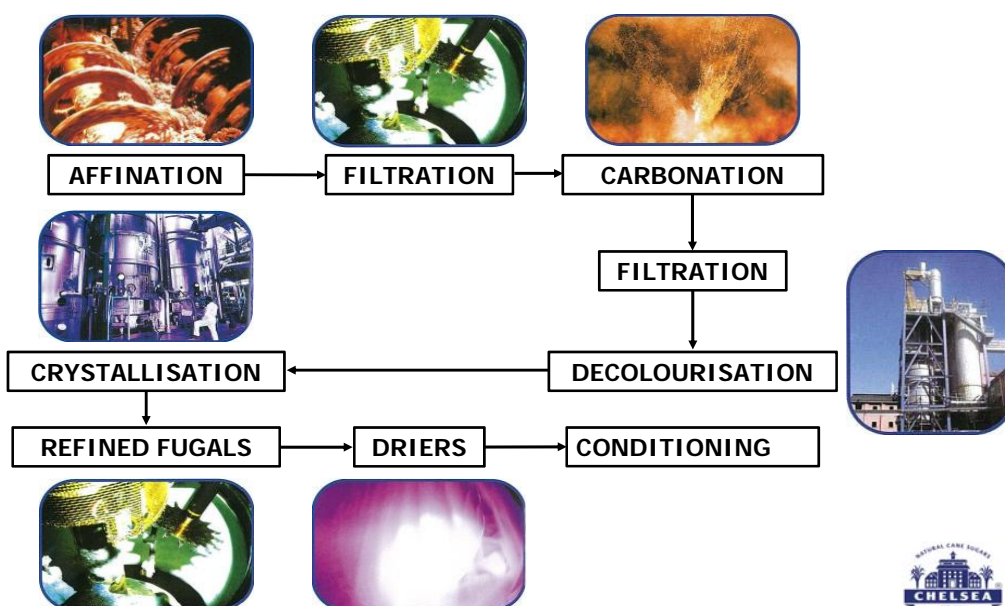


TEAM MANDATE for this Micro Focused Equipment & Process Improvement Team:

- ▶ Optimize Fugal cycle times to achieve the best Affination Station consistency, throughput and efficiencies while also improving or maintaining the following “Goal Aligned Performance Measures”:
 - ▶ % Colour Removal
 - ▶ Raw Wash make
 - ▶ Energy
- ▶ And all achieved within the 12 week cycle



SUGAR REFINING PROCESS

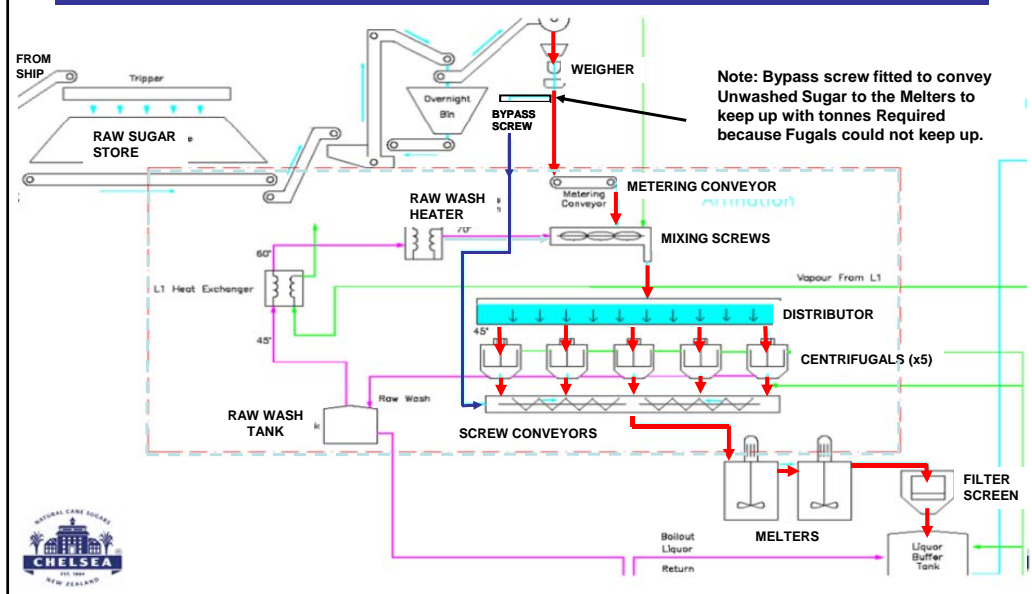


WHAT IS AFFINATION?

- ▶ “AFFINATION” is the first colour removal step
- ▶ Raw Sugar has a film of impurity on the outside of each crystal
- ▶ We apply a warm syrup to soften this film
- ▶ Fugals wash the Film off the crystals.
- ▶ Fugals remove up to 50% of the colour



AFFINATION FUGAL “DEFINED PRODUCTION AREA”



WHAT ARE FUGALS ?

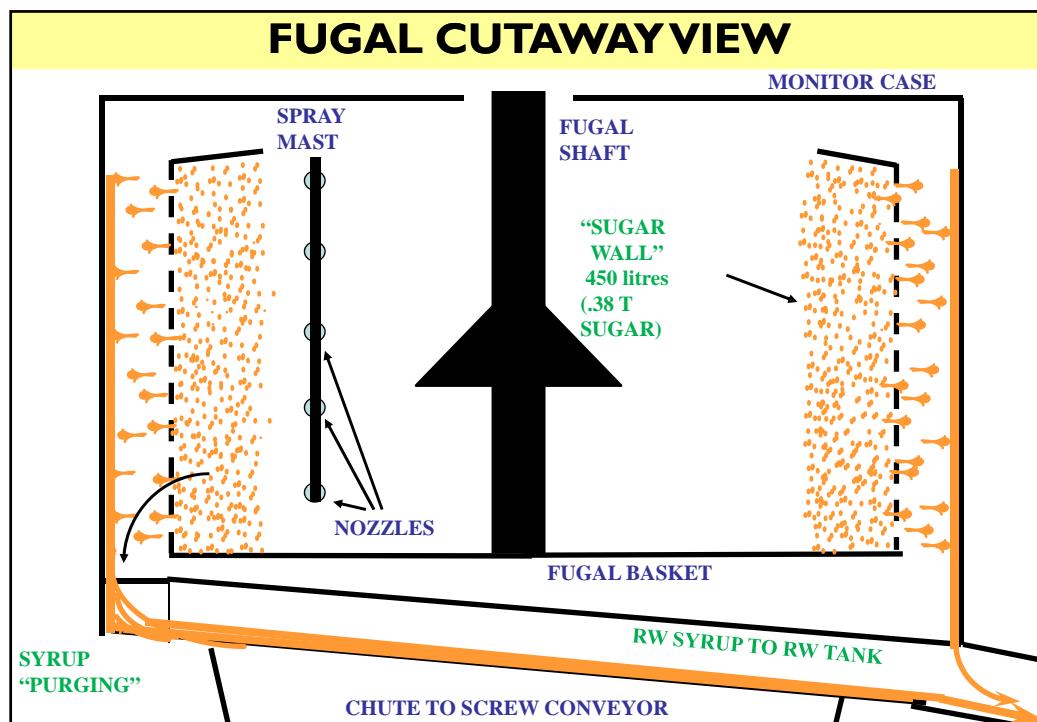
- ▶ Similar to Spin Driers – Like a high speed strainer
- ▶ Employ Centrifugal force to hold sugar crystals while being washed with Hot Water
- ▶ Hot Water passes through the sugar removing coloured film from the crystals
- ▶ The resulting Raw Wash syrup is collected and re-used
- ▶ These Fugals perform batch cycles approx every 2 minutes, each cycle holding .38t of crystals



AFFINATION FUGAL STATION



5 X 48" AREA CENTRIFUGALS CIRCA 1975.
BASELINE CAPACITY 356 TONNES / SHIFT



REASON FOR TEAM

- Affination Fugals were a Bottleneck, limiting the refinery throughput
- A Bypass Screw was installed many years ago to increase tonnes throughput
 - Bypassed Sugar increases colour loading
 - Bypass affects subsequent processes

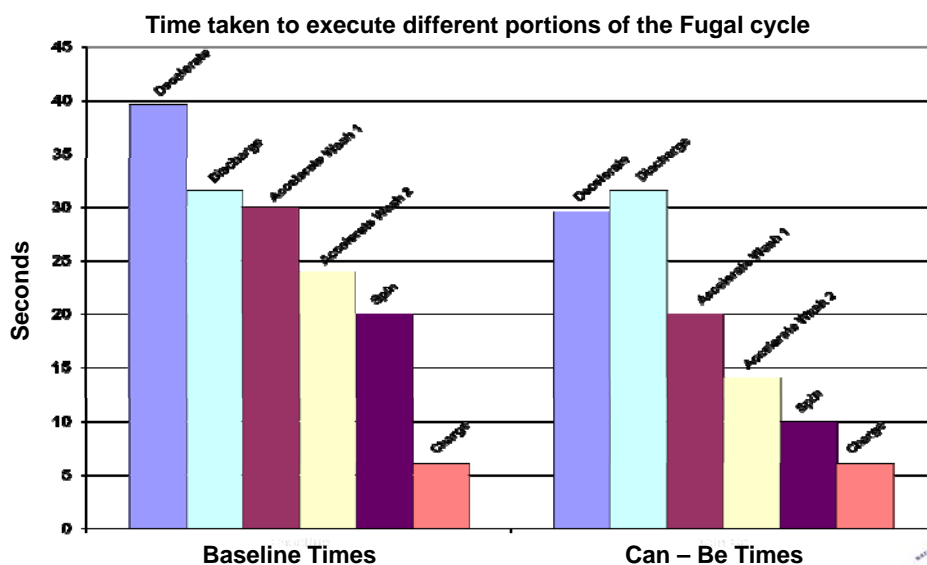


FUGAL CYCLE OBSERVATIONS

<u>FUGAL</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
Original Baseline times (seconds):					
ACCELERATE	6.5	4.8	5.9	4.9	6.4
CHARGE	6.9	5.6	6.0	6.0	4.1
1200rpm TIME	18.5	21.2	23.7	26.7	22.3
MECHANICAL BRAKING	10.8	15.6	14	13	21
PLOUGH DOWN	17	15.6	17.6	18	18
<u>PLOUGH UP</u>	<u>6.5</u>	<u>6.2</u>	<u>6.9</u>	<u>6.9</u>	<u>7.4</u>
TOTAL CYCLE	2:34	2:31	2:34	2:35	2:38

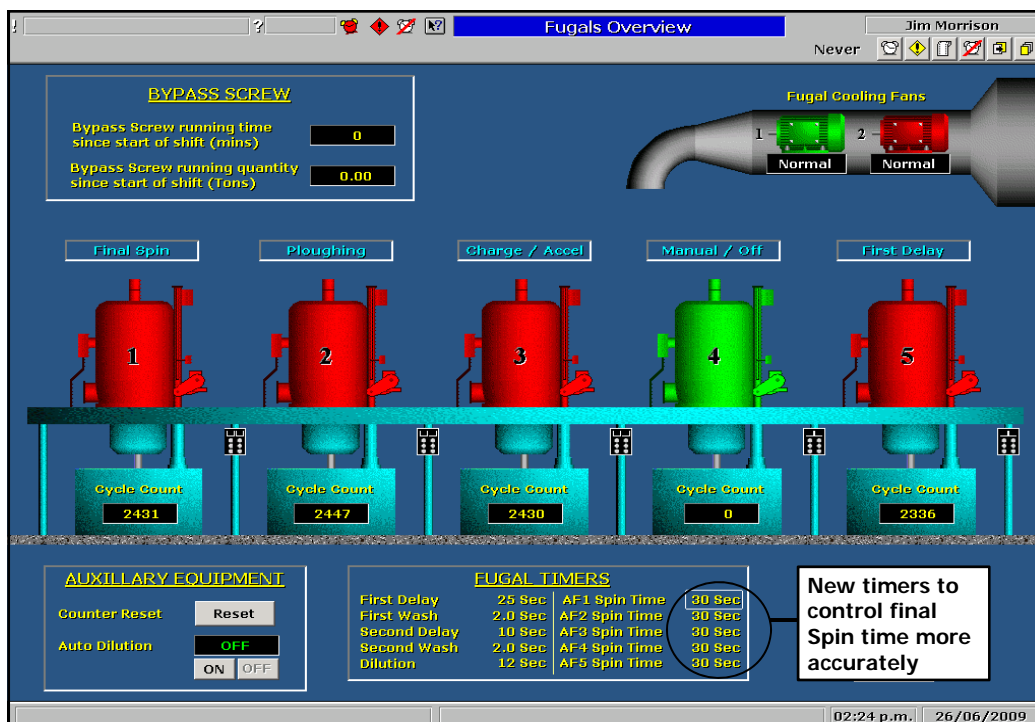


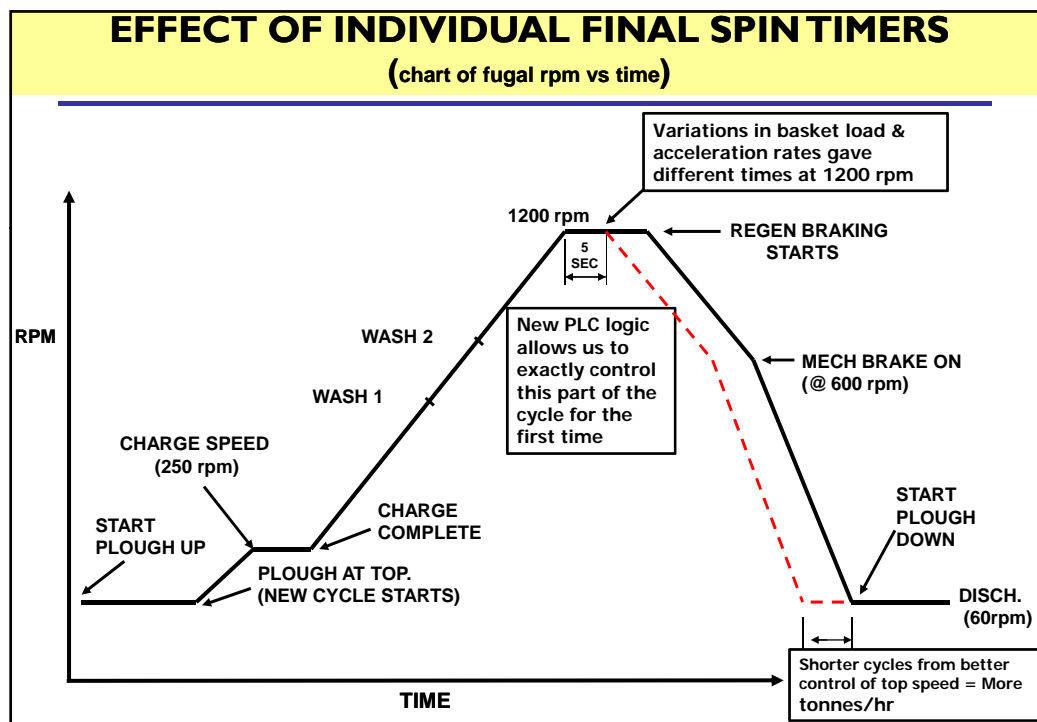
“CAN – BE ANALYSIS” cycle times



REDUCING VARIATION

- ▶ We measured the Fugal RPM's and adjusted all to be the same.
- ▶ Acceleration & Deceleration amps also checked, and all adjusted to be the same.
- ▶ This work had to be repeated over several days as the tiny, 35 year old potentiometers were a little fiddly to get right & stay set.

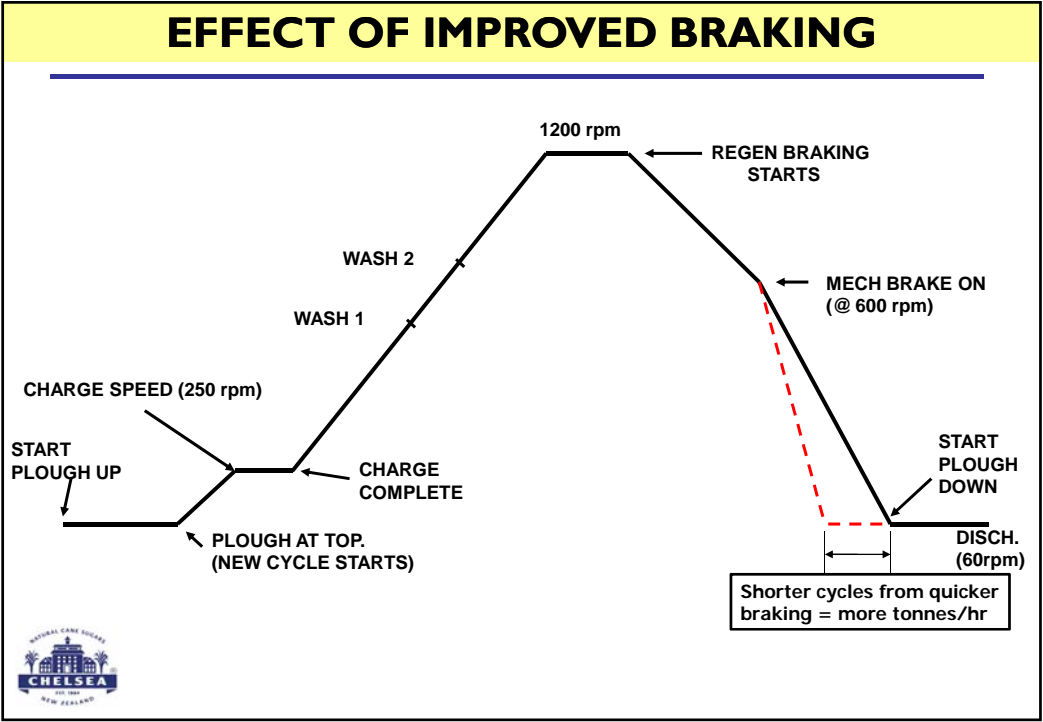
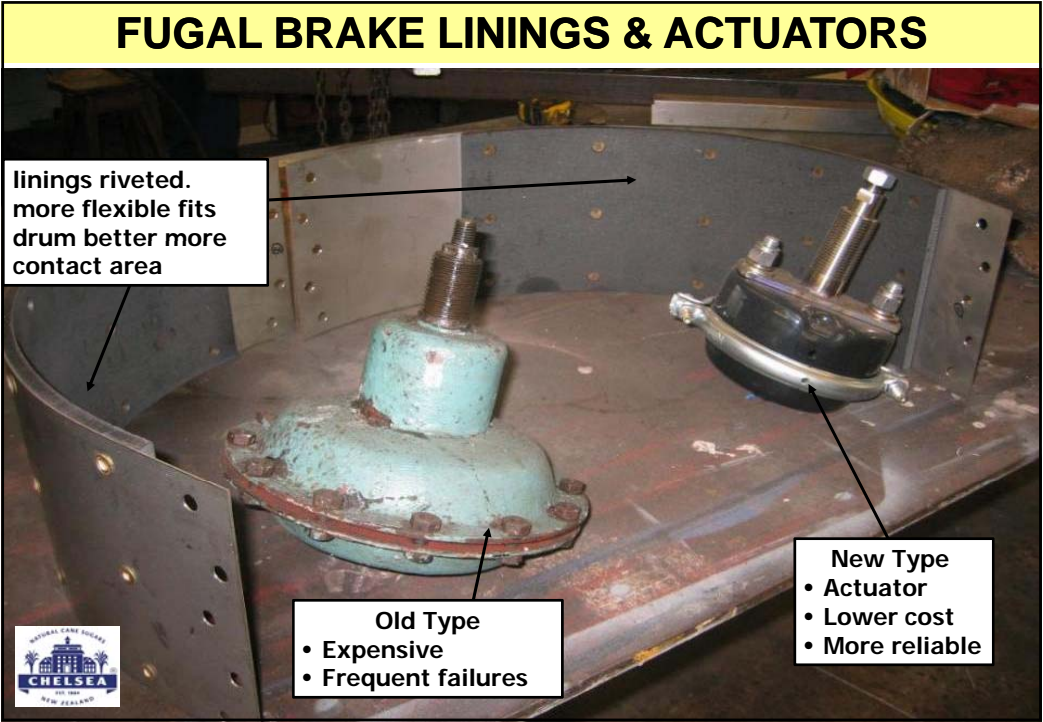




BRAKE MODIFICATIONS

- ▶ Total Braking time was over 30s
- ▶ Maker specifies Minimum Braking of 20s
- ▶ When we tried this, the brakes went up in smoke
- ▶ New type of brake actuator installed – cheaper and more reliable
- ▶ New brake linings riveted not bonded. This allows better flexing and more surface area contact = no smoke!





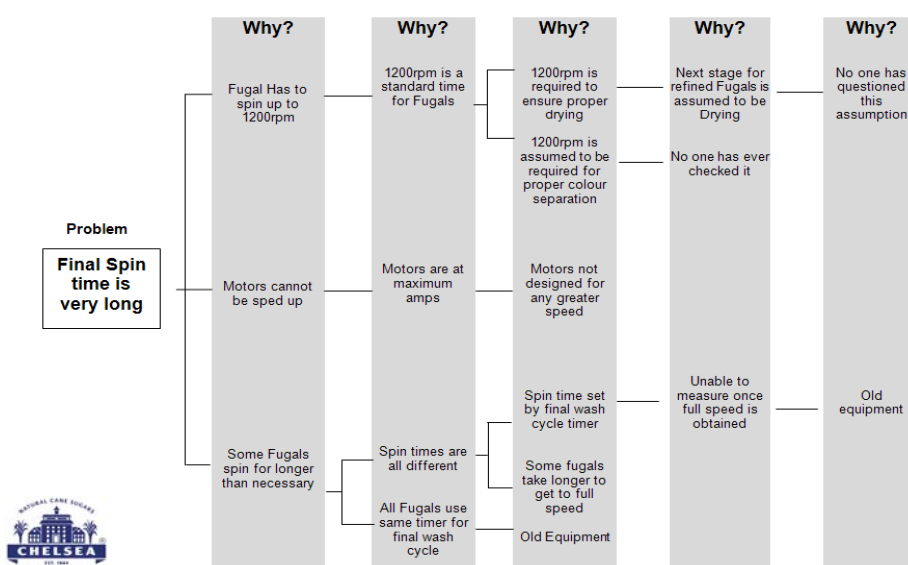
REDUCING THE CENTRIFUGING RPM

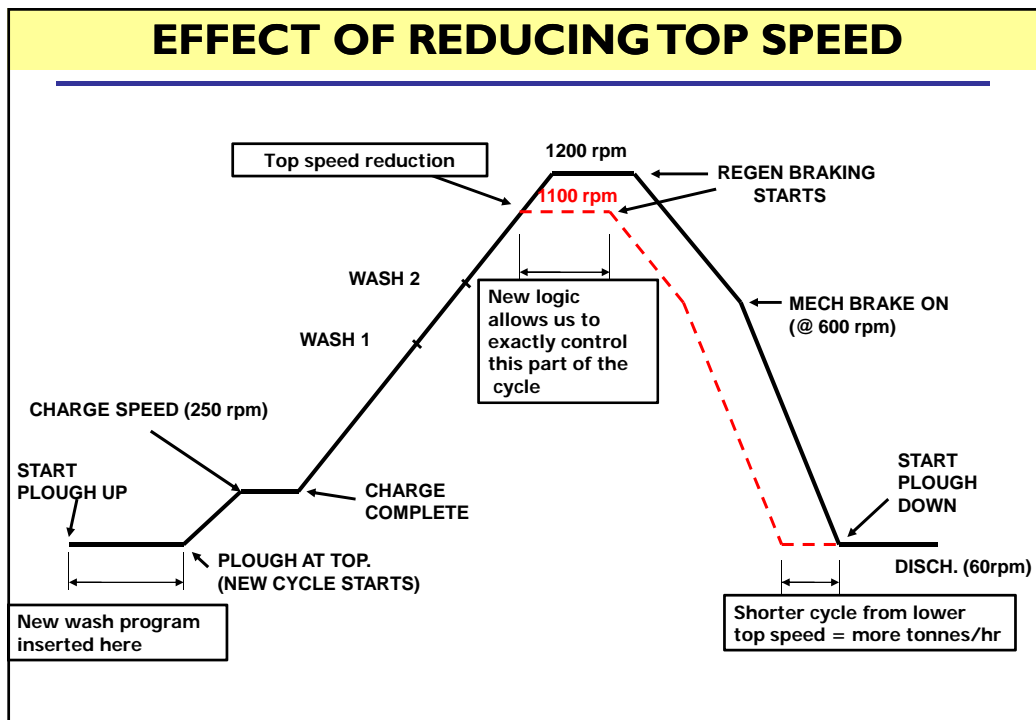
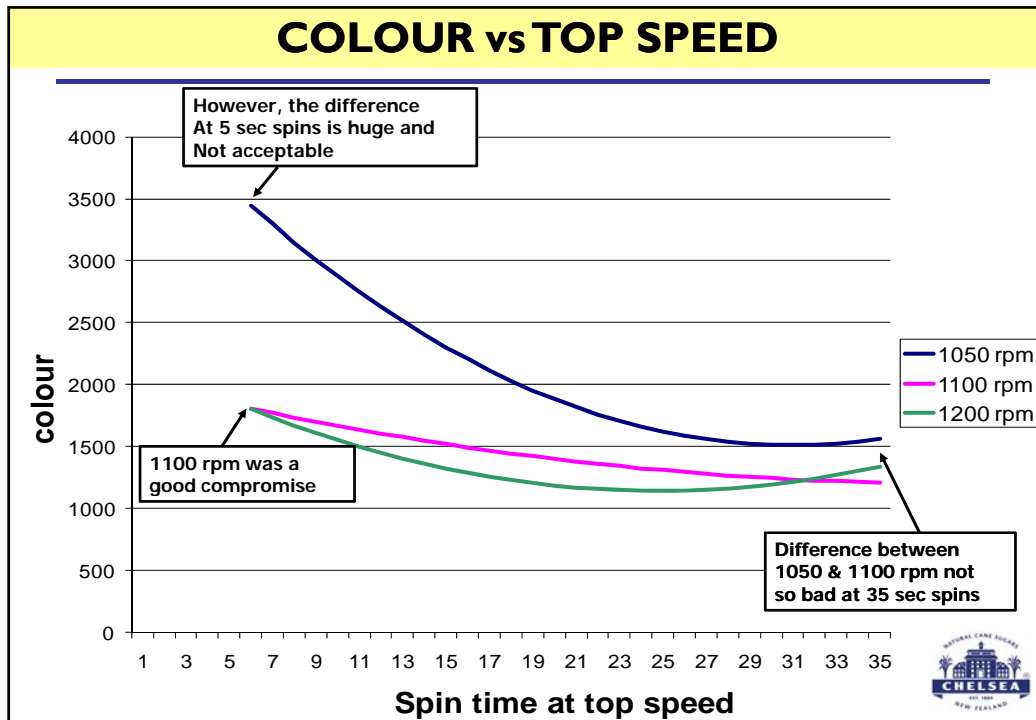
- ▶ Traditionally Fugals spin at 1200rpm
- ▶ **“WHY WHY”** analysis identified that this is only required if next stage is drying
- ▶ Affination Fugals feed dissolving not drying
- ▶ Trialled reduced speeds 1100rpm resulted in minimal impact on colour
- ▶ Reduced acceleration and deceleration time by 10 seconds

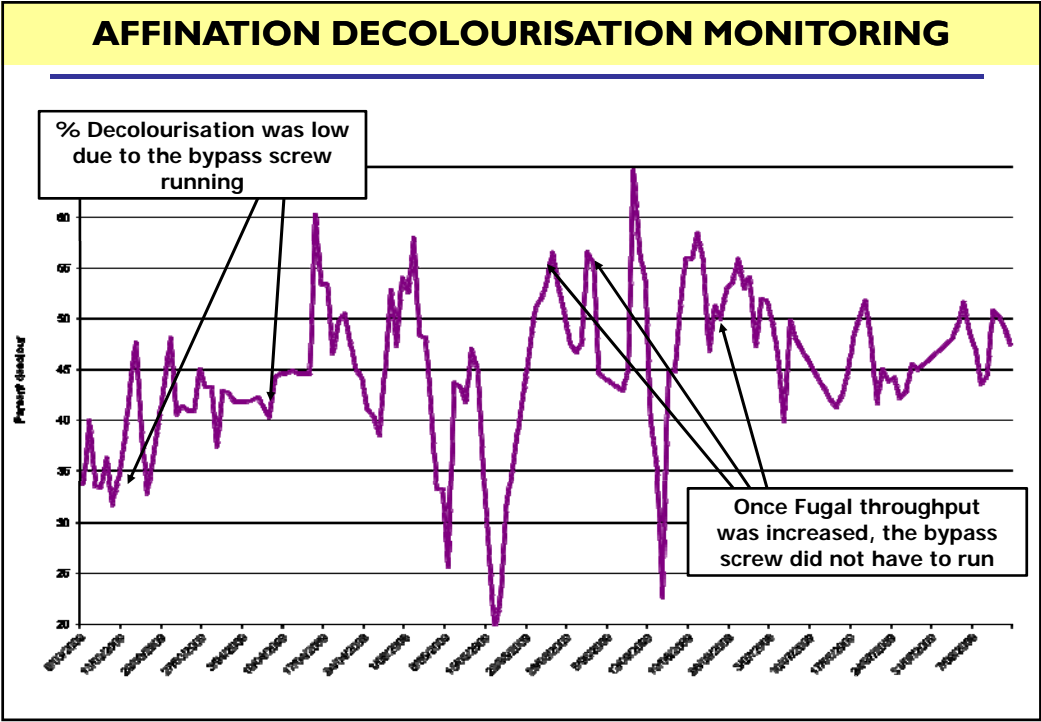
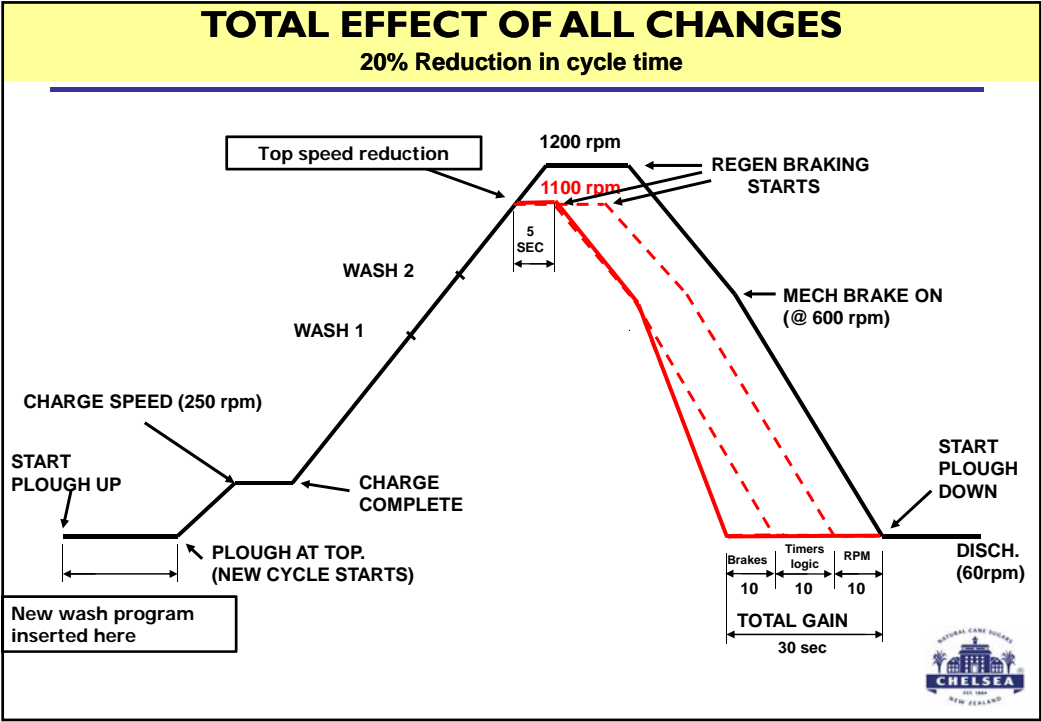


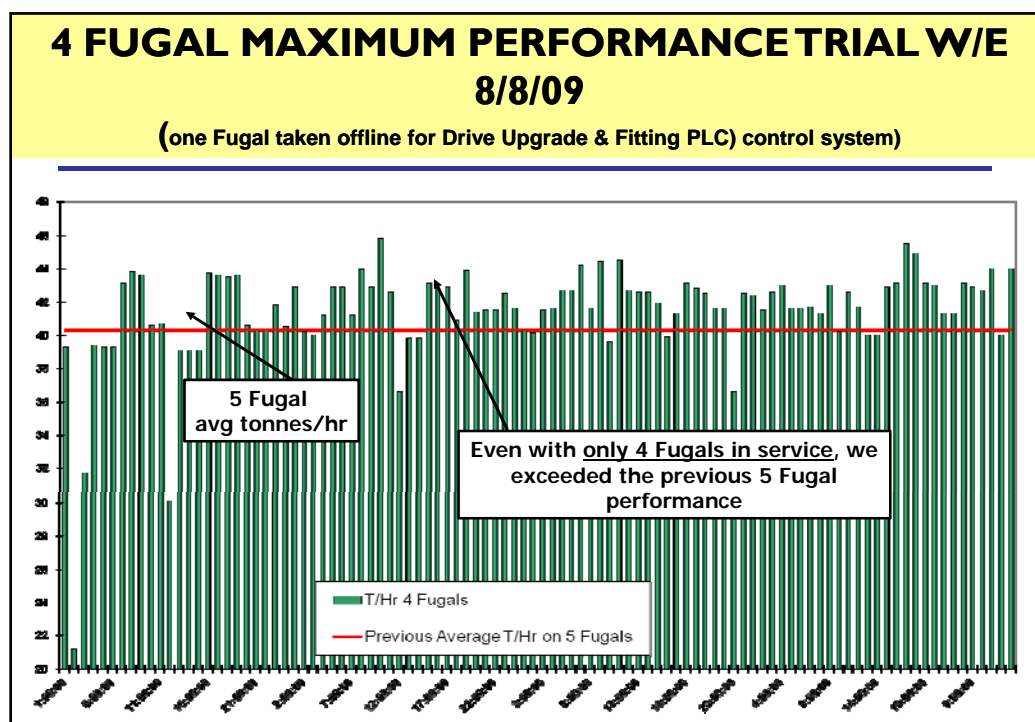
WHY WHY – Final Spin RPM

Why – Why Diagram Area: Melt House Team Affination Fugals Date: 17 / 06 / 2009





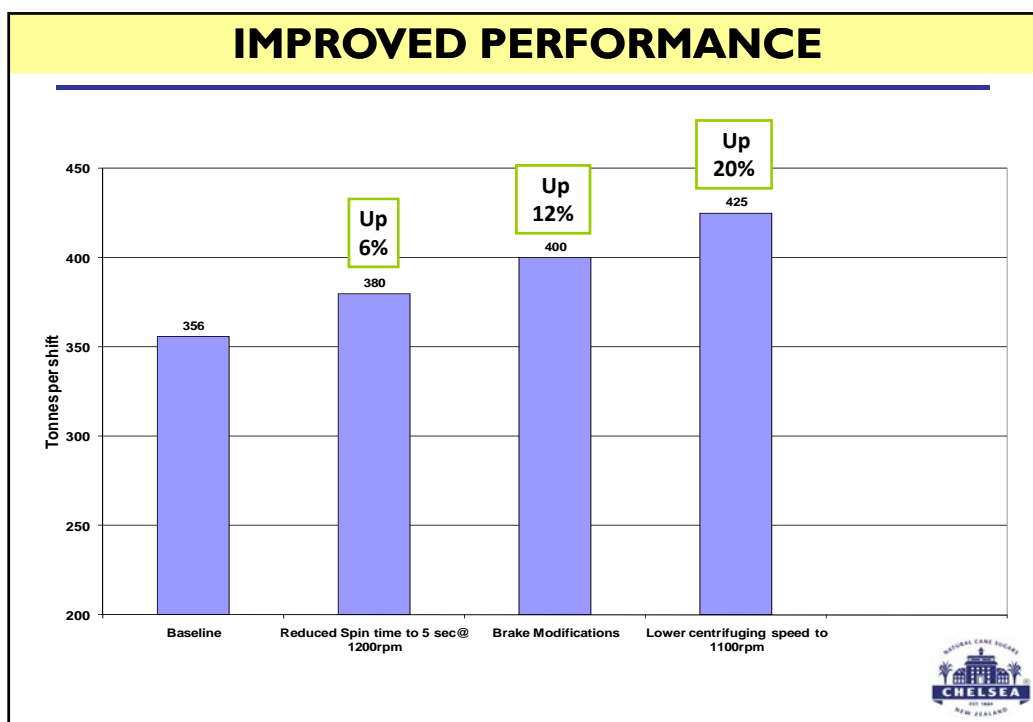




BREAKING RECORDS


- ▶ Following on from the team's success, the refinery went on to break a few production records as soon as demand picked up again & 5 fugals back on line:
 - ▶ Highest ever shift melt
 - ▶ Highest ever 24hr melt
 - ▶ Highest ever 3 day melt





FUGAL CLEANING

- ▶ Consistency of feed mix is vital to keep baskets full
- ▶ Manual operator hosing causes sloppy mixture
- ▶ Sloppy mix overcharges fugals & damages pumps
- ▶ We trialled a new basket wash program on # 5 fugal
- ▶ The basket gets an auto wash while the plough is returning back up to the parked position ...(at preset intervals)
- ▶ Eliminates empty wash cycles & manual hosing

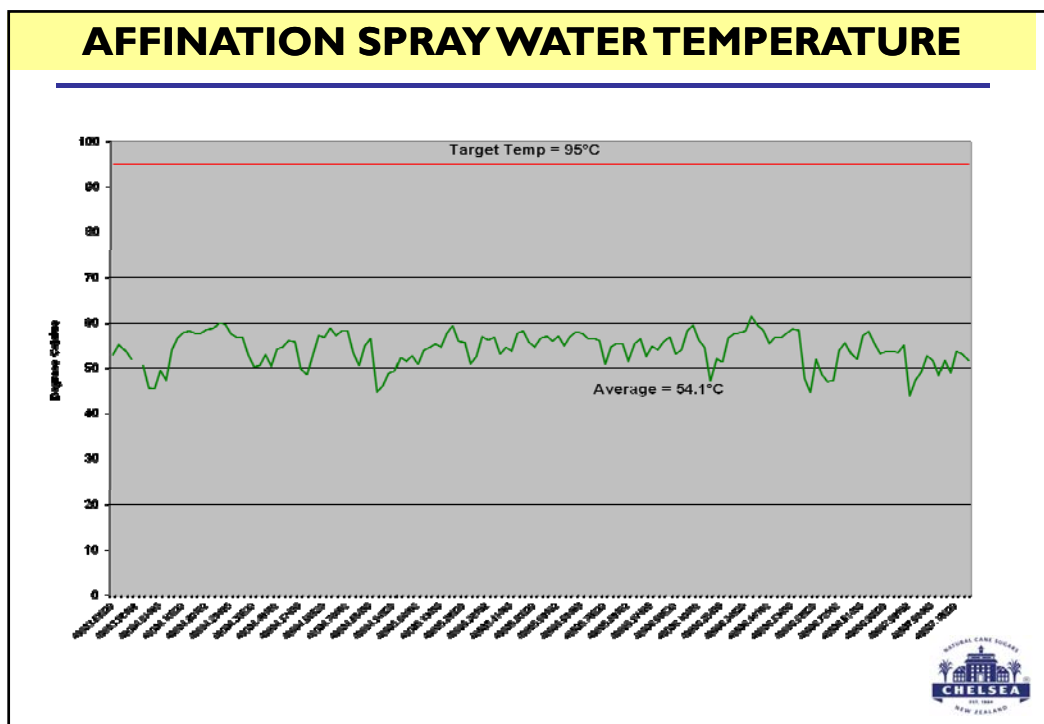




WASH WATER TEMPERATURE & SAVINGS

- Hot Water Spray temperature affects efficiency of the washing.
- Want 95 degrees - Currently 54 degrees.
- The hotter it is, the less you need.
- We installed a probe and began to monitor temperature.
- Capital Job created for heated wash water ringmain.
- 1 second spray reduced, saves 9430 MJ of energy or approx \$85 per week (\$4250 p.a.) in reduced Boilout Pan energy.





COST SAVINGS FROM ALL ACTIONS

▶ Individual spin timers:	\$39,000
▶ Increase brake efficiency:	\$26,000
▶ Centrifuge at lower RPM:	\$34,000
▶ Increase wash water temperature:	\$13,000
▶ Reduction in Brake Maintenance:	\$6,000
Total savings = \$118,000 pa	

NATURAL CANE SUGAR
CHelsea
EST. 1900
NEW ZEALAND

INTANGIBLE BENEFITS

- ▶ Getting Plant shut down early: **Priceless!**
- ▶ Training, TPM Activities and Maintenance is now able to be done on Shutdown days.
- ▶ Lift in Operator Morale from upskilling.
- ▶ Reduced Operator frustration.
- ▶ Key success of this team was the full involvement of Management, Operators & Maintenance working together & learning from each other.




LEARNINGS

- ▶ TPM Process encouraged us to think outside the square.
 - ▶ eg: WHY 1200 RPM?
- ▶ Previous Brake Modifications hadn't been successful as they had not followed a PDCA process.
- ▶ Need to understand your process and take nothing for granted. Eg: Hot water assumed to be ok until measured.
- ▶ Highlighted the importance of following the TPM process.



MANDATE REVIEW

- ▶ Optimise Fugal cycle times to achieve the best Affination Station:
 - ▶ Consistency ✓
 - ▶ Throughput ✓
 - ▶ Efficiencies ✓
- ▶ While also improving or maintaining the following “Goal Aligned Performance Measures”:
 - ▶ % Colour Removal ✓
 - ▶ Raw Wash make ✓
 - ▶ Energy ✓
- ▶ And all achieved within the 12 week cycle



HOW WELL WERE THESE IMPROVEMENTS LOCKED IN ?

- ▶ During the week ending 26 June 2010, we again had to run with only 4 Fugals while # 3 had a new drive installed.
- ▶ The 4 Fugals averaged 349.8 T/shift
- ▶ This equated to 437.2 T/shift for 5 Fugals

So, almost a year later,
there has been no drop
Off in capacity, in fact it
Improved even further

