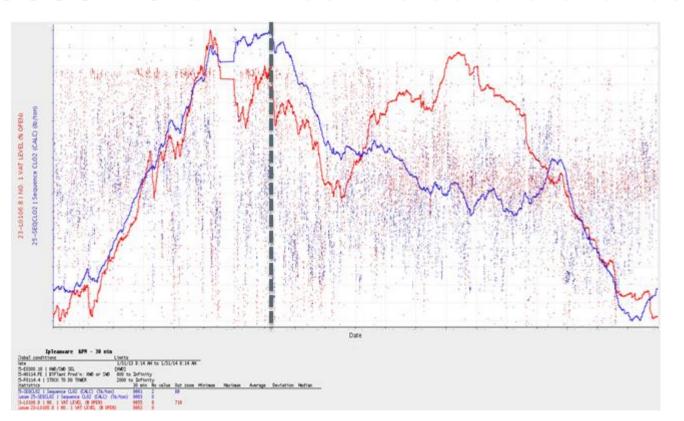


CUSUM Analysis of 4th Filtrate Conductivity and No.1 Vat Speed (Hardwood)

> CUSUM analysis shows visually that hardwood 4th filtrate conductivity tracks No. 1 washer drum speed

CUSUM Chart - Positive collateral affect





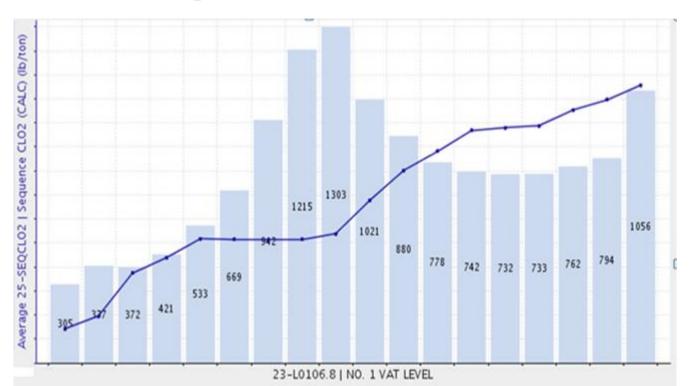
Reduction in Hardwood Bleach Sequence CIO2

The 4th brown washer mat consistency is not routinely measured so the mass rate of soda loss reduction is unknown

CUSUM analysis shows that SEQ ClO2 has decreased with No. 1 drum speed confirming that carryover is reduced

Bleaching cost reduction





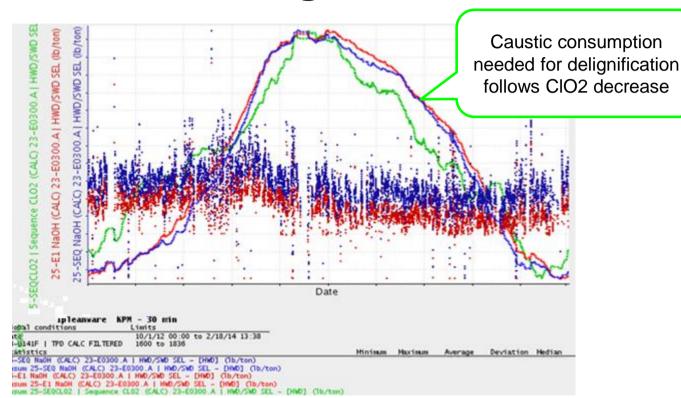
CIO2 vs No.1 Drum Speed (hardwood sequence)

CIO2 reduced by...

6% HWD 3% SWD

Extra bleaching cost reduction





Hardwood Sequence Caustic Reduction

Hardwood bleach caustic consumption has decreased as ClO2 has decreased – less is needed for E1 delignification

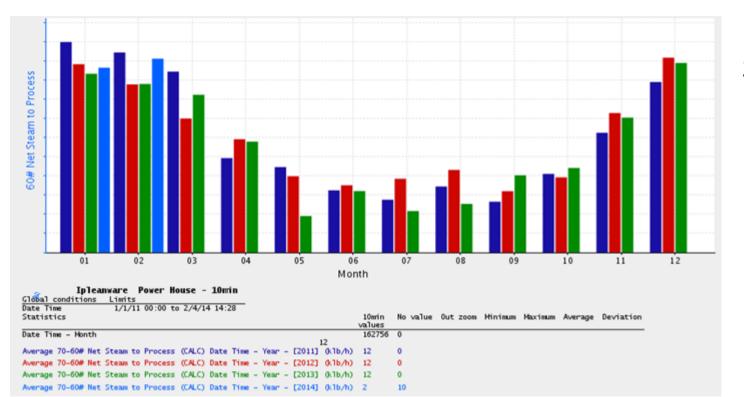
Other Braincube Value-Adds



- ✓ Discovered and corrected a bark boiler O2 controller logic problem
- ✓ Demonstrated excessive airflow in the lower furnace of our power boiler contributes to the high flue gas temperature
- ✓ Verified combustion air temperature and liquor gun pressure are primary drivers of recovery boiler CO emissions
- ✓ Created a utility plant efficiency metric for energy optimization
- ✓ Created dashboards for up-to-date comparisons of month over month steam demands by header pressure to monitor steam & energy use
- ✓ Evaluated the effectiveness of enzyme addition to brown pulp storage

New opportunities





Seasonal 60#
Steam Heating
Demand

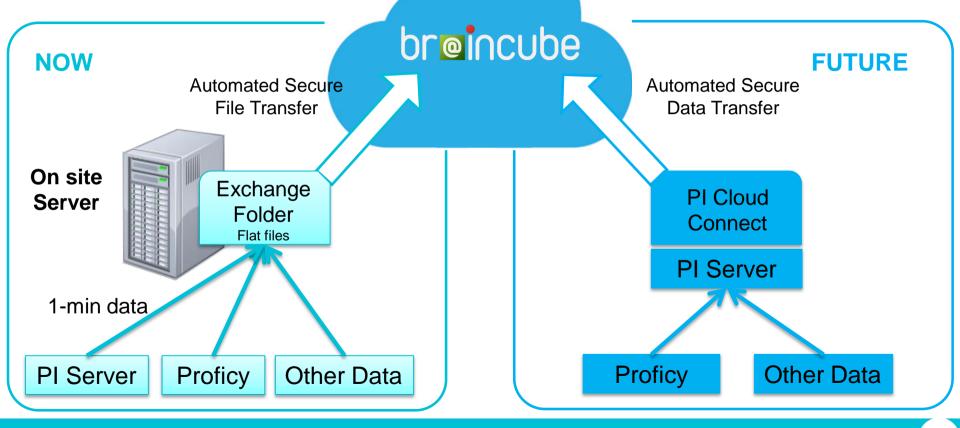
Total 60# Steam to Process (klb/h) = (Turbine 60# Steam + 60# PRV Steam + 400# AUX Turbine Exhaust Steam - 60# AUX Steam)

Drive smart, Drive "Green"!

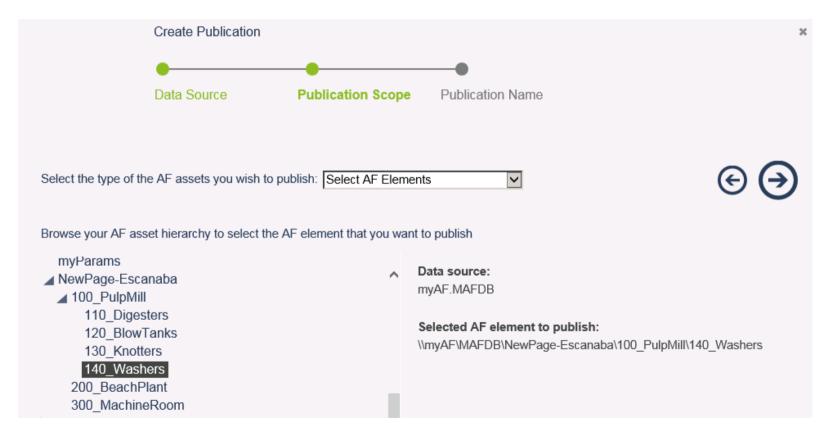


BrainTouch standardizes your best practices

Architecture



PI Cloud Connect - Publication



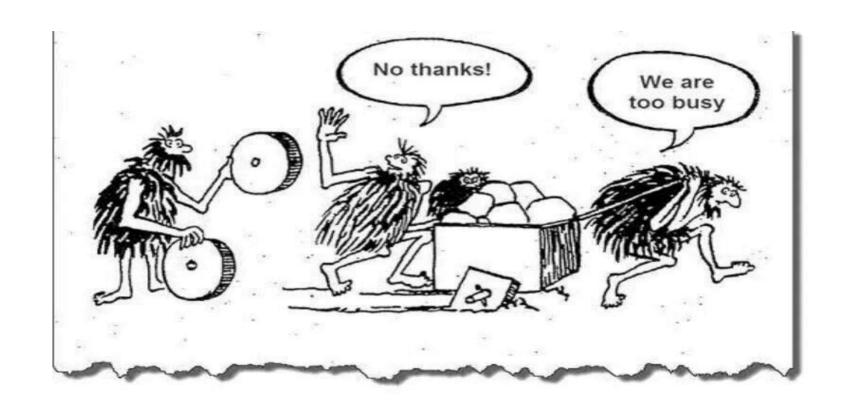
Conclusions



1. With fewer resources, we need solutions that will deliver:

Effective analytical tools
Insight (not just data)
Rapid solution deployment
Sustained profitability

2. Braincube has been demonstrated to be such a solution at the Escanaba mill



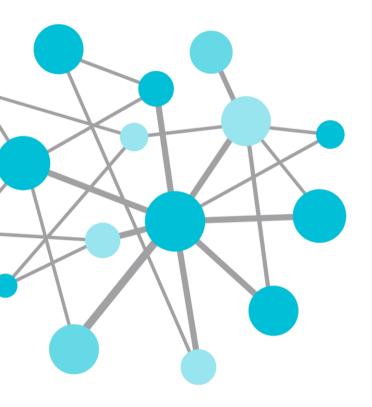


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THANK MAN

