ENGINEERED WOOD PRODUCTS – FROM HERE TO THE FUTURE

Delivering manufacturing excellence

November 14th, 2014

Mathias Makowski

Surfers Paradise

AGENDA

POYRY OVERVIEW

OPERATIONAL EXCELLENCE

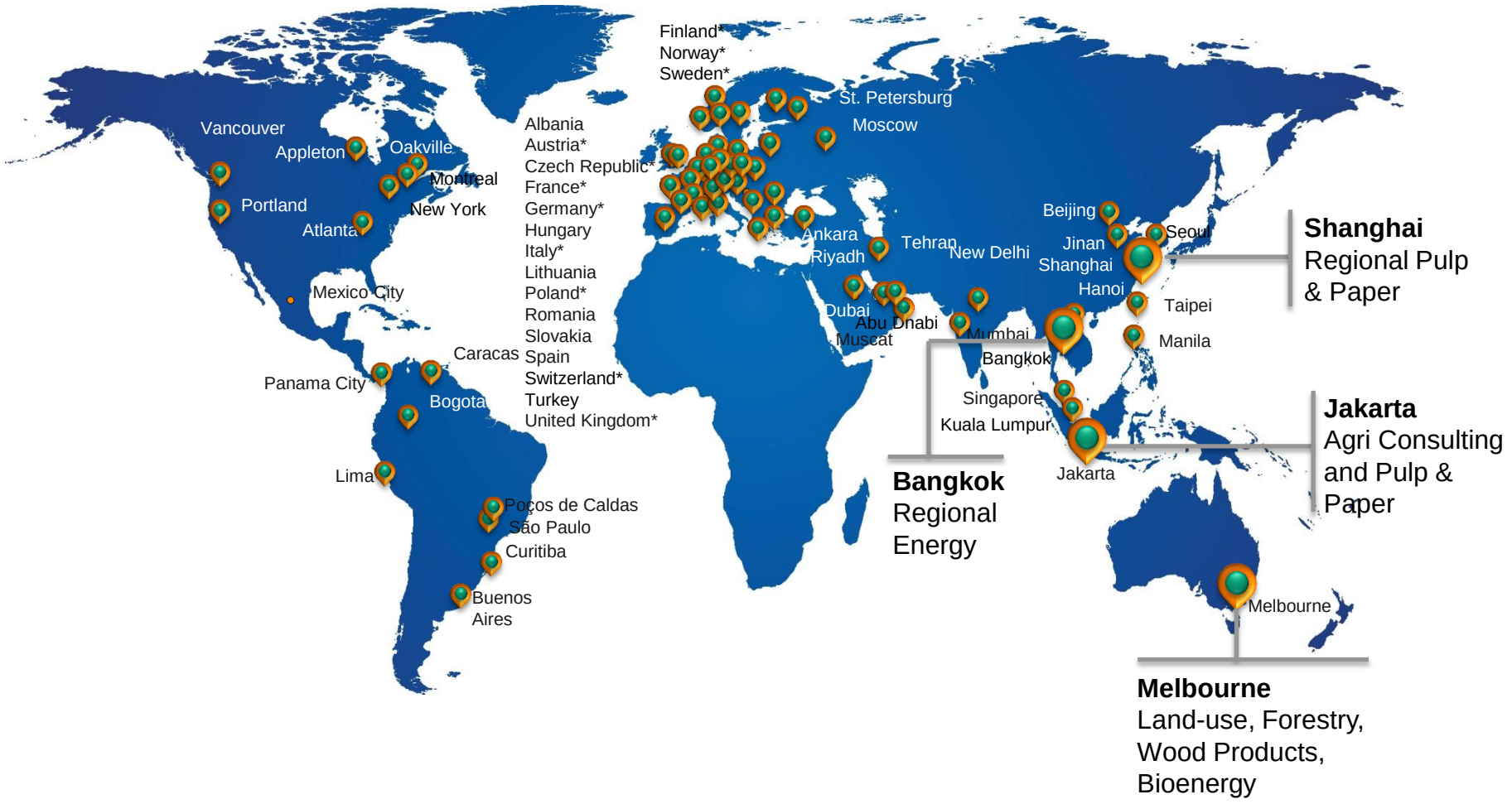
HOW TO CLOSE THE GAP?

CASES AND EXAMPLES

WE ARE CONSULTING AND ENGINEERING SPECIALISTS …

Today's focus		Land & forest	Wood products	Pulp, Paper, Packaging & Hygiene	Energy	Chemicals and Biorefining
Engineering	Engineering services		✓	✓	✓	✓
	Project implementation		✓	✓	✓	✓
	Operations support		✓	✓	✓	✓
Management consulting	Strategic advisory	✓	✓	✓	✓	✓
	Operational excellence	✓	✓	✓	✓	✓
	Market intelligence	✓	✓	✓	✓	✓

…WITH A GLOBAL NETWORK OF 6,000+ EXPERTS AND OFFICES IN ABOUT 50 COUNTRIES



WE WORK ACROSS THE FOREST PRODUCTS VALUE CHAIN WITH INDUSTRY, BANKS & PRIVATE EQUITY

Industry

- Operational Excellence
- Markets
- Strategy
- BioFuture

Banks

- Pre-Feasibility / IM Support
- Commercial Due Diligence
- Technical Due Diligence
- After Financing Support

Private Equity

- Pre-Feasibility / IM Support
- Commercial Due Diligence
- Technical Due Diligence
- After Financing Support

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MANY WAYS TO IMPROVE CORPORATE PERFORMANCE

Strategy

Example:

- M&A
- Divestiture
- Products / Markets

Assets

Example:

- New assets
- Major upgrades
- Rebuilds

Execution

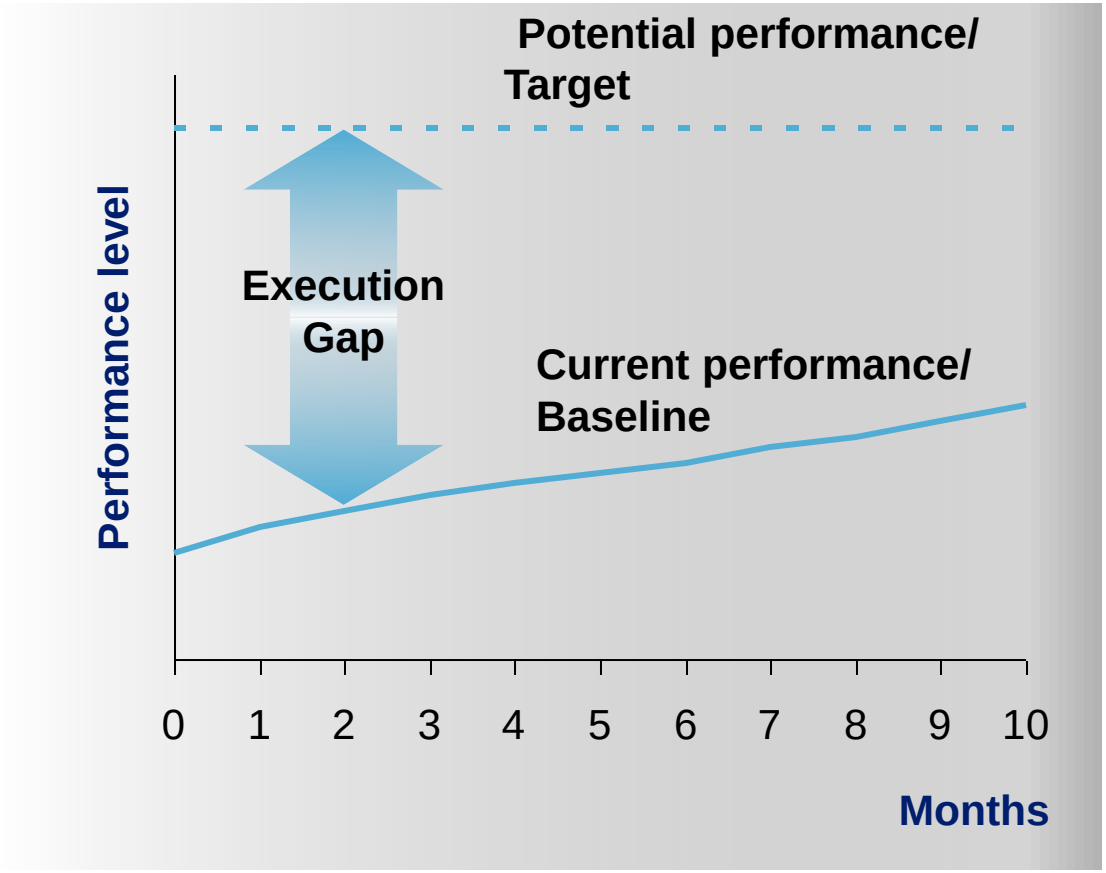
Example:

- Revised management system
- Improved skills
- Culture of continuous improvement

Competitive advantage:

- **Strategic initiatives tend to reflect common industry trends**
- **Most organizations have similar assets**
- **The way in which organizations separate themselves from the pack is to maximize their effectiveness given their existing strategy and assets**

WE DEFINE EXECUTION GAPS AS TARGET AND IMPROVEMENT METRICS. CLOSING THE GAPS IS WITHIN OUR CONTROL.



Reasons for an Ex-Gap

Process:

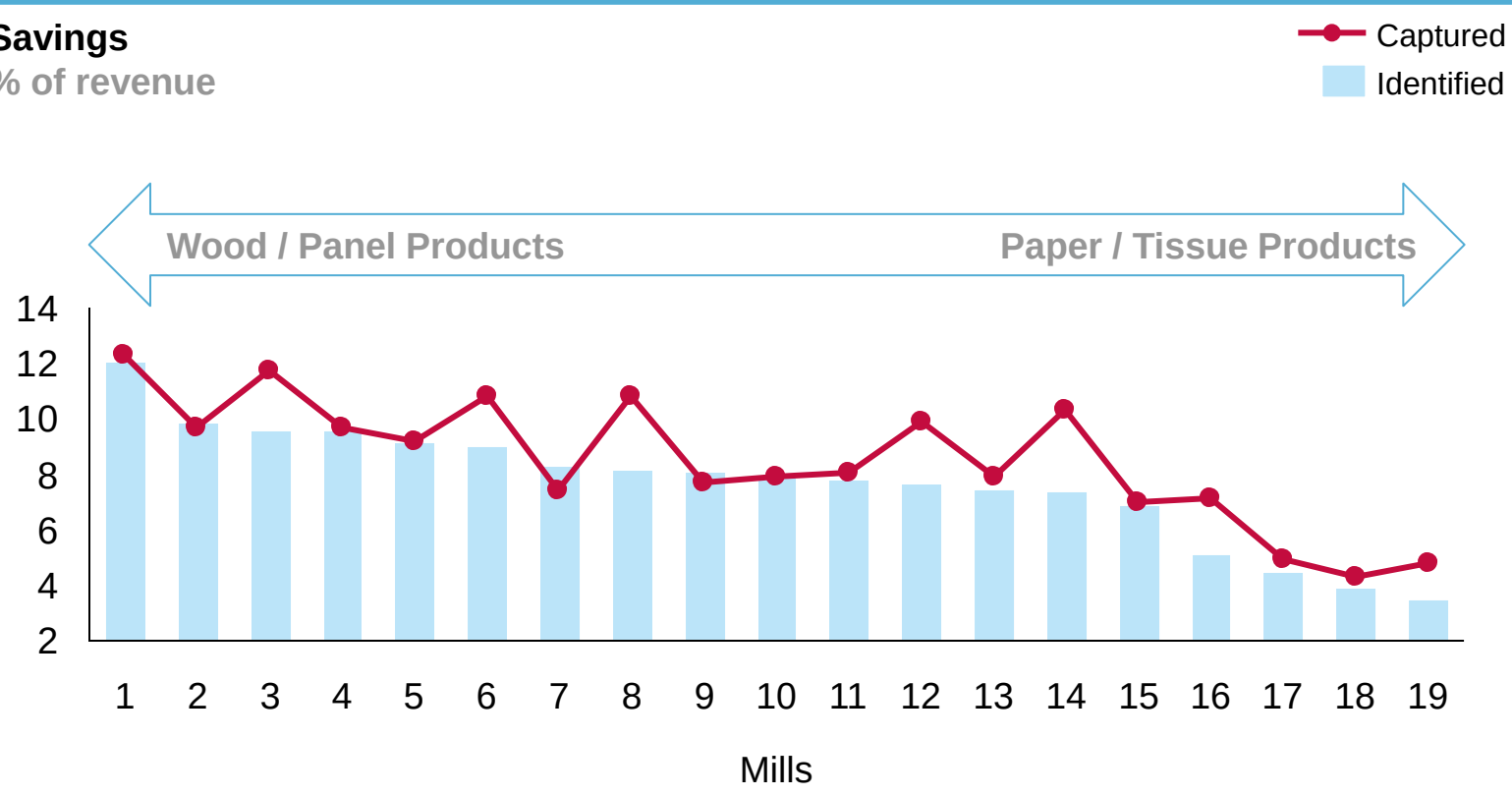
- ❑ Incomplete **management system infrastructure**.
- ❑ Either **too much data, not the right data** or it is not being used widely.
- ❑ Departments and levels of management are **not aligned**.
- ❑ Action and accountability process is often **informal** and **doesn't get at root causes**.
- ❑ Prior process improvement projects were **not sustained**.

People:

- ❑ Supervisors **lack disciplined** approach to managing
- ❑ Insufficient people development & management skills

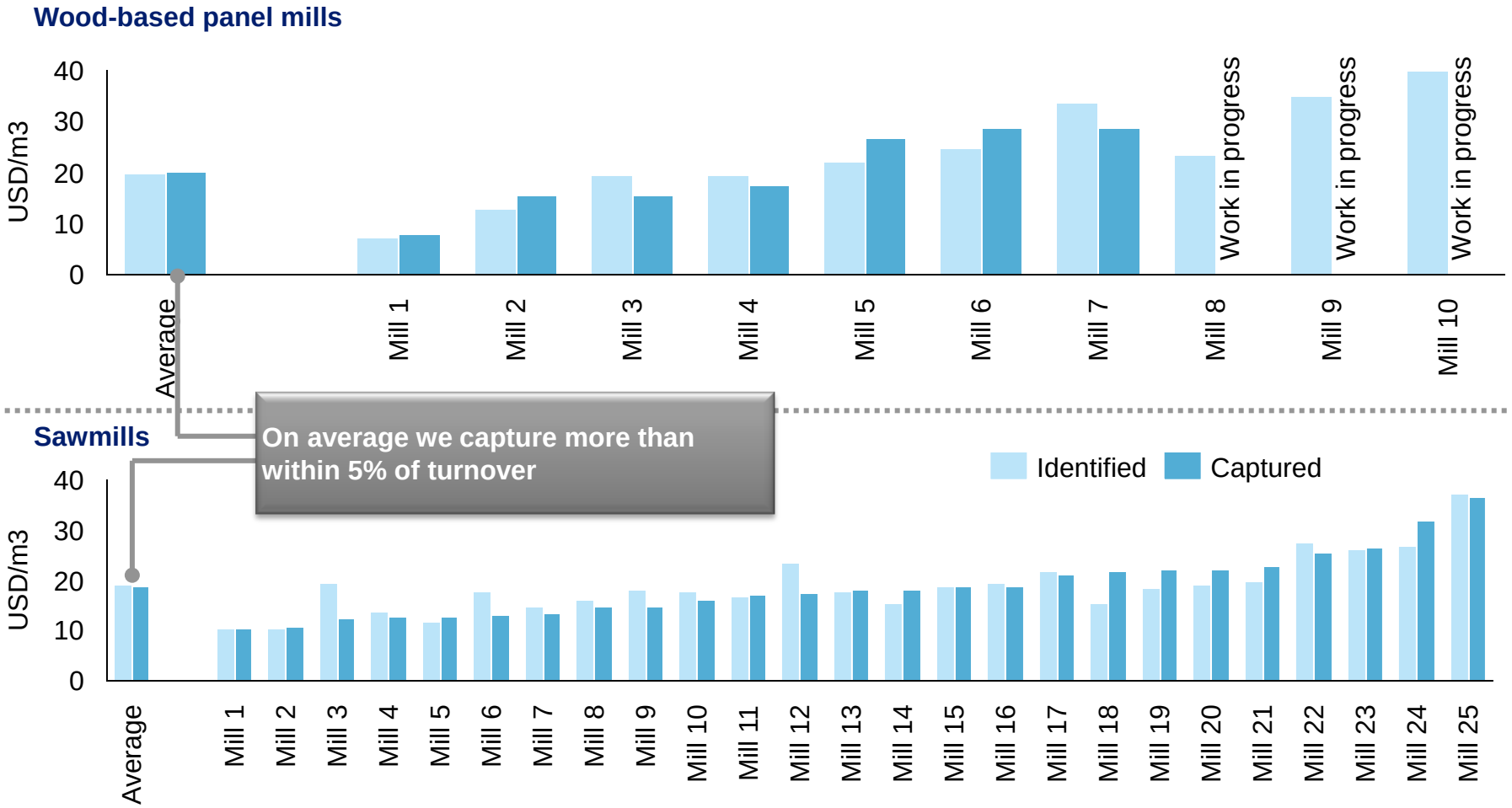
TYPICALLY HIGHER RELATIVE SAVINGS OPPORTUNITY FOR WOOD PRODUCTS OPERATIONS

Size of execution gap – identified vs. captured

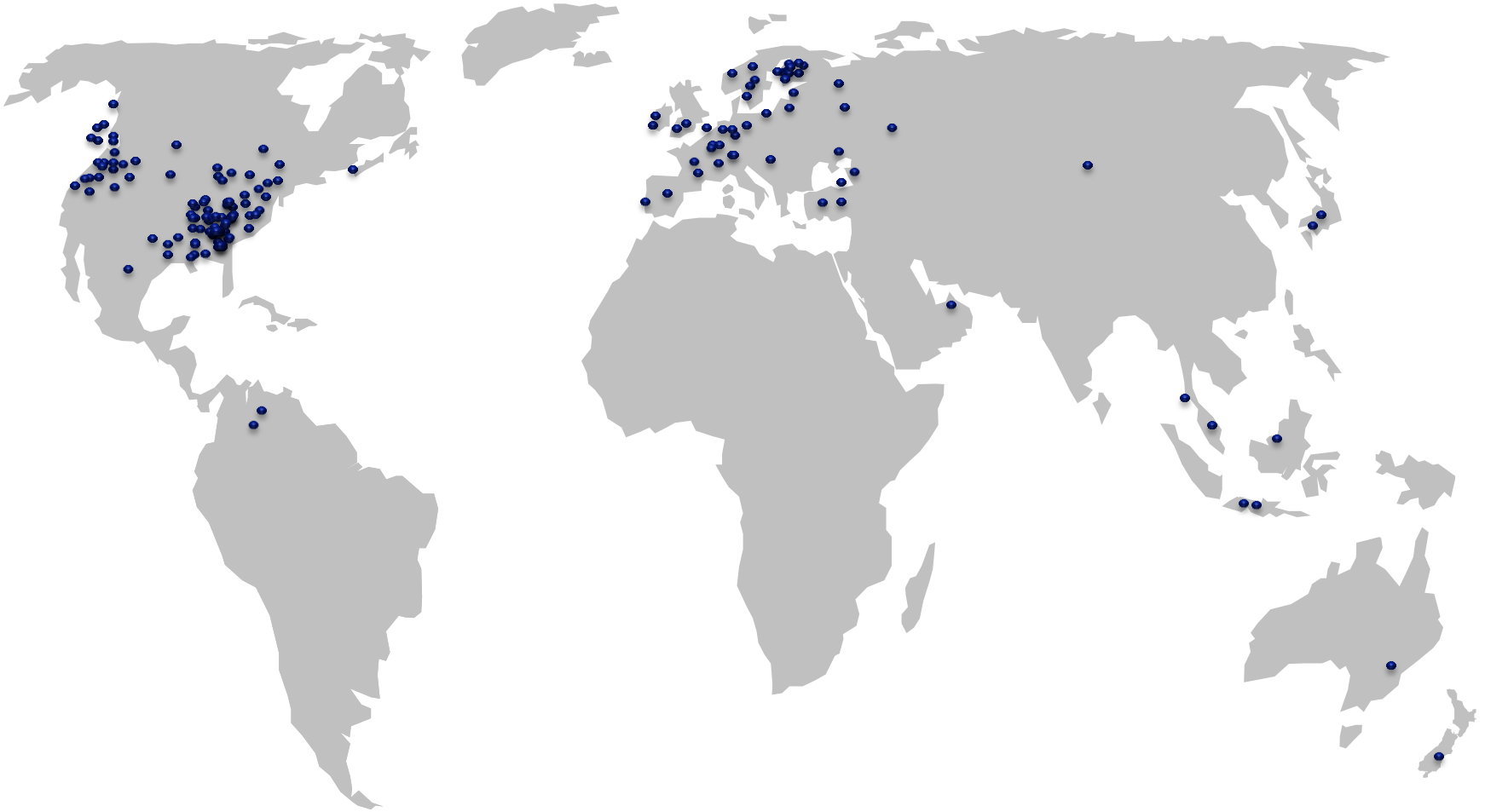


RECENT WOOD-PRODUCT PROJECTS SHOW THAT OE DELIVERS SIGNIFICANT FINANCIAL IMPACTS

Financial impact of recent wood-products projects



OPERATIONAL EXCELLENCE IS A GLOBAL TOPIC WITH AROUND 150 INITIATIVES GLOBALLY



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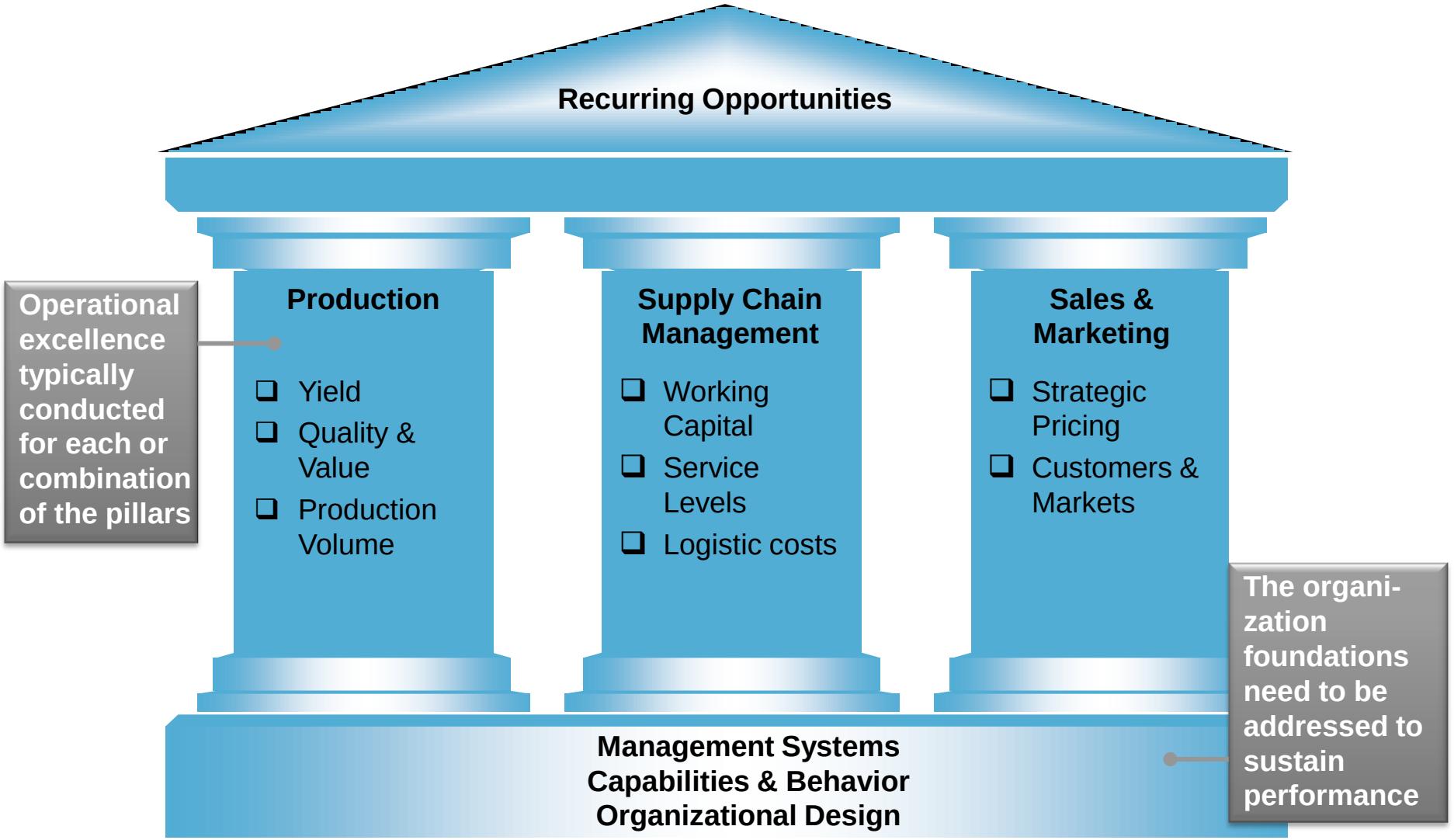
IMPROVEMENT IN ANY BUSINESS PILLARS NEED TO BE SUPPORTED BY THE ORGANIZATION FOUNDATIONS

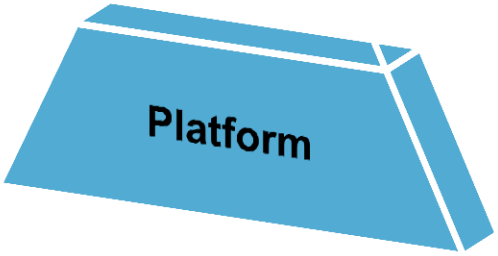


PÖYRY'S APPROACH COMBINES CREATING A PLATFORM AND ESTABLISHING A PROCESS TO SUSTAIN THE GAINS

ISO

ISO provides a basic structure for capturing important data

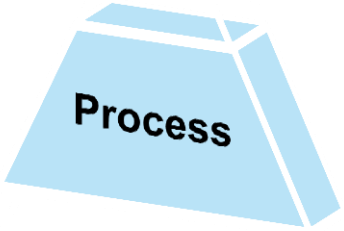
Lacks formal method for evaluation and follow up and does not promote action



Six Sigma

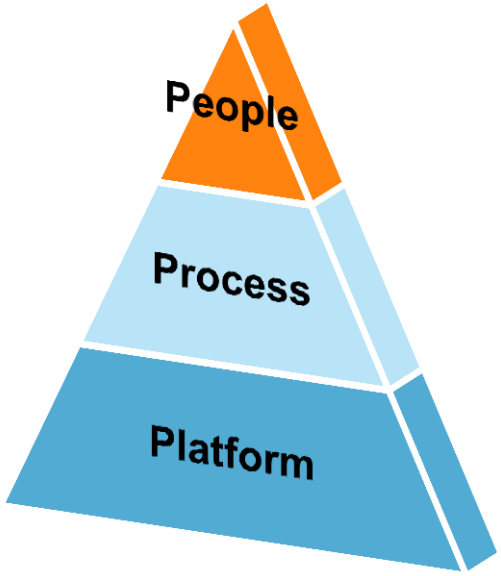
Six Sigma provides a structured process for addressing key issues

Is not comprehensive of all issues and does not indicate when follow up is required



Pöyry's approach

Pöyry combines people and management skill development with the tools required to create an action-driven culture of issue identification and resolution



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TECHNICAL ADVICE AND BEST PRACTICES TRANSFER IS OFTEN NOT ENOUGH TO SUSTAIN BETTER PERFORMANCE LEVELS

	Performance Improvement (PI)	Technical advice, Best practice (TA, BP)
Goal	Introduce a world-class management system to **establish a continuous performance improvement** culture at the mill	**Share possible ways to quick wins** and to replace parts of existing practices.
Approach	Let the **new management system "grow through and with" the existing one**, in close cooperation with the client's internal team.	**Introduce best practices** and to provide technical advice with the leading technical specialists
Process	**At least 16 months** of redesign of existing management system, implementation of changes and development of continuous improvement working practices	Focuses on providing specific technical solutions. Sustainability not given, no cultural change. **Can support the performance improvement process**

Operational excellence focuses on improving performance of existing assets and systems while technical advice complements the process

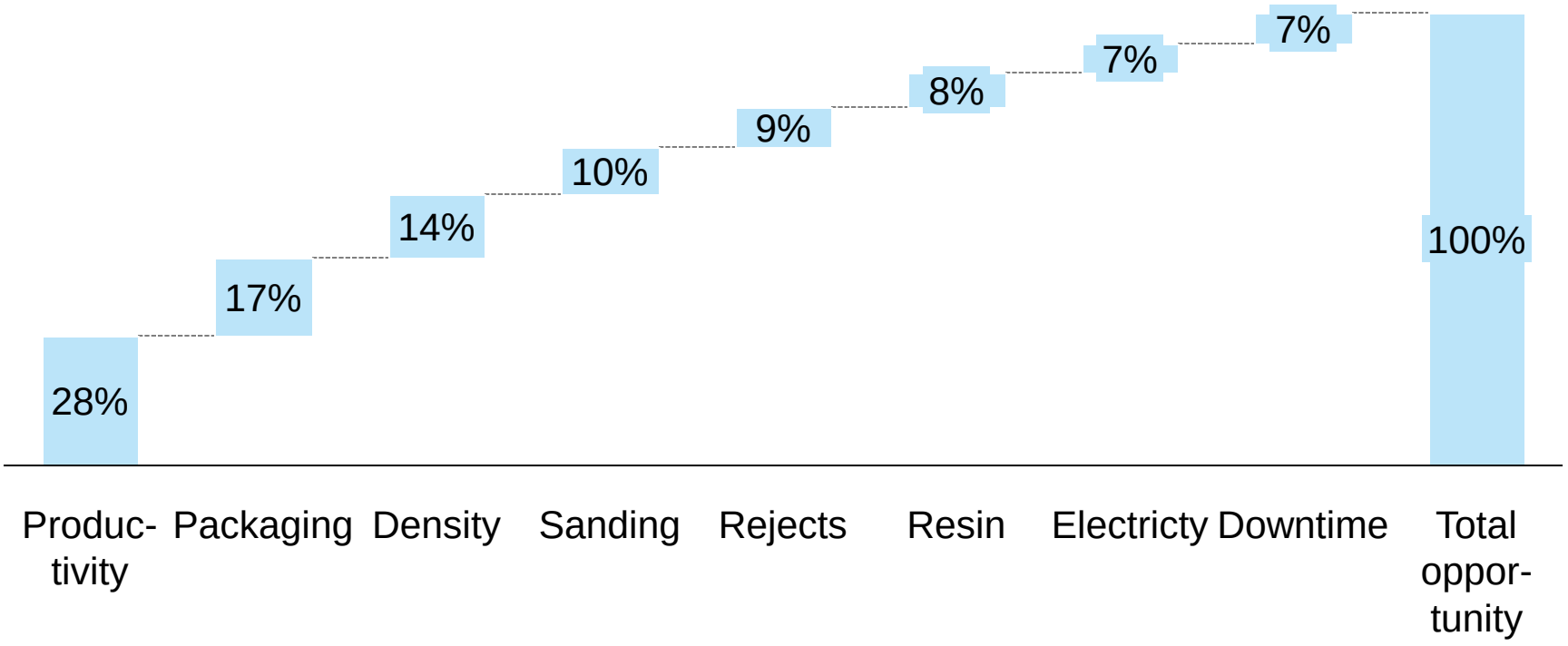
WE FOLLOW A TWO-PHASE APPROACH TO IDENTIFY AND PRIORITIZE AREAS OF IMPROVEMENT AND TO CLOSE THE GAP

4-8 weeks | *12-16 months*

	Phase I: Diagnostic	**Phase II: Implementation**	
	Identify gaps	**Develop platform**	**Capture opportunities**
Objectives	**System Review** • Financial Diagnostic • Management Process & System diagnostic • Technical Process Diagnostic	**System Design** • Redesign of KPIs and management systems • Design team training and system rollout	**Control & Capture** • Implementation of new management processes and information tools • Coaching and training of staff at all levels to utilize improved processes
Result	**ExGAP** • Identification & prioritization of improvement areas • Quantification of recurring saving potential	**Platform development** • Measurement process • Establishment of reporting tools	**Establish & Sustain** • Capture of improved KPI results and financial impacts

DIAGNOSTIC PHASE WILL PROVIDE SIZE OF EXECUTION GAPS (EXGAP) FROM RESPECTIVE EXECUTION AREAS

Client example of execution gaps (ExGap) from each area



STEPWISE APPROACH TO IMPLEMENT SUSTAINABLE CHANGE

Establish Indicators
- % On Spec
- % Efficiency
- % Compliance

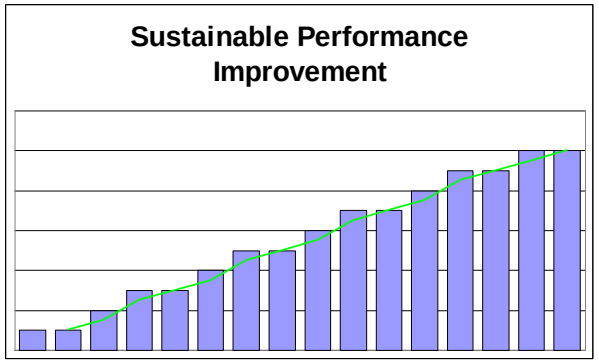
Formal Data Capture
- Operator Tallies
- Quality Control Checks
- Machine Outputs

Report
- KPI
- Critical Result Indicators
- Trends

Managers' Meeting

Operators

Action Plans



EACH BUSINESS AREA FOLLOWS A 3-STEP APPROACH. KEY SPB STAFF HAS OWNERSHIP & ACCOUNTABILITY TO ENSURE SUSTAINABILITY.

1 System Design

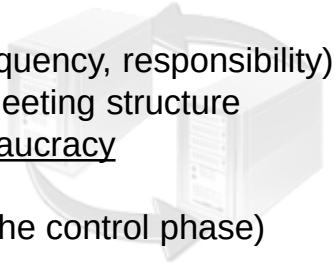
- Sessions facilitated by Pöyry OE team
- Team of 4-6 key personnel from the business/region areas, complemented by technical experts as required (lathes, operations, resin, etc.)
- Methodology training to ensure comprehension and consistency
- Joint development of processes, approaches, needed supporting management framework and KPIs

Time Frame: 3-5 weeks per business area (depending on availability and logistics)

2 Tool Development

- Led by design team members
- Design and customization of data collection process (method, frequency, responsibility)
- Integration into existing systems, development of reporting and meeting structure
- Emphasis on simplicity, and not creating more paperwork or bureaucracy

Time Frame: 2-4 months per business area (some cross over into the control phase)



3 Control Phase

- Phase led by design team, facilitated by Pöyry
- Coaching and training of personnel in effective usage of redesigned system
- Meetings management, development of action planning culture – Continuous Improvement!
- Focus on ensuring sustainability and achievement of financial impact targets

Time Frame: typically one year

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CASES AND EXAMPLES

- **SAWMILL**
- PLYWOOD

SAWMILL EXAMPLE - DURING DIAGNOSTIC THE KILN DRYING WAS IDENTIFIED AS A BOTTLENECK

Background

- The client owns a sawmill in Europe with spruce and pine species
- Annual production of >200,000 m^3

Challenges

Client Consensus:

"*We knew we could cut more in the sawmill and we thought the log yard could handle it, but the kilns just couldn't dry it*!".

Pöyry's approach

- Diagnostic and review of management systems
- Extensive implementation process and change management

PÖYRY REVIEWED AND IMPROVED THE MILL'S KPIS TO ENSURE SPECIFIC, MEASURABLE AND CONTROLLABLE PERFORMANCE

From old "result-based" system…

KSF	Results
Production	m^3 dried per week
Moisture Control	"Not Too Wet"

…to a revised KPI-based System

KSF	Results	KPIs	
Production	m^3 dried per week	Change Over Efficiency	Attainment to Steam Pressure Targets
		Attainment to Drying Schedule	Capacity Utilization
Quality	"Not Too Wet"	Green Stacking Quality	Moisture Content on Spec - Hot
		Dry Stacking Quality	Moisture Content on Spec - Planer

Proposed Solutions

- Build new kilns
- Invest in additional fans, baffling, pipes, etc.
- Locate a partner to dry additional volume
- Increase sales of lower-value, green timber

THE KPIS ARE TRACKED AND REPORTED REGULARLY…

KILN PRODUCTION TALLY

version 010704

Date In: 10/30/2003
Operator: Doug Llewelyn

KILN:
- ☐ SINGLE WELLONS
- ☒ DOUBLE WELLONS
- ☐ COE

Charge #: 2-003

A.	Time Out (Last Charge)	6:30
B.	Time In (This Charge)	7:15
C.	Actual Change Over Time	45
D.	Target Change Over Time	26
E.	**% Change Over Efficiency (D/C)**	**58%**
F.	Time Out (This Charge)	8:30
G.	Total Drying Time (hours)	20.25
H.	Target Drying Time (hours)	19
I.	**% Attainment to Drying Schedule (H/G)**	**94%**
J.	Hours at Target Steam Pressure	20.25
K.	**% Attainment to Target Steam Press. (J/G)**	**100%**

CHANGE OVER DOWNTIME

CODE	DT REASON	MINUTES	COMMENTS	AP?
10	LIFT NOT AVAILABLE	5	DRIVER COULDN'T HEAR RADIO CALL	X
20	LIFT BROKEN			
30	SHORT TRACK BROKEN	14	LEFT RAIL OF LEFT TRACK HAS NO HINGE	X
40	BOILER - NO FLOW			
50	BOILER - CELL CLEANING			
60	BAFFLES BROKEN			
70	CAR OFF RAIL			
80	PACKS DUMPED			
90	MAINTENANCE			
100	OTHER			
	TOTAL MINUTES DOWNTIME:	19		

CAPACITY UTILIZATION

L. DIMENSION	M. SORT	N. LENGTH	O. LAYERS	P. LLF PER PACK	Q. # PACKS	R. TOTAL LLF (PxQ)
1x6	8/10	9	29	261		
	12/14	13	29	377		
	16	16	29	464		

UTILIZATION SUMMARY	
TOTAL LLF (SUM OF "R")	9,040
TARGET LLF	9,840
% CAPACITY UTILIZATION	**92%**

Key Performance Indicators are reported on every kiln charge

Specific, accurate accounting of downtime issues are tracked, and corrective action plans are developed

…WHICH ALLOWS THE MILL TO MEASURE THE IMPROVEMENT OVER TIME

Weekly Kiln KPI Summary Report

KILN PRODUCTION

Production Results	BASELINE	TARGET	PREVIOUS WEEK	WEEK OF 6/20/04	IMPROVEMENT OVER BASELINE
BF DRIED	2,147,374		2,493,098	2,643,104	23.1%
% Primary Length Retention	90.03%		90.58%	84.35%	-6.31%

Key Performance Indicators					
% ATTAINMENT TO DRYING SCHEDULE	85.8%	100%	108.4%	109.9%	28.1%
% ATTAINMENT TO TARGET STEAM PRESSURE	43.0%	100%	96.7%	97.5%	126.7%
%CAPACITY UTILIZATION	92.0%	100%	92.9%	93.1%	1.1%
% CHANGE-OVER EFFICIENCY	30.6%	100%	64.8%	74.2%	142.4%

Downtime

CAUSE	MINUTES	# OCCURENCES
LIFT NOT AVAILABLE		
LIFT BROKEN		
SHORT TRACK BROKEN		
BOILER - NO FLOW	59	2
BOILER - CELL CLEANING		
BAFFLES BROKEN		
CAR OFF RAIL		
PACKS DUMPED		
MAINTENANCE	94	1
OTHER	33	2

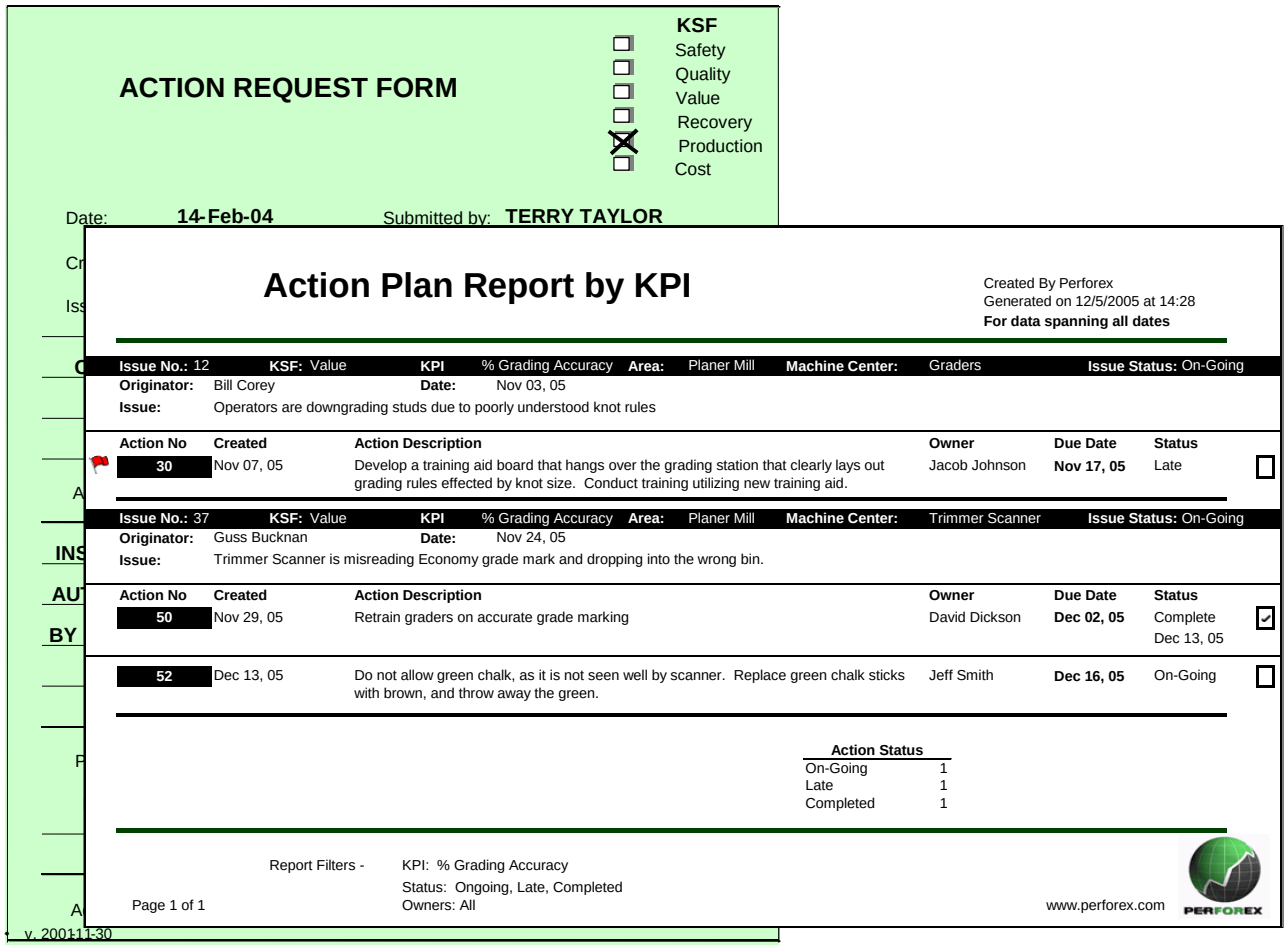
TOTAL DOWNTIME MINUTES: 186

KILN QVR

Key Performance Indicators	BASELINE	TARGET	PREVIOUS WEEK	WEEK OF 6/20/04	IMPROVEMENT OVER BASELINE
% STACKING QUALITY	51.4%	100%	86.7%	100.0%	94.6%
% GREEN YARDING QUALITY	51.4%	100%	83.3%	90.0%	75.1%
% ROUGH DRY YARDING QUALITY	47.1%	100%	80.0%	75.0%	59.2%
% MOISTURE CONTENT IN TARGET RANGE	76.2%	90%	76.1%	75.4%	-1.1%

Mill no longer gauges performance based on production volume.
Now focus is on the key factors which drive production.

KPI REPORTING ALSO ENABLES PROBLEM SOLVING AND FORMAL ACTION PLANNING



ACTION REQUEST FORM

KSF
- ☐ Safety
- ☐ Quality
- ☐ Value
- ☐ Recovery
- ☒ Production
- ☐ Cost

Date: 14-Feb-04 Submitted by: TERRY TAYLOR

Action Plan Report by KPI

Created By Perforex
Generated on 12/5/2005 at 14:28
For data spanning all dates

Issue No.: 12 **KSF:** Value **KPI** % Grading Accuracy **Area:** Planer Mill **Machine Center:** Graders **Issue Status:** On-Going
Originator: Bill Corey **Date:** Nov 03, 05
Issue: Operators are downgrading studs due to poorly understood knot rules

Action No	Created	Action Description	Owner	Due Date	Status	
30	Nov 07, 05	Develop a training aid board that hangs over the grading station that clearly lays out grading rules effected by knot size. Conduct training utilizing new training aid.	Jacob Johnson	Nov 17, 05	Late	☐

Issue No.: 37 **KSF:** Value **KPI** % Grading Accuracy **Area:** Planer Mill **Machine Center:** Trimmer Scanner **Issue Status:** On-Going
Originator: Guss Bucknan **Date:** Nov 24, 05
Issue: Trimmer Scanner is misreading Economy grade mark and dropping into the wrong bin.

Action No	Created	Action Description	Owner	Due Date	Status	
50	Nov 29, 05	Retrain graders on accurate grade marking	David Dickson	Dec 02, 05	Complete Dec 13, 05	☑
52	Dec 13, 05	Do not allow green chalk, as it is not seen well by scanner. Replace green chalk sticks with brown, and throw away the green.	Jeff Smith	Dec 16, 05	On-Going	☐

Action Status	
On-Going	1
Late	1
Completed	1

Report Filters - KPI: % Grading Accuracy
Status: Ongoing, Late, Completed
Owners: All

Page 1 of 1

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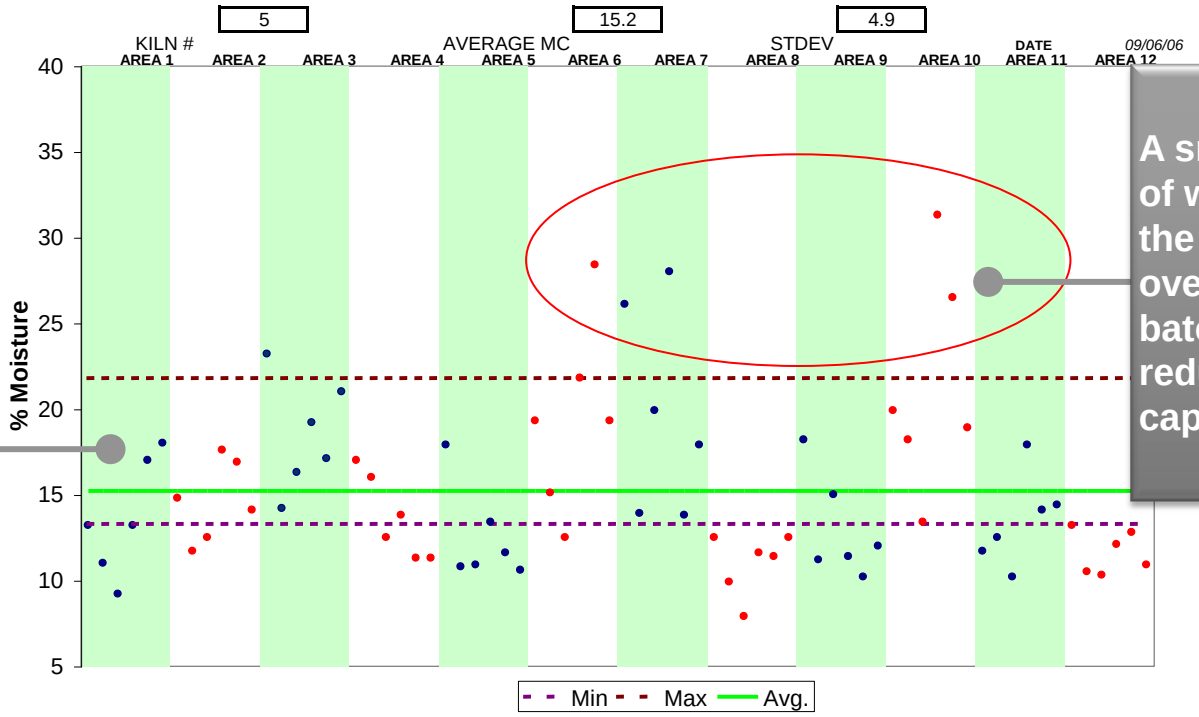
PERFOREX

v. 200111-30

- **Root cause issues are identified**
- **Formal actions are developed to address the root cause**
- **Responsibility is assigned to a person with a due date for completion**
- **Issue is followed up until it no longer effects performance**

AN IMPROVED TOOL WAS DEVELOPED TO HIGHLIGHT DRYING INCONSISTENCIES

Improved evaluation tools capture moisture content by zone/area of the kiln, and highlight drying inconsistencies



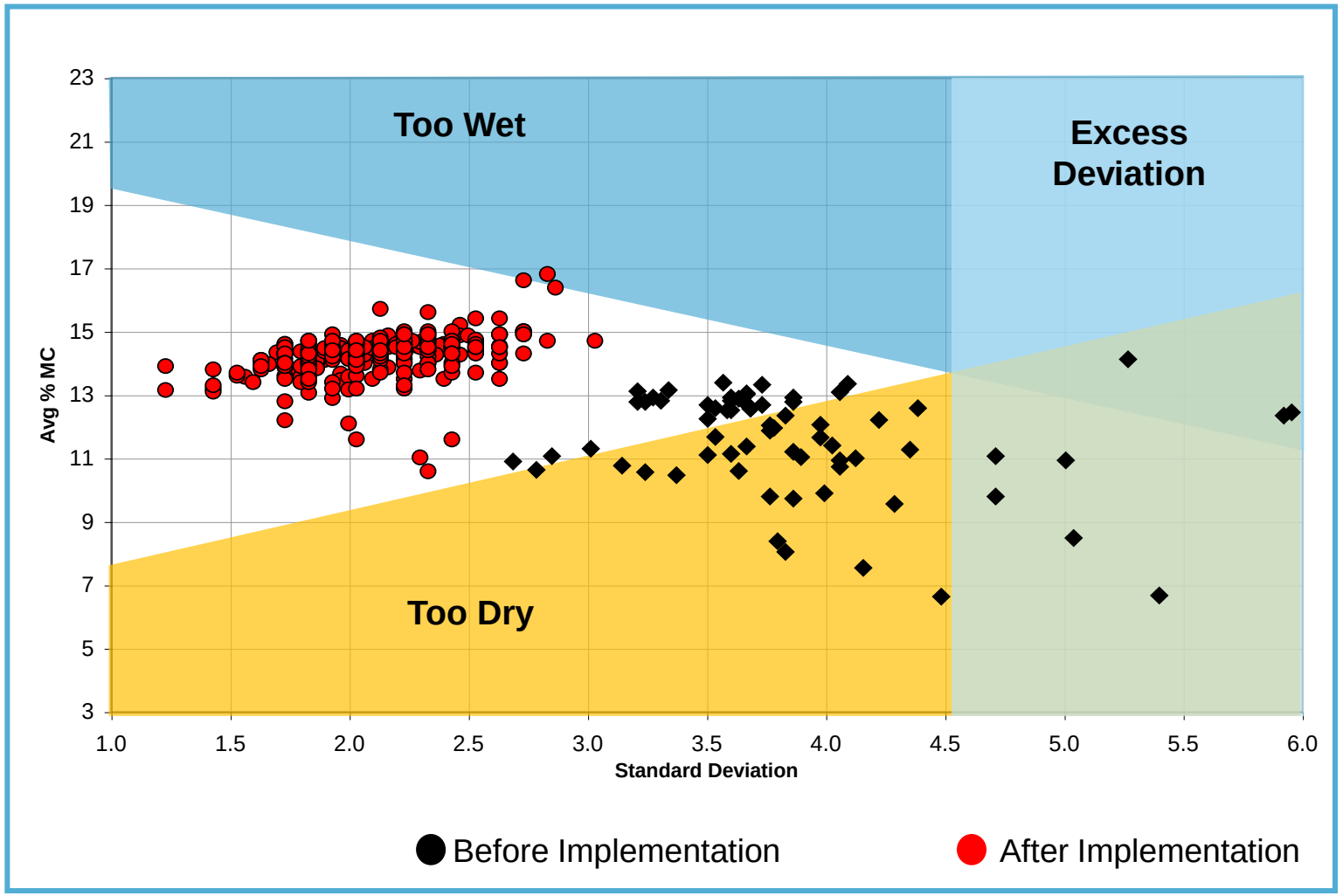
	AREA 1	AREA 2	AREA 3	AREA 4	AREA 5	AREA 6	AREA 7	AREA 8	AREA 9	AREA 10	AREA 11	AREA 12
Area Average	13.6	14.6	18.5	13.7	12.5	19.4	19.9	11.0	13.0	21.4	13.5	11.6
% On Spec	33.3%	66.7%	83.3%	50.0%	33.3%	50.0%	66.7%	0.0%	33.3%	66.7%	50.0%	0.0%

Hot Moisture Content Max:	21.8
Hot Moisture Content Min:	13.3
Range:	*8.5*

% Moisture on Spec	45.8%
Measure on Spec	33
Total Measurements	72

A small number of wet spots in the dryer caused overdying of batch and reduces overall capacity

OPERATIONAL EXCELLENCE DELIVERED A SUSTAINABLE CONSISTENCY IN DRYING METRICS…



…AS WELL AS OVERALL PRODUCTION OUTPUT

From a weekly production of 5,000m³…

- Primary performance indicator was measured in m^3 / week
- Moisture content checked as “not too wet” as caught in the planer mill – too late to impact drying.
- Operators are proficient at operation, but not aware of performance or engaged in improvement.

To a weekly production of 6,000m³

- Operators can tell you:
  - 4 Production KPIs
  - 4 Quality KPIs
- Operators understand and own targets. Targets are 100%.
- Crew held accountable. Supervisors engage hourly operators.
- Action plans developed daily / weekly to address shortfalls.

+28% production improvement

Improved drying quality
Decreased trim loss
Higher grade out

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PLYWOOD EXAMPLE - DURING DIAGNOSTIC THE KILN DRYING WAS IDENTIFIED AS A BOTTLENECK

Background

- The client operates a plywood mill in South East Asia
- Annual production of >100 000 m^3

Challenges

- Quality together with a lot of other process data is measured, however the information is not used to drive improvement
- No system in place to ensure that operators make the correct decisions about veneer quality and waste
- Strong focus on volume instead of quality

Pöyry's approach

- Extensive diagnostic including technical experts to establish best practices
- Implementation of an action driven performance management system

DRYER MANAGEMENT PROCESS

In place | Not in place

FOCUS			TARGET	EVALUATE		ACT
KSF	KPIs	Results Indicators		Measure	Report	
Production	Efficiency	In-feed Volume	According to Production Plan	Production Tally Sheets	Production White Board	Daily Production Meeting
		Out-feed Volume			Downtime Summary	Shift Change Meetings
	Uptime	Downtime		DT Tally Sheets	Downtime Report	Maintenance WO
Recovery	Reject Accuracy	Recovery %	90-92%		Production Data System	Immediate Action
Quality	MC On-Spec		Analytically Optimum Targets	Dryer MC	Ad Hoc Analysis	Action Planning Process
	Veneer On-Size			Dryer Temp.	Quality Report	
	Dryer Condition			Steam Pressure		
Value	Clipping Accuracy			Clipping Width	Production Summary	

- **Dryer capacity is not know or used to maximize dryer utilization and throughput.**
- **Veneer MC measurement practices are not sufficient to provide consistent, actionable data.**
- **No indicators in place to ensure that "wet" veneer is not unnecessarily redried.**

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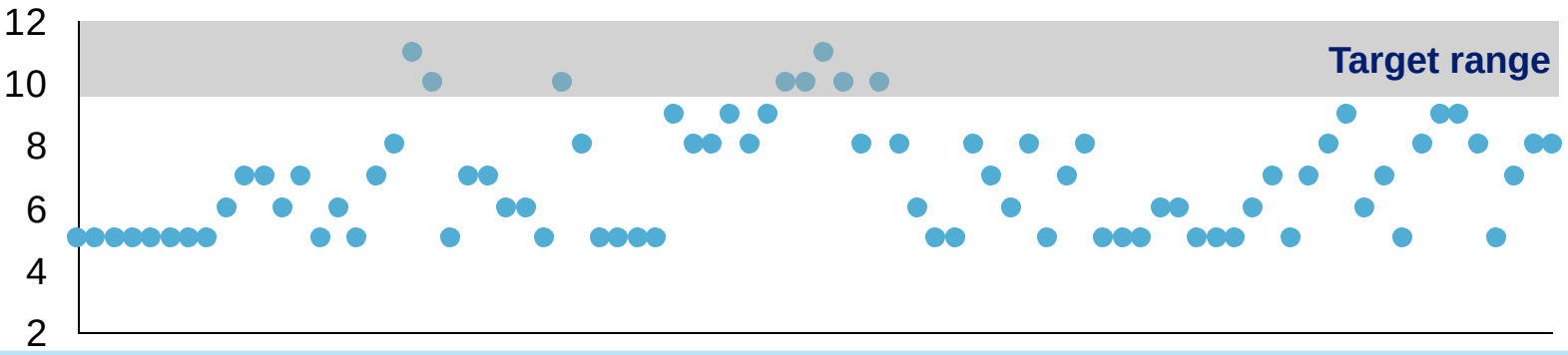
MAJORITY OF THE DRY VENEERS ARE OVER-DRIED

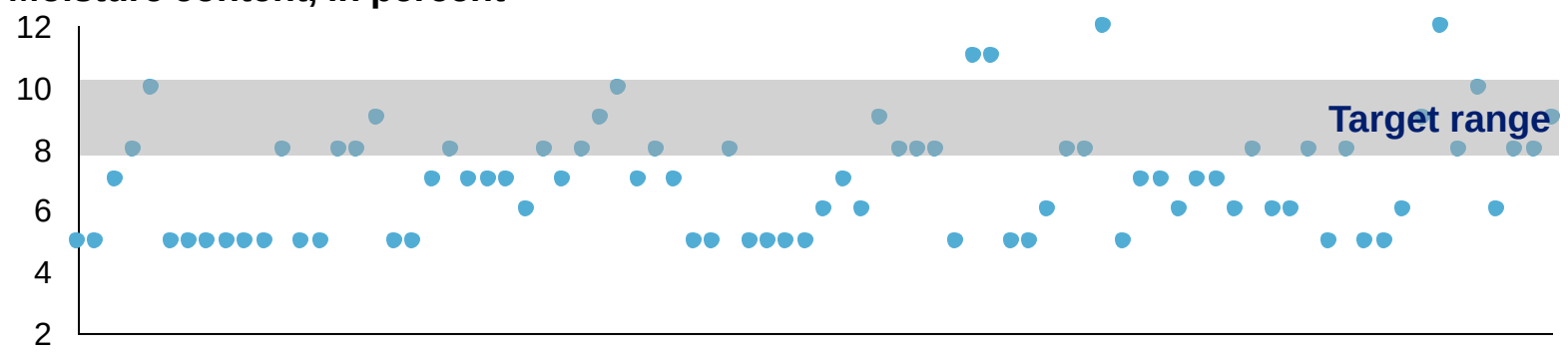
Glue type 1



% over-dried

91%

Glue type 2



65%

1 The lowest scale of MC meter is “below 6”, hence the samples that are shown as 5 should be read “below 6”; Sample size 160

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MANAGEMENT REPORTS FOCUSED ON OUTPUT AND VOLUME INSTEAD OF UNDERLYING VALUE DRIVERS

DATE : 30/9/2014

	TODAY PCS	TODAY VOL
LOG BLOCK STOCK		
BLOCKS - 10 , 9, 8, 7, 6		0.0000
BLOCKS - 4, 3		0.0000
LOGS		
TOTAL		0.0000
1. LOG INPUT		
TOTAL	630	690.1689
AVERAGE DIAMETER		
	34.31CM	0.0000
2. LOG SPECIES RATIO		
KP/KR	2.27%	15.6797
Meranti	36.12%	249.2577
MLH	52.44%	361.9485
NJGB	3.15%	21.7346
PlantedTimber	6.02%	41.5484
4. BLOCK OUTPUT		
10ft		0.0000
3ft	210	17.1895
4ft	386	55.8906
6ft	1543	320.4951
7ft	256	33.5117
8.5ft		0.0000
8ft	890	240.9377
9ft		0.0000
TOTAL	3285	668.0245
5. CUTTING YIELD		
	137.57%	0.0000

DATE : 30/9/2014

	TODAY PCS	TODAY VOL
6. LATHE INPUT		
TOTAL	2952	602.7363
7. LATHE OUTPUT (VENEER)		
VeneerStack-SC-DSYME-1-BE-SR		57.6593
VeneerStack-SC-DSYME-2-BE-SR		70.1964
VeneerStack-SC-DSY-ME-2-B-SR		134.4427
VeneerStack-SC-DSYME-3-BE-SR		75.0600
VeneerStack-SC-GC-CH-1-BE-SR		33.6201
8. PEELING YIELD		
		97.63%
9. DRYER INPUT		
VeneerReel		158.7278
VeneerStack-LC		11.1875
VeneerStack-SC		522.4554
10. NET DRYER		
B	11710	37.6915
BR		15.7771
F	14929	48.1064
LC	8598	33.2754
LR	16	15.8439
TOTAL	35253	150.6943
11. ROLLER DRYER		
		10.3967
Short Core Random		455.0406
TOTAL (NET+ROLLER DRYER)		
		616.1318
12. DRYING YIELD		
		88.99%

- Volume driven
- Unknown underlying KPIs
- Not linked to actions

SHIFTING REPORTING FROM VOLUME-DRIVEN TO VALUE- AND ACTION-DRIVEN

Summary of Key Performance Indicators relevant for the business area

Baseline targets

Initiated actions

KPI Summary Report

Created by Administrator

SANITIZED CLIENT EXAMPLE

	Crew A	Crew Crew B	Crew C	Total	Prior Period	Baseline	Improvement Over Baseline	Action Plans
QUALITY								
% LOGS ON-LENGTH	91.7%	91.7%		91.7%		84.3%	▲ 8.7%	
% DEBARKING QUALITY	90.0%	86.7%		88.3%		90.3%	▼ -2.2%	
Comment - 11/7/2011 (Afternoon,Crew B) - B-Crew, #1 Debarker, bark patches								
% LOG DIAMETER ON-SPEC	76.4%	88.0%		82.2%		81.9%	▲ 0.4%	
% DLI LOG DIAMETER ON-SPEC	81.8%	95.0%		88.4%		87.8%	▲ 0.7%	
% RT LOG DIAMETER ON-SPEC	67.4%	71.3%		69.4%		70.7%	▼ -1.9%	1
% GREEN MFG DEFECT FREE	88.0%	92.0%		90.0%		82.2%	▲ 9.5%	1
% BOARDS ON-LENGTH	100.0%	98.1%		99.0%		99.7%	▼ -0.7%	
% STACKING QUALITY	73.3%	76.9%		75.1%		89.2%	▼ -15.8%	
Comment - 11/7/2011 (Afternoon,Crew B) - B-Crew, offsize lumber in loads								
VALUE								
% LUMBER SORT DECISION ACC.	93.3%	98.3%		95.8%		95.7%	▲ 0.1%	
% MANUAL EDGING DECISION ACC.	96.7%	83.3%		90.0%		94.9%	▼ -5.2%	
Comment - 11/7/2011 (Afternoon,Crew B) - B-Crew, operator forgot 1"set on								
% STEM MERCH DECISION ACC.	100.0%	100.0%		100.0%		97.8%	▲ 2.2%	
RECOVERY								
% ON-SIZE						86.4%		
PRODUCTION								
% DLI UPTIME	71.0%	84.6%		77.8%		76.6%	▲ 1.5%	
% RT UPTIME	72.7%	65.5%		69.1%		69.5%	▼ -0.6%	1
% SAWMILL UPTIME	71.8%	75.1%		73.4%		73.1%	▲ 0.5%	2
% DLI EFFICIENCY	51.4%	69.3%		60.4%		50.7%	▲ 19.1%	
% RT EFFICIENCY	58.3%	54.8%		56.5%		54.8%	▲ 3.2%	
% SAWMILL EFFICIENCY	54.9%	62.1%		58.5%		52.8%	▲ 10.7%	
VALUE								
% PREDICTABILITY - DLI								
% PREDICTABILITY - RT								

YOU HAVE TO UNDERSTAND YOUR PERFORMANCE TO CONTROL IT

Operational Excellence

- It is significant – in all industries and market conditions
  - Often >5% of revenue in wood products operations
- Gap size is often unknown
- It is a potential competitive advantage
- It does not require large capital spending
- It is controllable through improved management systems and change processes

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