SUIKER UNIE
A ROYAL COSUN COMPANY

Introduction towards TPM

examples on availability

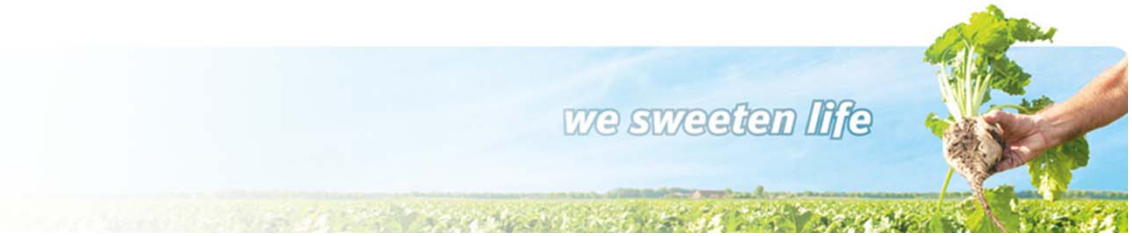


Menno Roukema

ISSCT Aug 2014

Contens

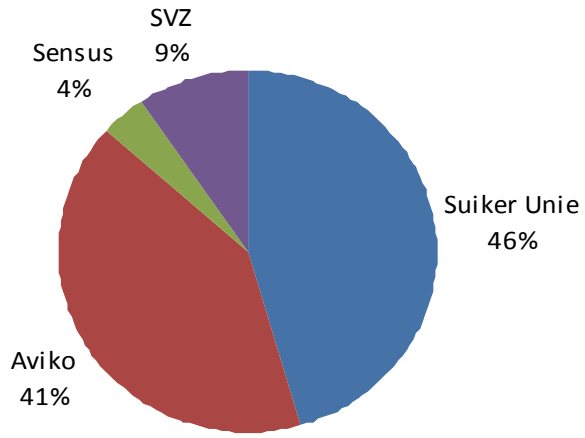
- Cosun- Suiker Unie
- TPM explained
- Loss cost - OPE
- How availability - reliability is influenced



SUIKER UNIE

ROYAL COSUN

- Agro industrial company
- Cooperative of 9.300 sugar beet growers
- Approx. 3.500 FTE
- Turnover € 2,2 billion (2013)



SUIKER UNIE



Sugar products

AVIKO



Potato products

SENSUS



Inuline products

SVZ

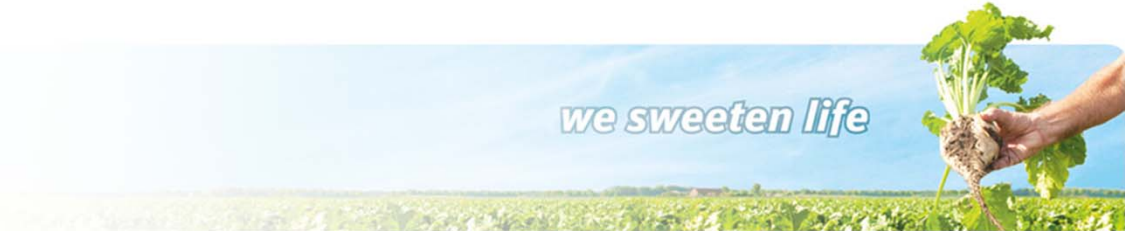


Fruit products

Duynie Holding



Cattlefeed



SUIKER UNIE
A ROYAL COSUN COMPANY

Groningen
- Sugar factory
- Green Gas Plant
- Sugar terminal

Anklam
- Sugar factory
- Bio-ethanol
- Green Gas Plant



Puttershoek,
Roosendaal
- Sugar specialities

Dinteloord
- Sugar factory
- Green Gas Plant
- Central Office

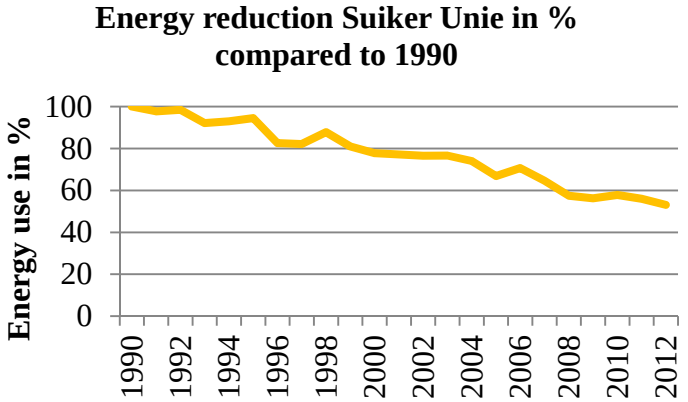


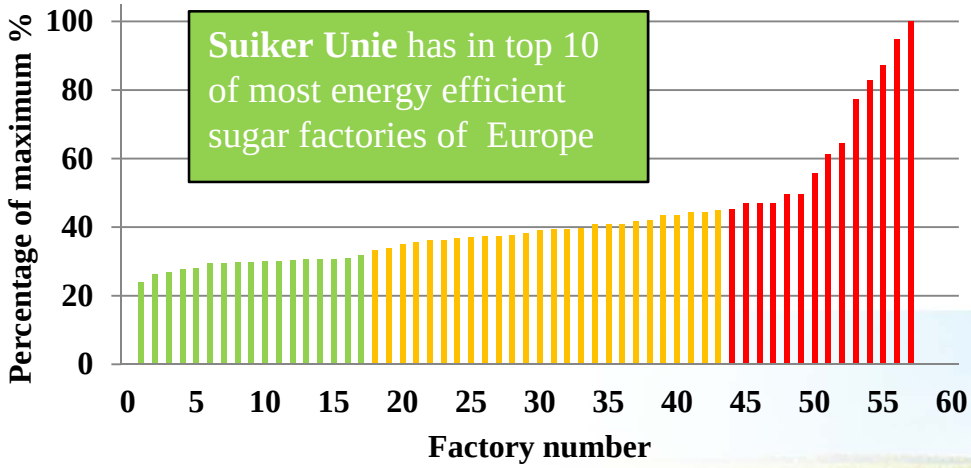
SUIKER UNIE
A ROYAL COSUN COMPANY

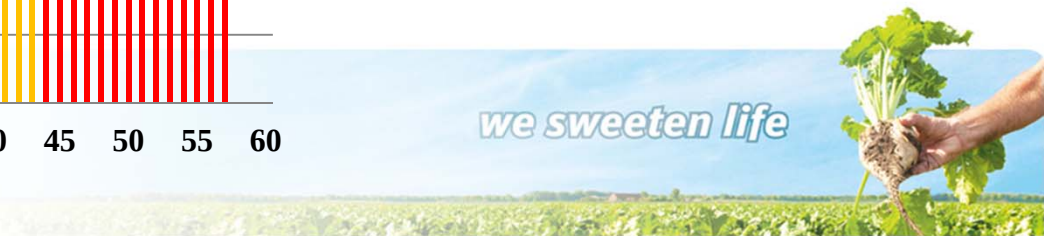
Main facts



- 3 sugar beet factories
- Campaign 135 days + 30 days thick juice
	Slicing capacity	White sugar
NL: **2** x	22.000 t/d	4.000 t/d
GE: 1 x	12.000 t/d	1.200 t/d
- Total sugar beet: 7,5 million ton/yr
  White sugar: 1,2 million ton/yr
  Raw cane sugar refining: 200.000 ton/yr
  Ethanol: 70.000 m3/yr
  Green gas (digesters): 30 million m3/yr

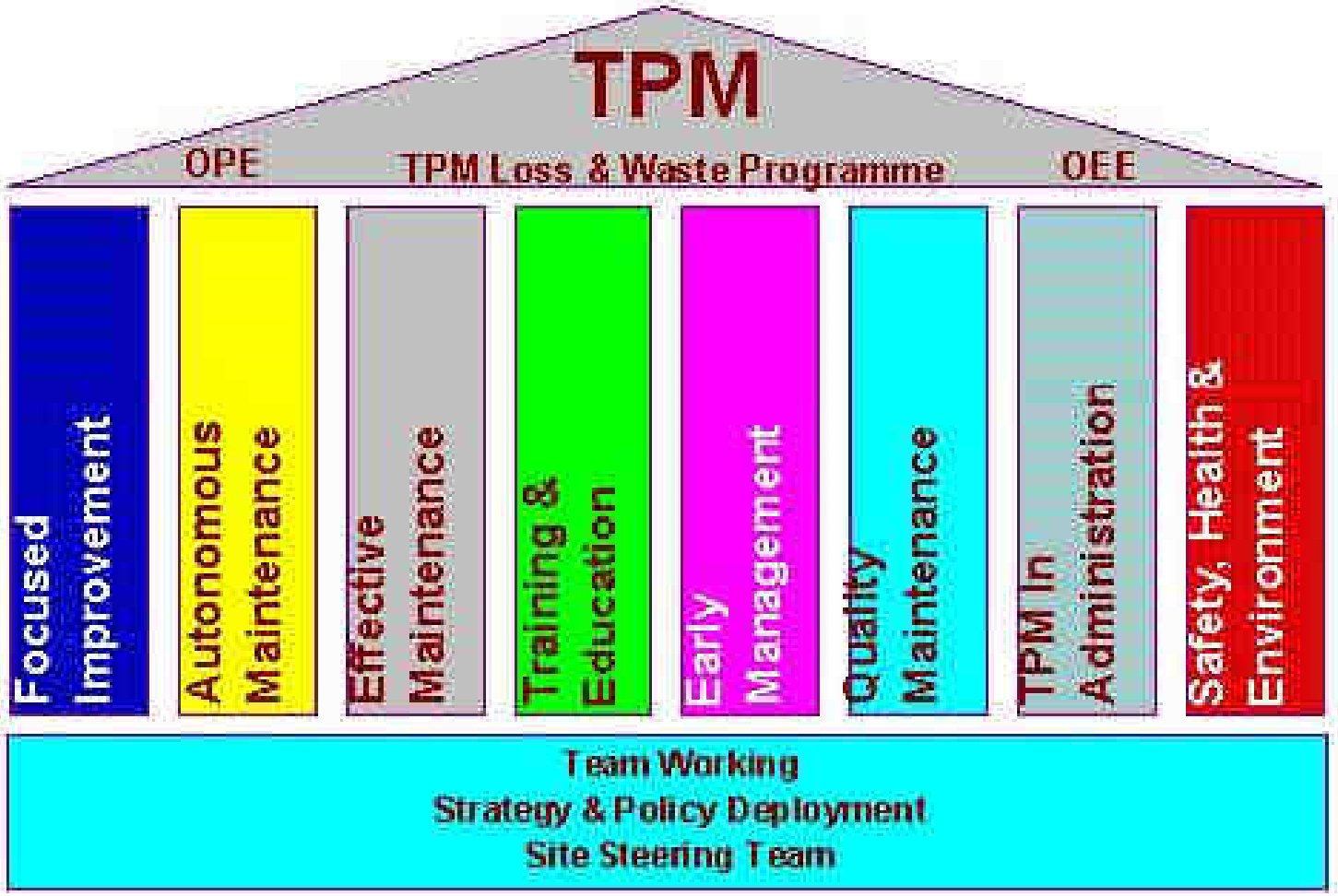






SUIKER UNIE

TPM : THE EIGHT PILLAR / PROGRAMMES

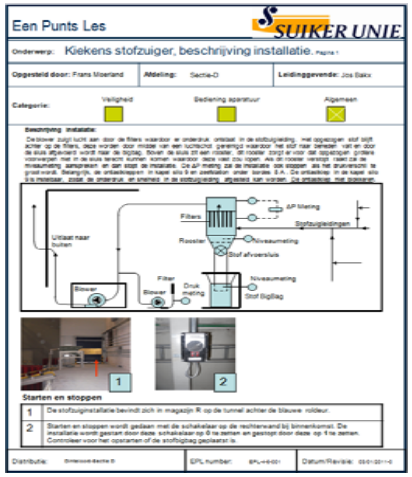


TPM; what is it (about)?

Total Productive Maintenance (*not entirely correct translation*)

Maintain Total Productivity

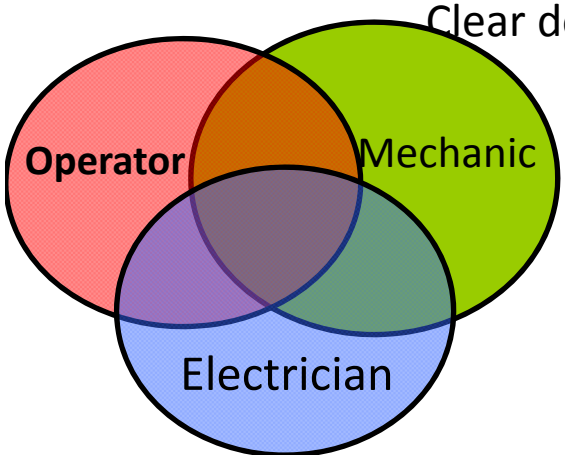
All aspects in the value train and the business processes around it.
(raw material –> production –> logistics –> customer)





People; help them being effective.
Train and use effective techniques
Visual communication
Focus on losses (**Zero loss**)
Improve continuously and maintain

All levels and **all** departments involved
Organise small groups
Make plan; select and coordinate activities.
Clear down-drill from goals to activities







TPM is (not) about



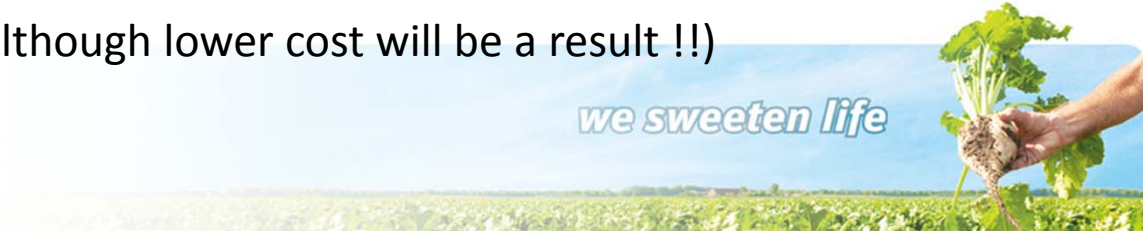
Optimal use of the existing



Getting new toys



Not:
Get new stuff (although some will be needed)
Reduce FTE
Cost reduction program (although lower cost will be a result !!)



TPM Basis: Clean –out & organise

Separate, sort, clean, order, standardise.

Visual management.





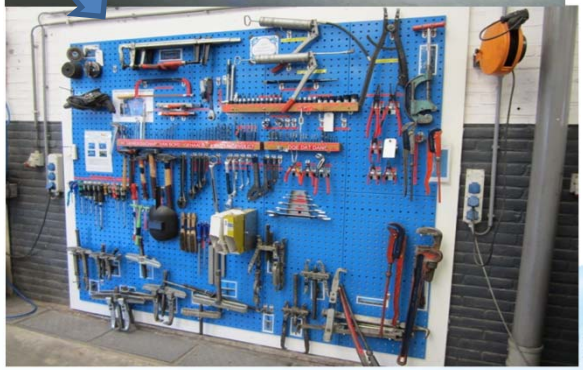








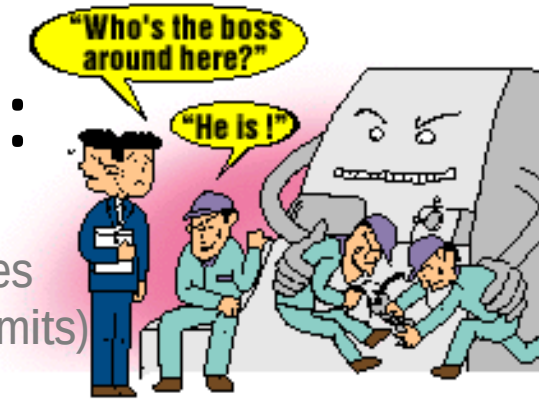
Search time reduced 20%







Autonomous Maintenance:





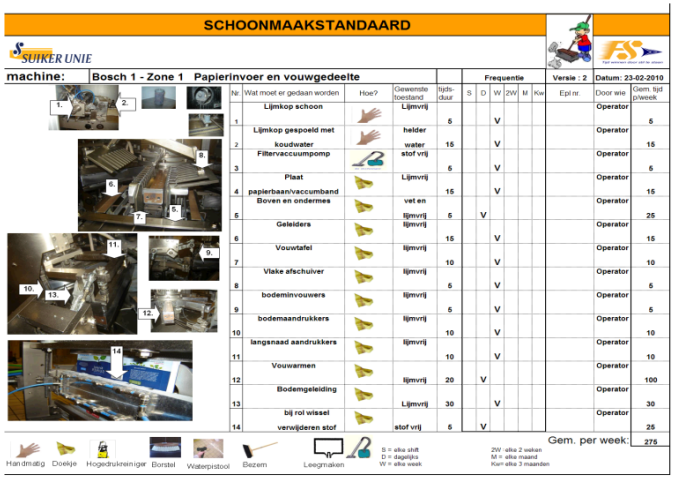
Objective:
Make operator feel responsible and care for his machines
Instruct and develop operator to be self reliant (within limits)

7 step plan:

1. Bring machines in 'good' condition
2. Find-solve polution sources
3. Create CIL-list (Cleaning – inspection - lubrication)
4-7. Standardise maintenance and educate operator to maintain his machine



With involvement and guidance by maintenance technicians


SCHOONMAAKSTANDAARD

SUIKER UNIE

machine: Bosch 1 - Zone 1 Papierinvoer en vouwgedeelte — Versie : 2 — Datum: 23-02-2010

Nr.	Wat moet er gedaan worden	Hoe?	Gewenste toestand	tijds-duur	S	D	W	2W	M	Kw	Epl.nr.	Door wie	Gem. tijd p/week
1	Lijmkop schoon		Lijmvrij	5			V					Operator	5
2	Lijmkop gespoeld met koudwater		helder water	15			V					Operator	15
3	Filtervaccumpomp		stof vrij	5			V					Operator	5
4	Plaat papierbaan/vaccumband		Lijmvrij	15			V					Operator	15
5	Boven en ondermes		vet en lijmvrij	5		V						Operator	25
6	Geleiders		lijmvrij	15			V					Operator	15
7	Vouwtafel		lijmvrij	10			V					Operator	10
8	Vlake afschuiver		lijmvrij	5			V					Operator	5
9	bodeminvouwers		lijmvrij	5			V					Operator	5
10	bodemaandrukkers		lijmvrij	10			V					Operator	10
11	langsnaad aandrukkers		lijmvrij	10			V					Operator	10
12	Vouwarmen		Lijmvrij	20		V						Operator	100
13	Bodemgeleiding		Lijmvrij	30			V					Operator	30
14	bij rol wissel verwijderen stof		stof vrij	5		V						Operator	25
												Gem. per week:	275

Handmatig Doekje Hogedrukreiniger Borstel Waterpistool Bezem Leegmaken

S = elke shift
D = dagelijks
W = elke week
2W = elke 2 weken
M = elke maand
Kwt= elke 3 maanden





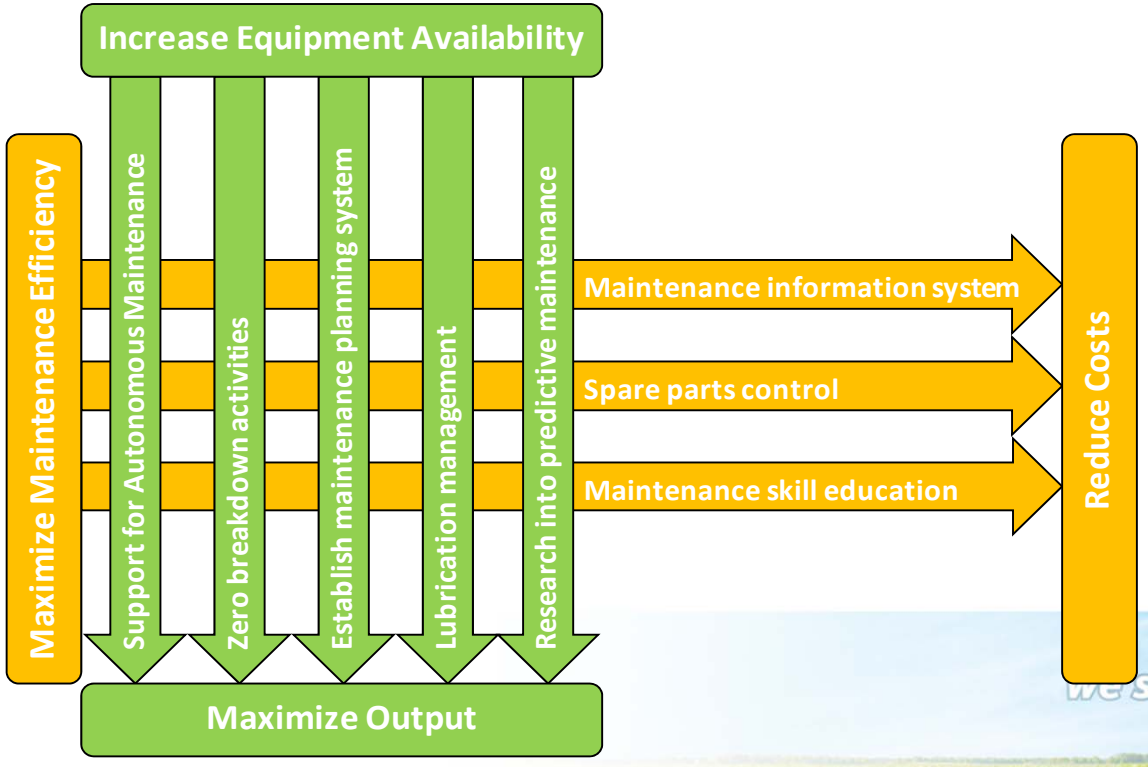
Effective Maintenance

Often incorrectly called: Planned Maintenance

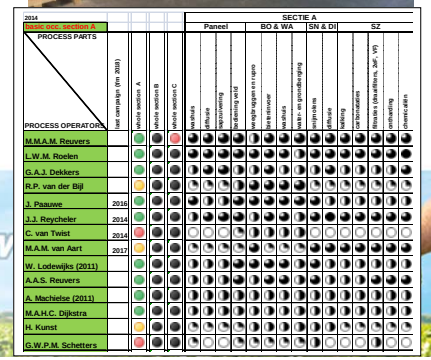
Objectives:

1) **Increase availability of machines for production**
2) **Increase maintenance efficiency**

Organised in 8 sub-pillars and 4 steps

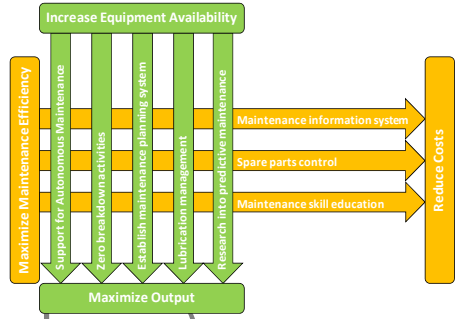






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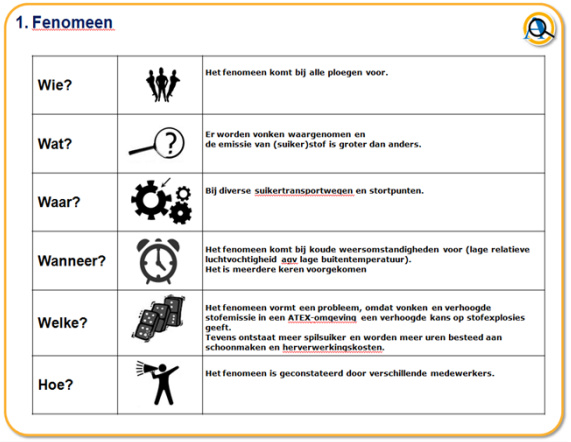
Effective Maintenance



All well known maintenance activities
Use proven and effective techniques (often simple and easy)
- ABC ranking of equipment
- Measure MTTR – MTBF
- Analyse breakdowns –> zero loss activities

Assist and educate activities by operators

Just start and do it !


1. Fenomeen

Wie?	Het fenomeen komt bij alle ploegen voor.
Wat?	Er worden vonken waargenomen en de emissie van (suiker)stof is groter dan anders.
Waar?	Bij diverse suikertransportwegen en stortpunten.
Wanneer?	Het fenomeen komt bij koude weersomstandigheden voor (lage relatieve luchtvochtigheid agv lage buitentemperatuur). Het is meerdere keren voorgekomen
Welke?	Het fenomeen vormt een probleem, omdat vonken en verhoogde stofemissie in een ATEX-omgeving een verhoogde kans op stofexplosies geeft. Tevens ontstaat meer spilsuiker en worden meer uren besteed aan schoonmaken en herverwerkingskosten.
Hoe?	Het fenomeen is geconstateerd door verschillende medewerkers.

Operator 40 %



Mechanic 60%



Our Challenge:
Maintenance cost 2% on invested capital
Up time 25% increase, OPE expected 98%

Equipment dating from 1950 -2014:

Rotating	1.400
Vessels	210
Buildings	200
E&I I/O	22.000

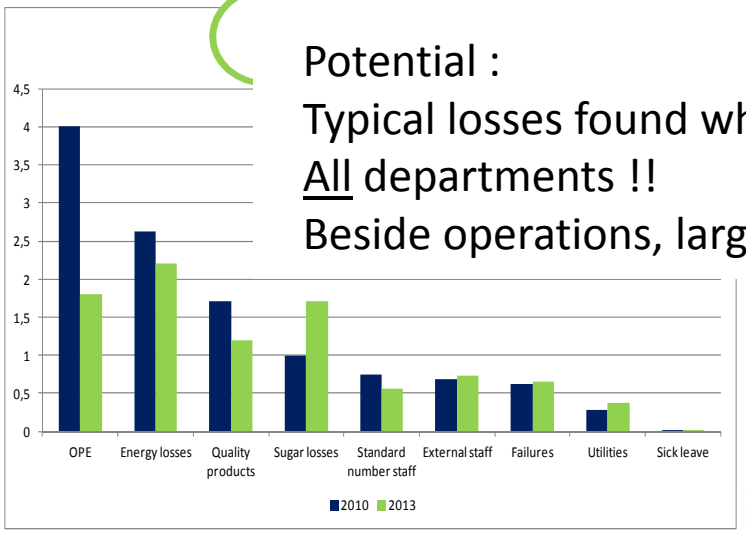


Focussed Improvement

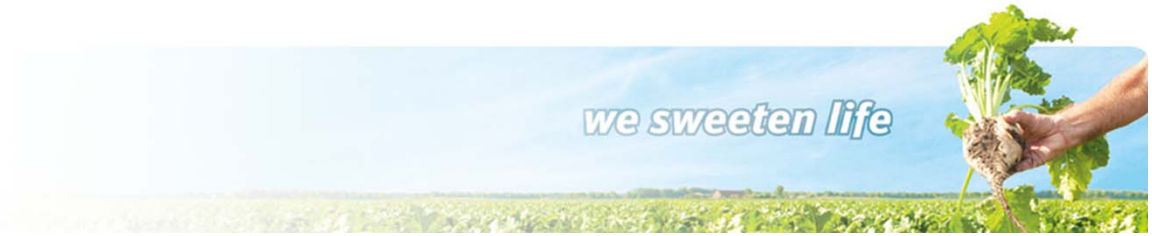


Everyone is involved in finding and eliminating losses

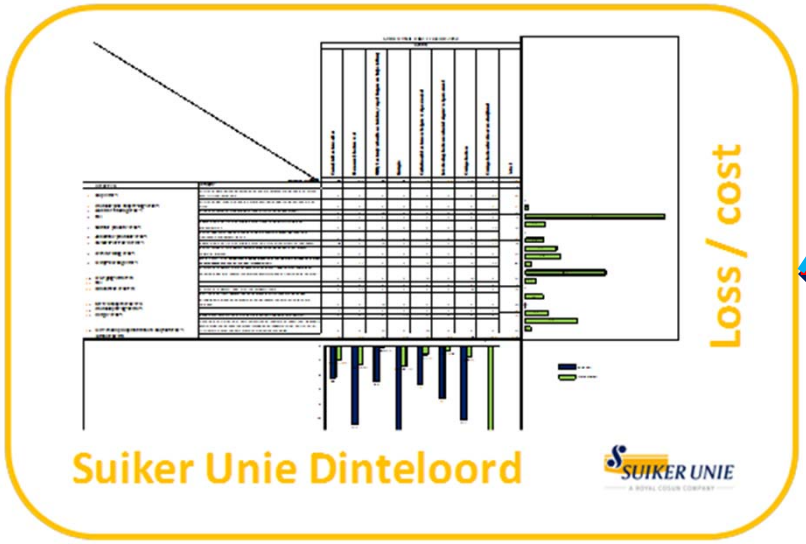
- Losses are mapped - visualised
- Improvement techniques are set-up and trained to work force (Kai-Zen).
- Selection of losses to solve, organise resources, time and means -> go for zero loss!
- Kai-Zen activity list – follow up – tracking of losses solved

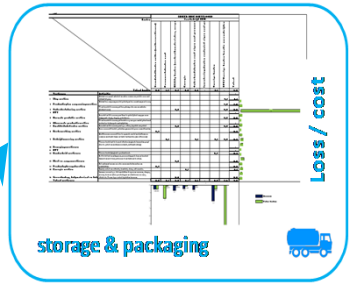


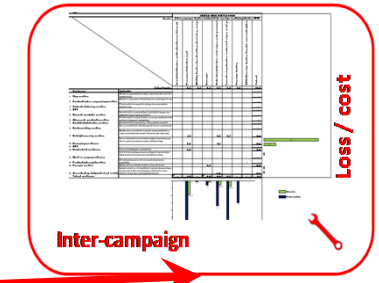
Potential :
Typical losses found when starting TPM; >30% of total operating cost
All departments !!
Beside operations, large losses are found in business processes (Office !).

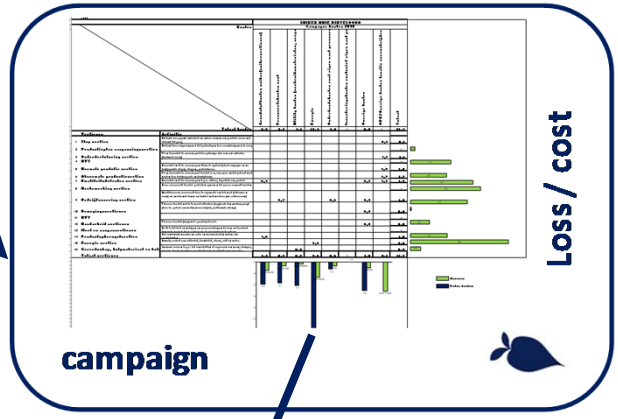


Loss/Cost Matrices

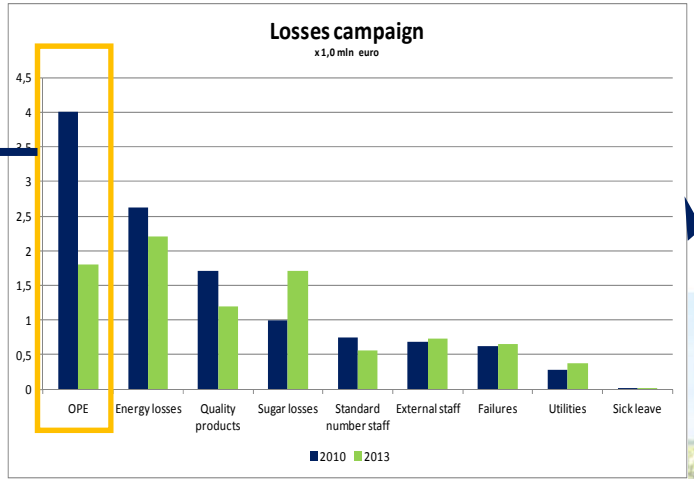






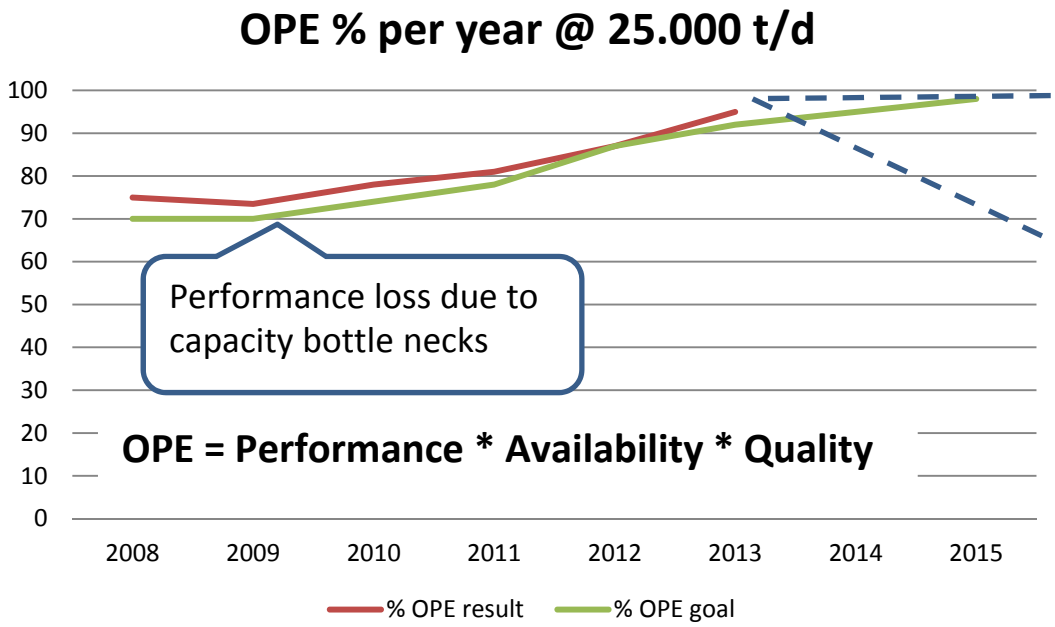


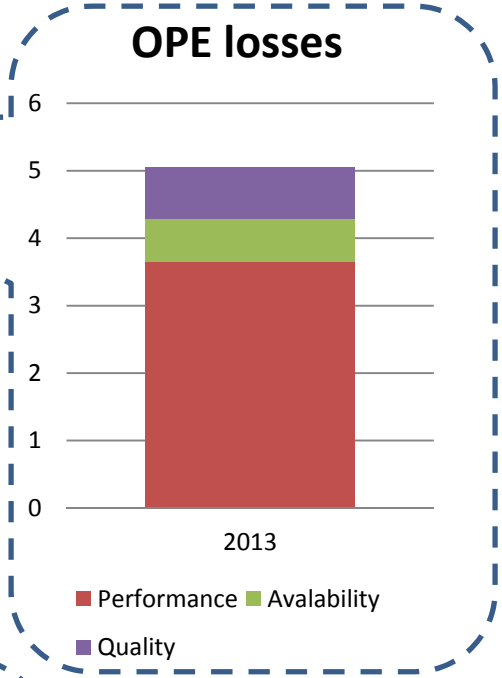
Further investigate and down-drill to Kai-Zen activities

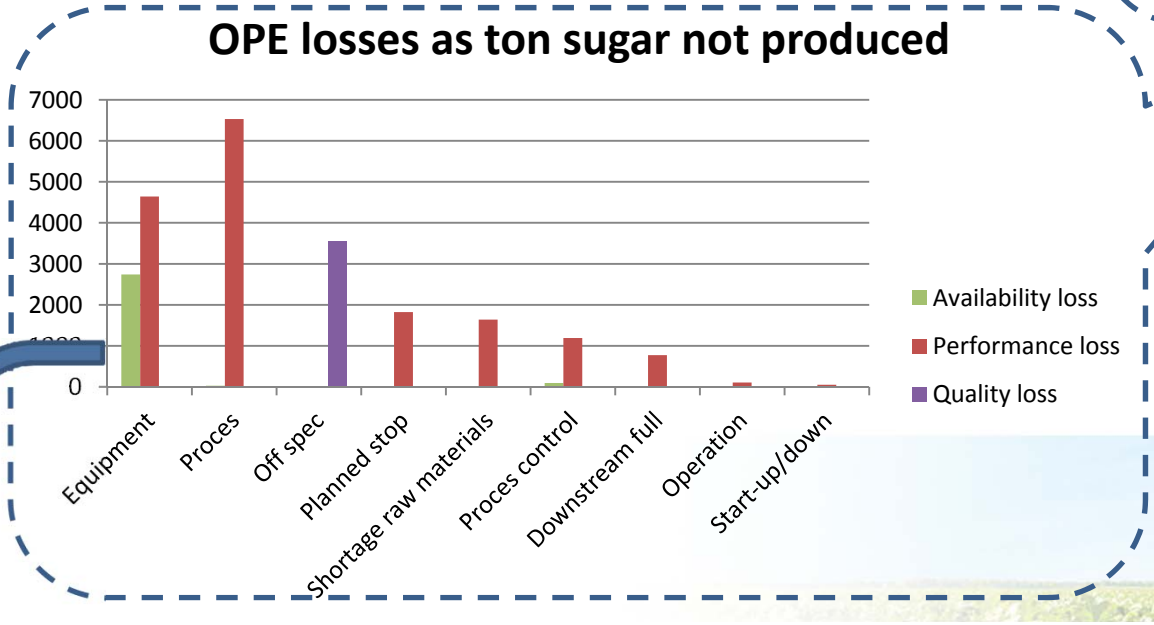




OPE (Overall Plant Effectiveness)





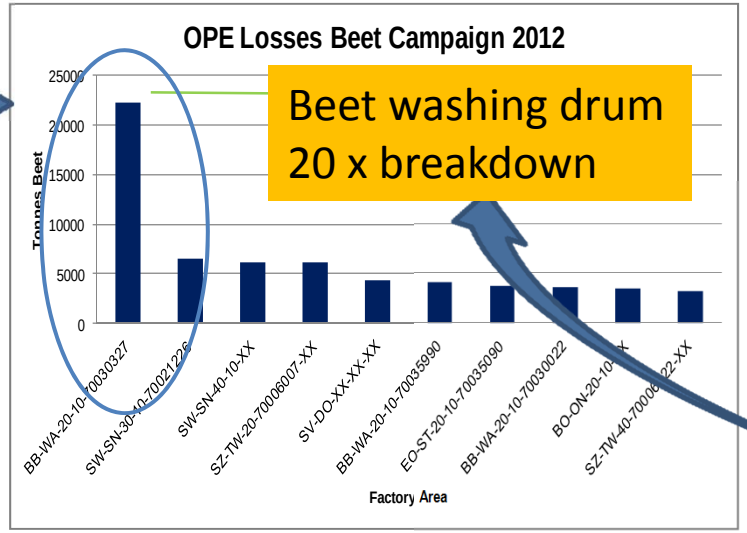


Every OPE loss is listed by operators:
- type of loss
- Equipment involved

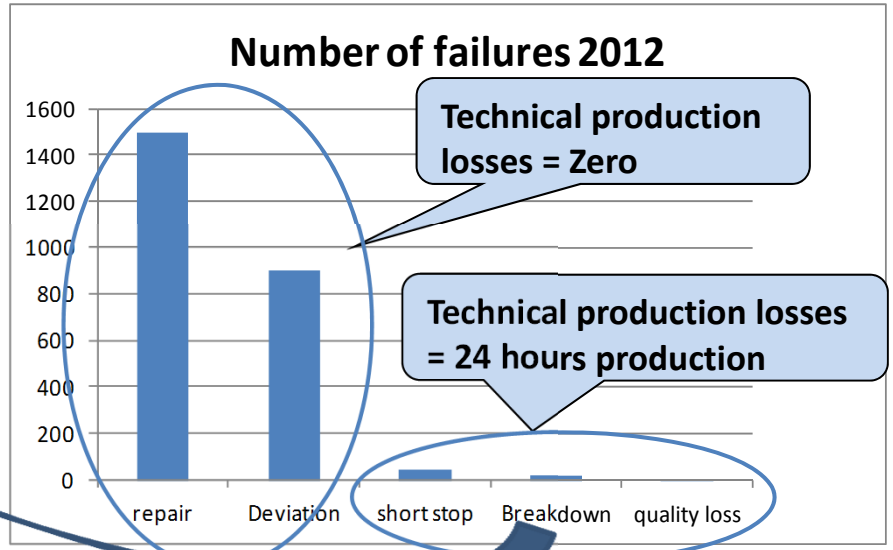


SUIKER UNIE

Availability loss by reliability issues



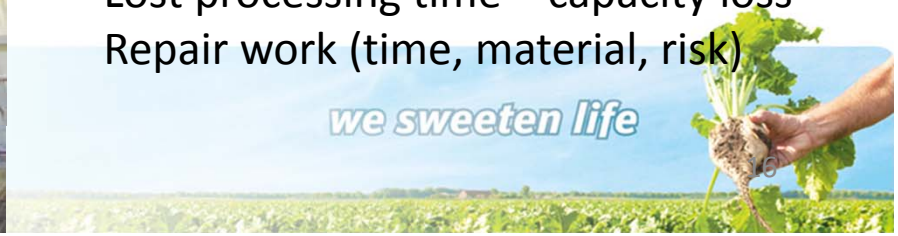
Beet washing drum
20 x breakdown





Only tiny fraction of technical issues-breakdowns is causing OPE availability loss.

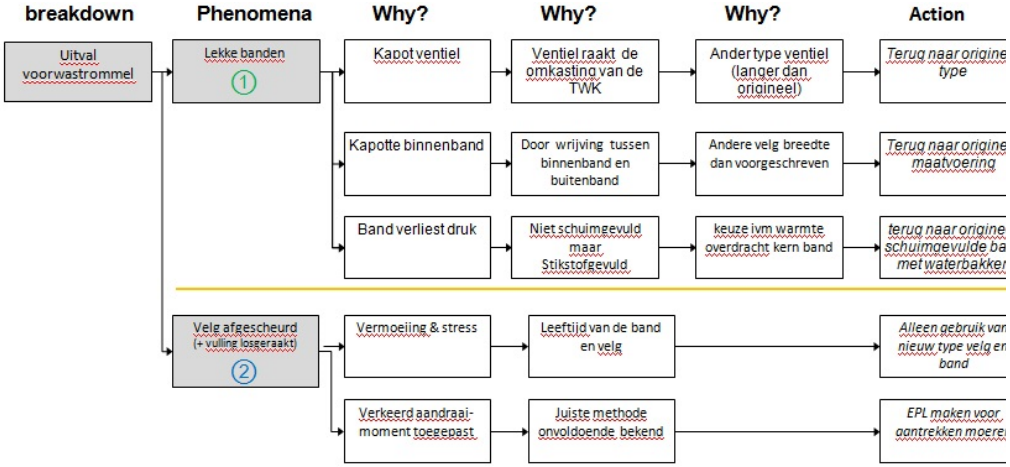
Losses:
Lost processing time = capacity loss
Repair work (time, material, risk)



Root cause; Changing causes reliability issues







Change = root cause

Event sequence:

2011 Replace drum, new drum 30% heavier operating weight + stiffer campaign; problems with original tires

2012 new tires (air filled, not right size wheel rim, long tire valve) campaign; many tire leakages

Action 2013: Renew all tires to original foam filled type, correct rim and strengthened flange .

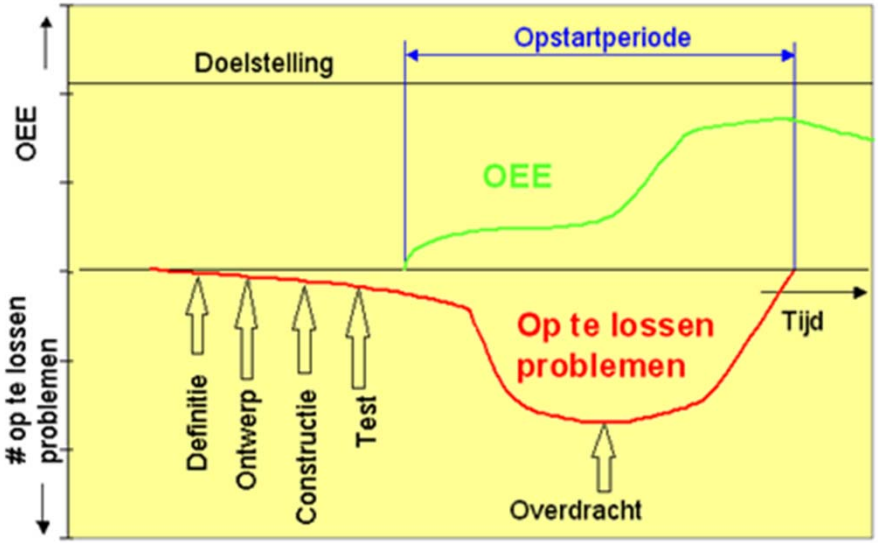
Instruction ‘how to place wheel correctly’

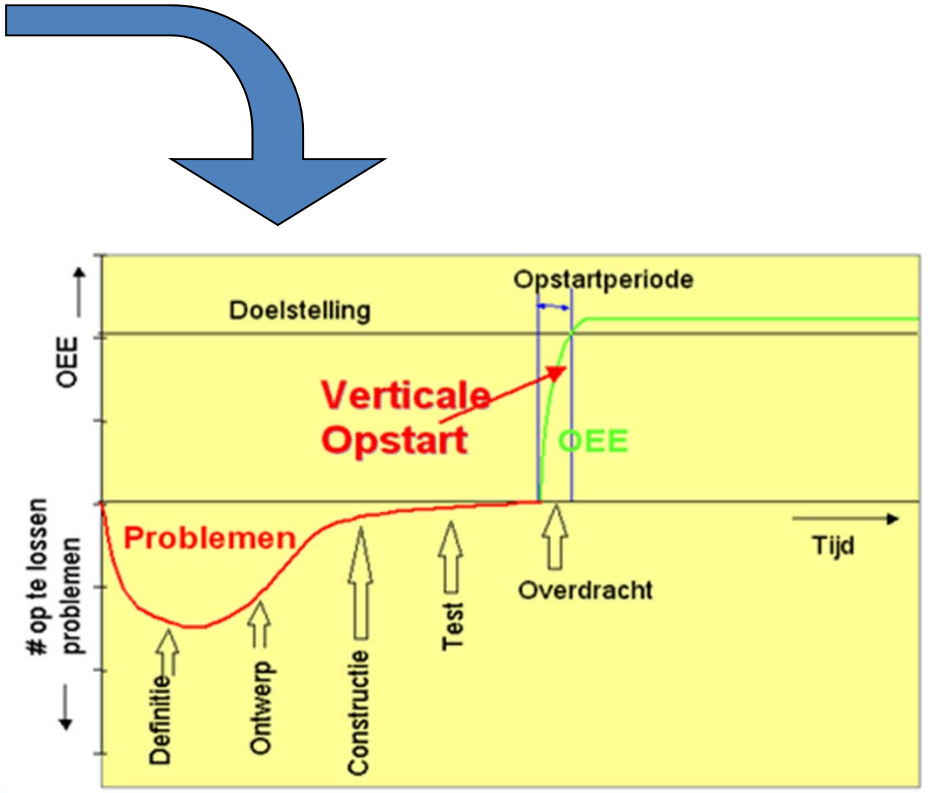
Result -> Zero loss **Lesson**: Focus on Maintain, no changeneering



Early Management

Objectives: Vertical Start-up
Maintenance prevention (standards)
Reduce Long Term Cost of Ownership



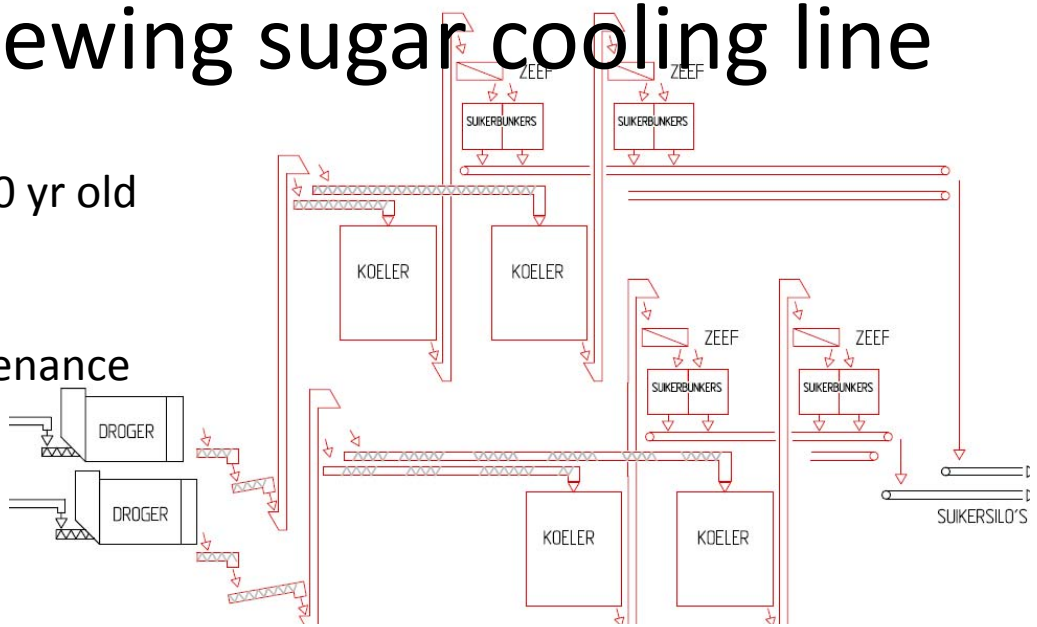




EM example: Renewing sugar cooling line

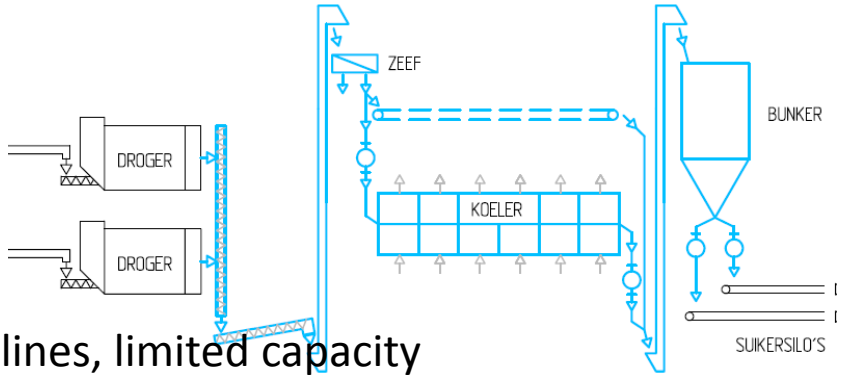
Old system;

- 4 lines with coolers, 50 yr old
- Very complicated
- high operational load
- reliability risk – maintenance
- Safety (Sugar dust)



New system objectives:

- high capacity (4200 t/d)
- high availability (98%)
- SIMPLE and robust
- acceptable cost
- according Atex etc.
- Keep up and downstream two lines, limited capacity



=> Final choice 1 line with horizontal cooler (BMA) for 200 t/hr



Influence of design on availability

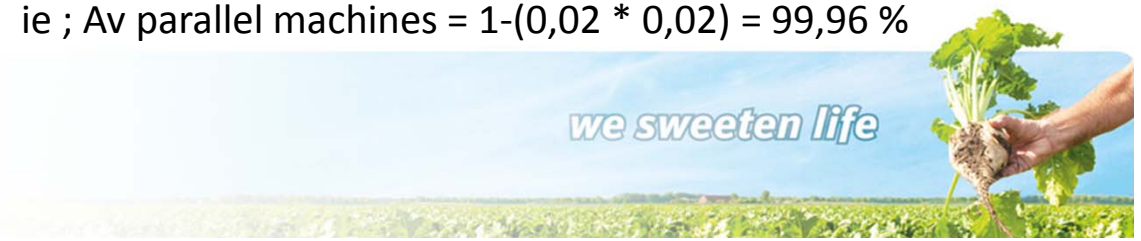
Availability screw conveyor taken as @ 99,5%

Main options	Simplicity	# machines for sugar transport	Availability @ 200 t/hr (calculated)	Capex Index	
Minimal design 1 line 200 T/hr	Very simple	10	94,4 %	Lowest	
Minimal + bypass 1 line 200 T/hr	**Simple**	**13**	**99,4 %**	+ 3%	Chosen
2 lines 120 T/hr 1 horizontal cooler	Medium complex	19	95,6 %	+ 10%	
2 lines 100 T/hr 2 vertical coolers	Complex	22	Ca. 90 %	+ 30%	cooling machines

Availability calculation:

Series Av tot = Av 1 * Av 2 ie; Av two machines in series = 0,98 * 0,98 = 96 %

Parallel Av tot = 1 – ((1-Av1)*(1-Av2)) ie ; Av parallel machines = 1-(0,02 * 0,02) = 99,96 %



2012 Succesfull start-up

Largest BMA horizontal sugar cooler (200 t/hr)

- Fair vertical start-up
- Availability, capacity and quality as expected

Be aware of reliability - availability issues in suppliers equipment design! Often availability low as 95%.

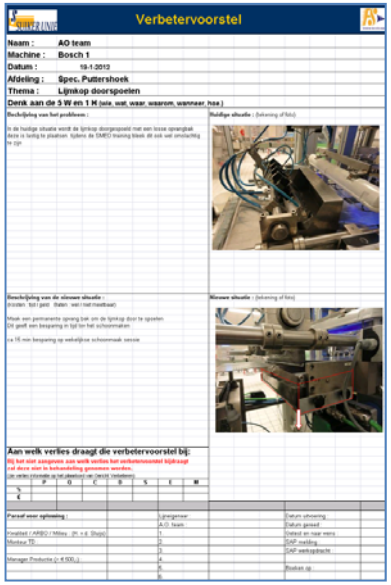


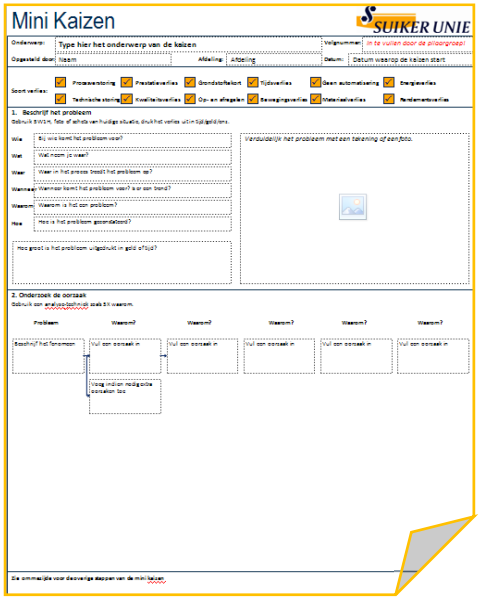




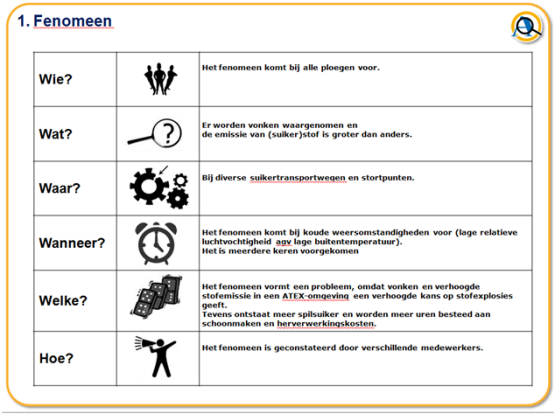
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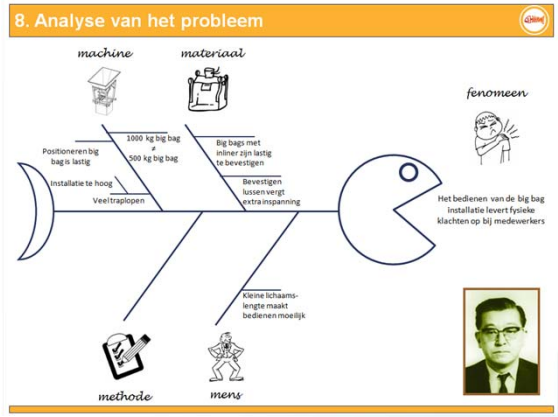
Kaizen Techniques

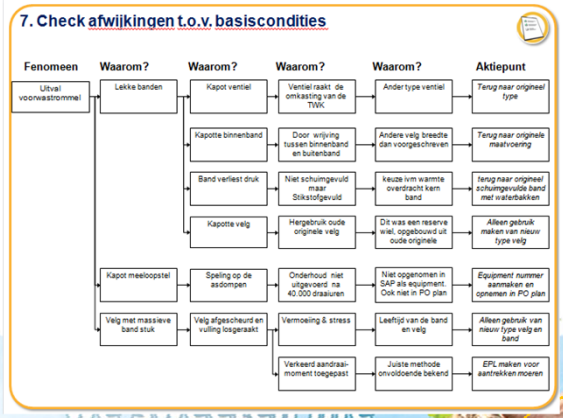












TPM implementatie

