Reg Belyea, P. Eng. , GPAC, May 1st, 2009

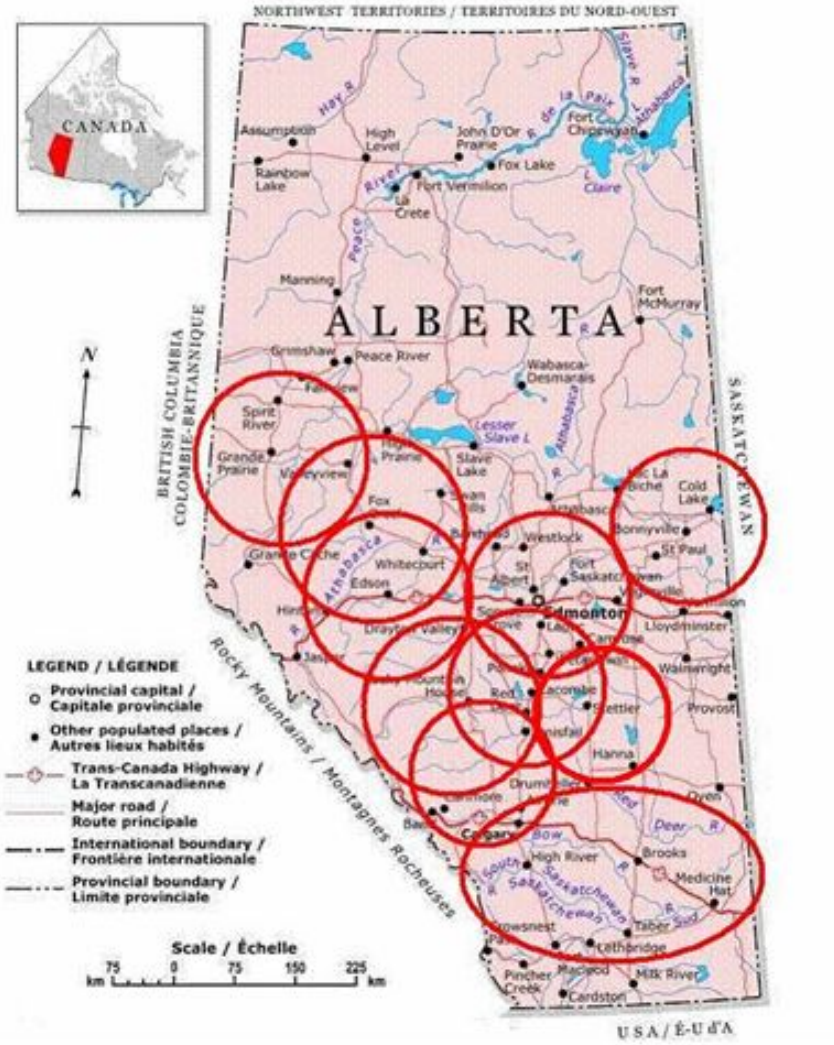
Improving Maintenance Business Performance Through Best Practices

ABB Reliability Services

Upstream and Downstream Reliability Services

- ABB Reliability Services is a $800M services group within ABB that provides Reliability and Maintenance programs;
  - Technology & equipment neutral
  - Performance-based service partnerships
  - ABB Reliability Services portfolio
    - Hosting Enterprise Asset Management Services
    - Reliability Consulting
    - Motor Performance Management
    - ABB Full Service®

Field Service Locations

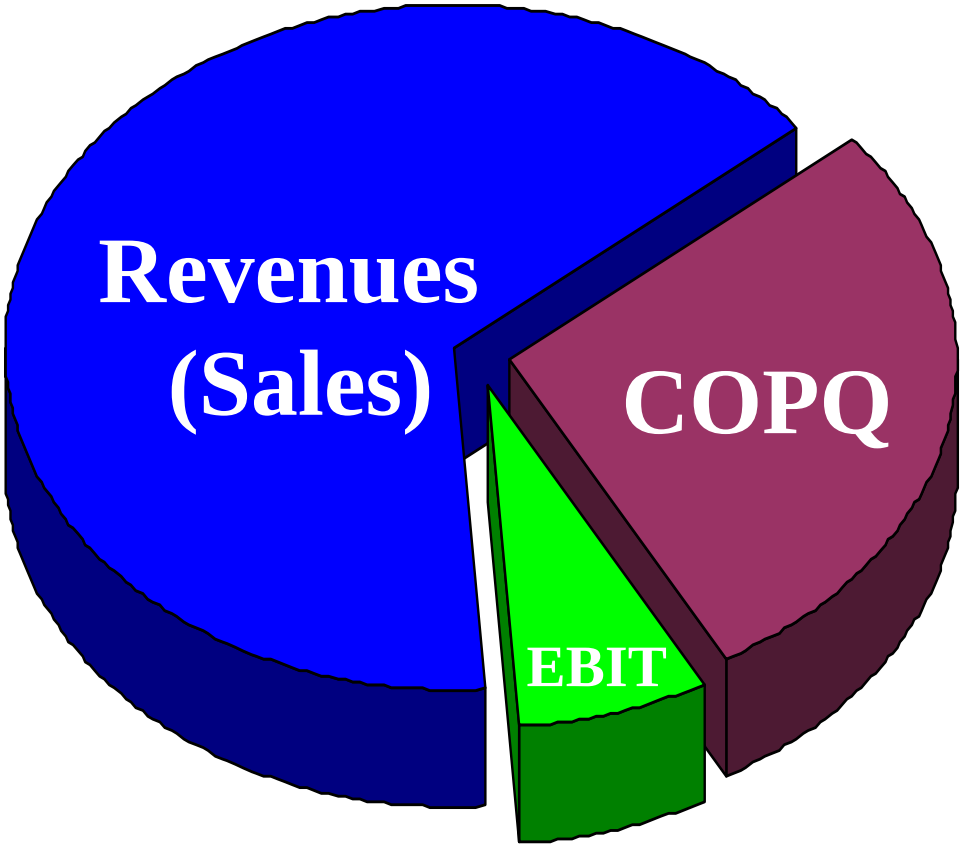


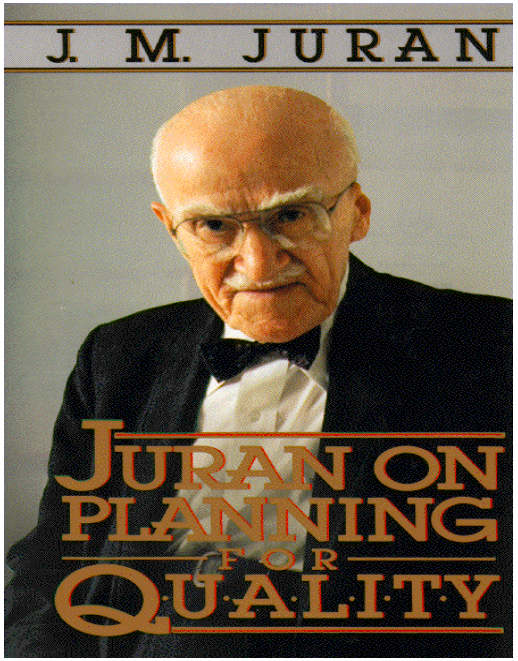
The Challenge

Overlooked and Undervalued.

…that's how many process and manufacturing industries treat maintenance... and their facilities' performance are poorer for it. Output, quality and eventually safety suffer from this oversight, which are reasons enough to re-evaluate your maintenance practices. Previously established practices may not be appropriate for the current plant-floor environment.

Cost of Poor Quality (COPQ)





"In most companies COPQ runs at about 20% - 40% of sales."

Reducing COPQ is the easiest way to improve profitability

Carter Holt Harvey , New Zealand

Client:	Carter Holt Harvey
Location:	Kinleith, New Zealand
Scope:	Full Service with performance bonus on OEE, Total Maintenance Costs, & Inventory Levels

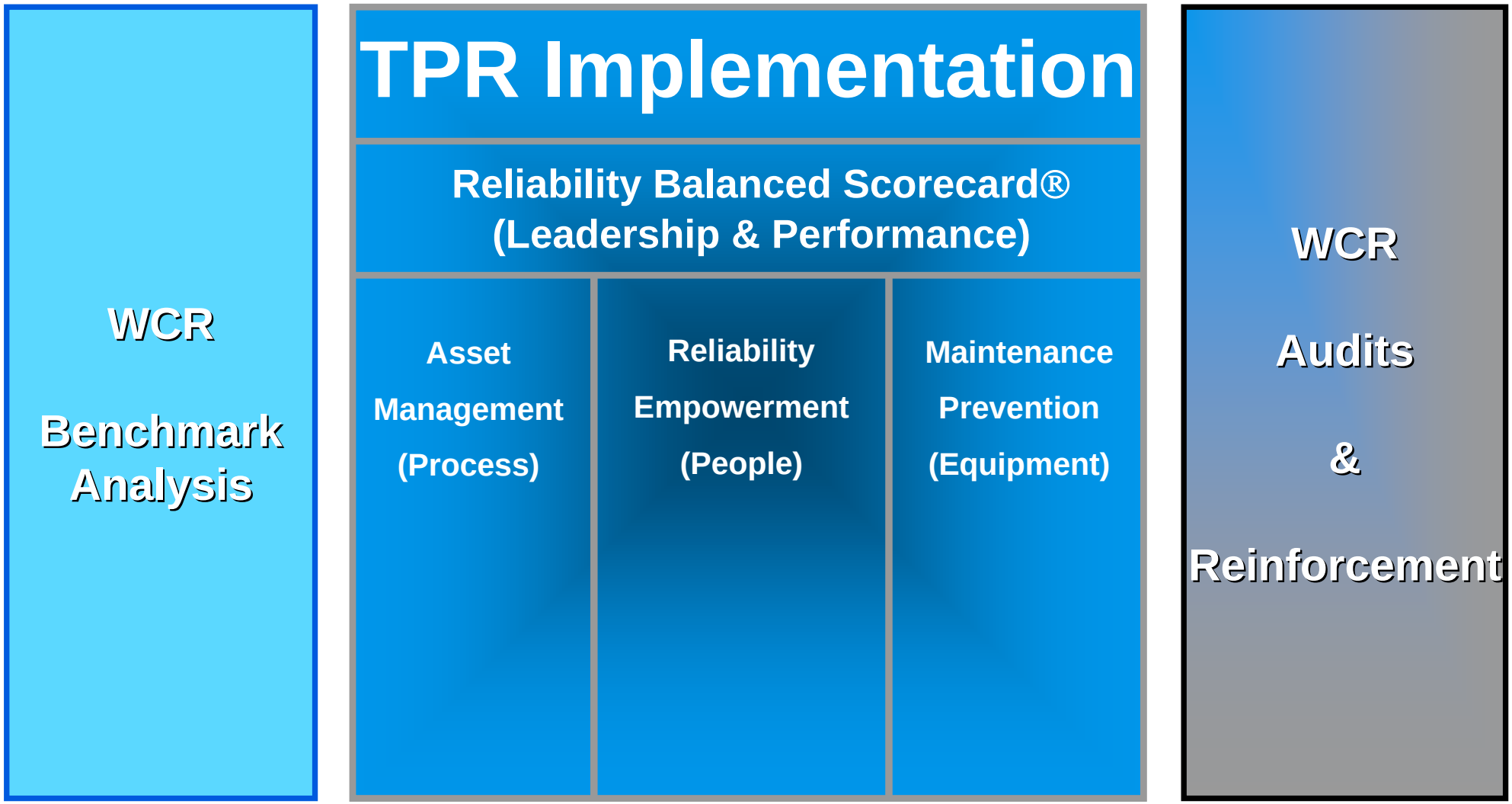
"Understand that, if executed well, an alliance on maintenance has organizational benefits well in excess of those quantified within the maintenance discipline. That has certainly been the Kinleith experience."

Dave King
Mill Manager, Kinleith

Benefits:

- Exceeded 14 production records in 10 months
- Production volumes increased >8% over two years
- Productivity (tons per employee) increased by 36% over two years
- Total Maintenance Cost reduced by 15% in year one
- Number of employees reduced by 18% over two years
- Total employee costs reduced by 22% over two years
- Exceeded organizational goal of $18MUSD/yr

The Path to Success



2-6 Weeks

- Helps identify improvement opportunities

1-3 Years

- Tactical plan on how you sustain performance

1-4 Weeks/Year

- Tracking

Deliverables

WCR

Benchmark Analysis

- **Findings**
  - **Highlights strengths and improvement opportunities**
- **Self-evaluation survey results**
  - **Compares employee perceptions graphically by position and function to reality**
- **Recommended course of action**
  - **Provides high-level framework strategy**
- **Business case**
  - **Develops ROI and payback analysis**
- **Executive summary**

The Path to Success

WCR

Benchmark Analysis

TPR Implementation

Reliability Balanced Scorecard®
(Leadership & Performance)

Asset Management (Process)	Reliability Empowerment (People)	Maintenance Prevention (Equipment)

WCR

Audits

&

Reinforcement

2-6 Weeks

- Helps identify improvement opportunities

1-3 Years

- Tactical plan on how you sustain performance

1-4 Weeks/Year

- Tracking

Deploying a Reliability Culture in a Strong Reactive Maintenance Environment
2001 - 2008

Processing Facility located in Valleyfield, Quebec

What We Do

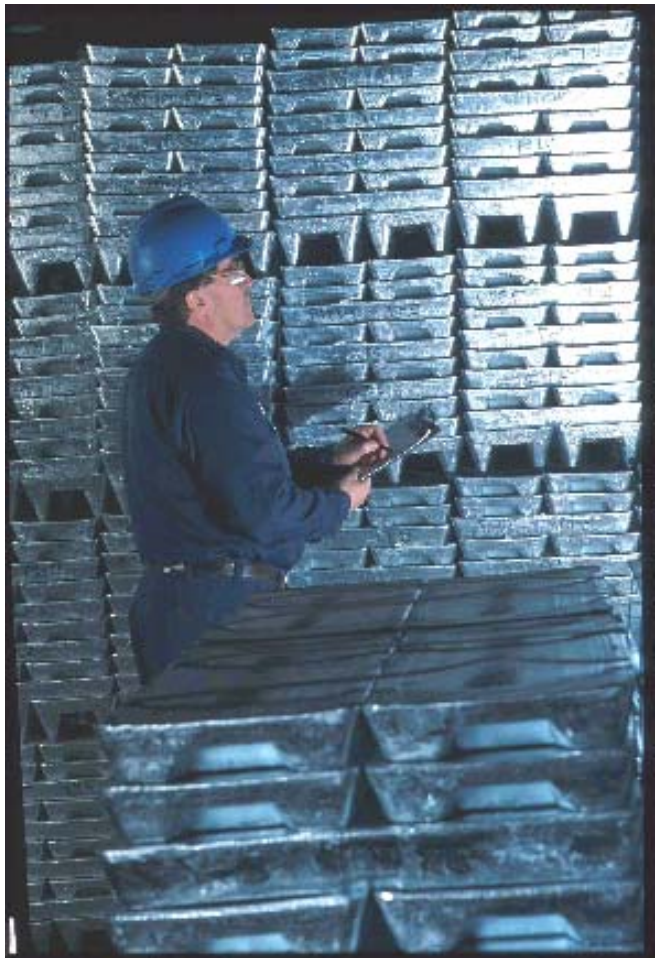
Zinc Concentrate

Processing Facility

Zinc Products

Our Annual Production

- **Zinc - 275,000 mt**
  - Jumbo
  - Lingots
  - Shot
  - Powder
- **By-products**
  - Sulphuric acid - 474,000 mt
  - Copper cake - 5,400 mt
  - Cadmium - 350 mt



Maintenance Department - 2008

Size - 129 union employees + 22 staff (in 8 areas)

Principal Trades - Millwrights, electricians, instrumentation technicians, welders, pipe fitters

Annual Budget - $35 M (labor, parts and contractors)

CMMS - MPAC from TSW since 1986

Since March 2004 - Warehouse managed by the maintenance department

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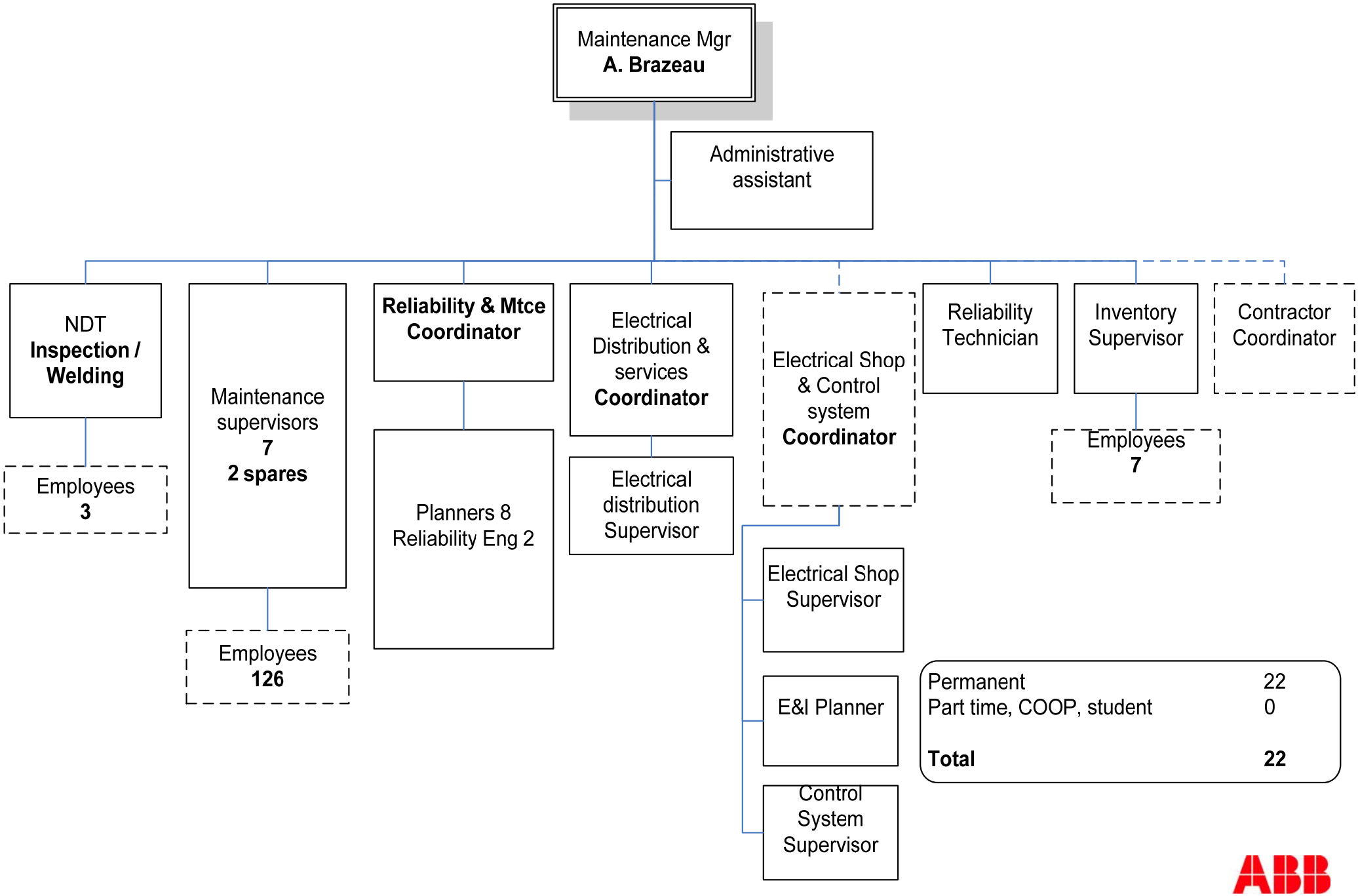
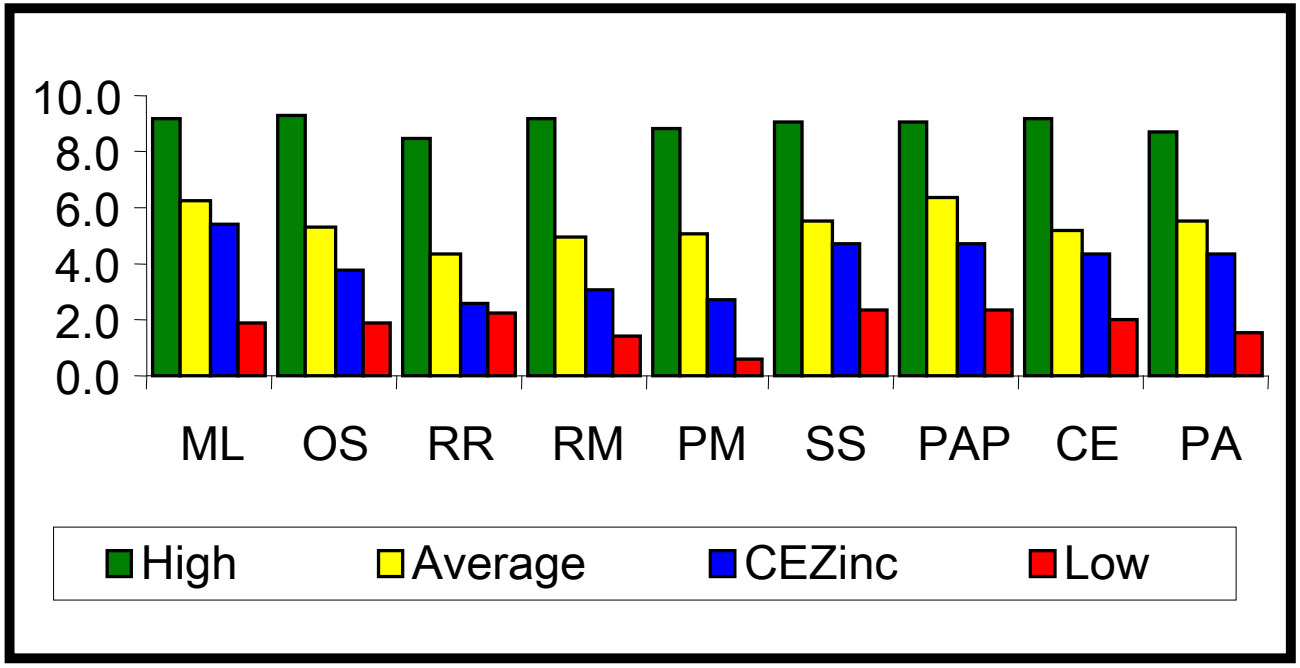

Maintenance Mgr
A. Brazeau
Administrative assistant
NDT
Inspection / Welding
Employees
3
Maintenance supervisors
7
2 spares
Employees
126
Reliability & Mtce Coordinator
Planners 8
Reliability Eng 2
Electrical Distribution & services
Coordinator
Electrical distribution Supervisor
Electrical Shop & Control system
Coordinator
Electrical Shop Supervisor
E&I Planner
Control System Supervisor
Reliability Technician
Inventory Supervisor
Employees
7
Contractor Coordinator
Permanent 22
Part time, COOP, student 0
Total **22**

In 2001, ABB (ex HSBRT) Benchmarked CEZinc with World Class Organization



ML = MANAGEMENT LEADERSHIP

OS = ORGANIZATIONAL STRUCTURE

RR = ROLES & RESPONSIBILITIES

RM = RESPONSIVE MAINTENANCE

PM = PREVENTIVE & PREDICTIVE MAINTENANCE

SS = SUPPLIERS & SERVICES INTEGRATION

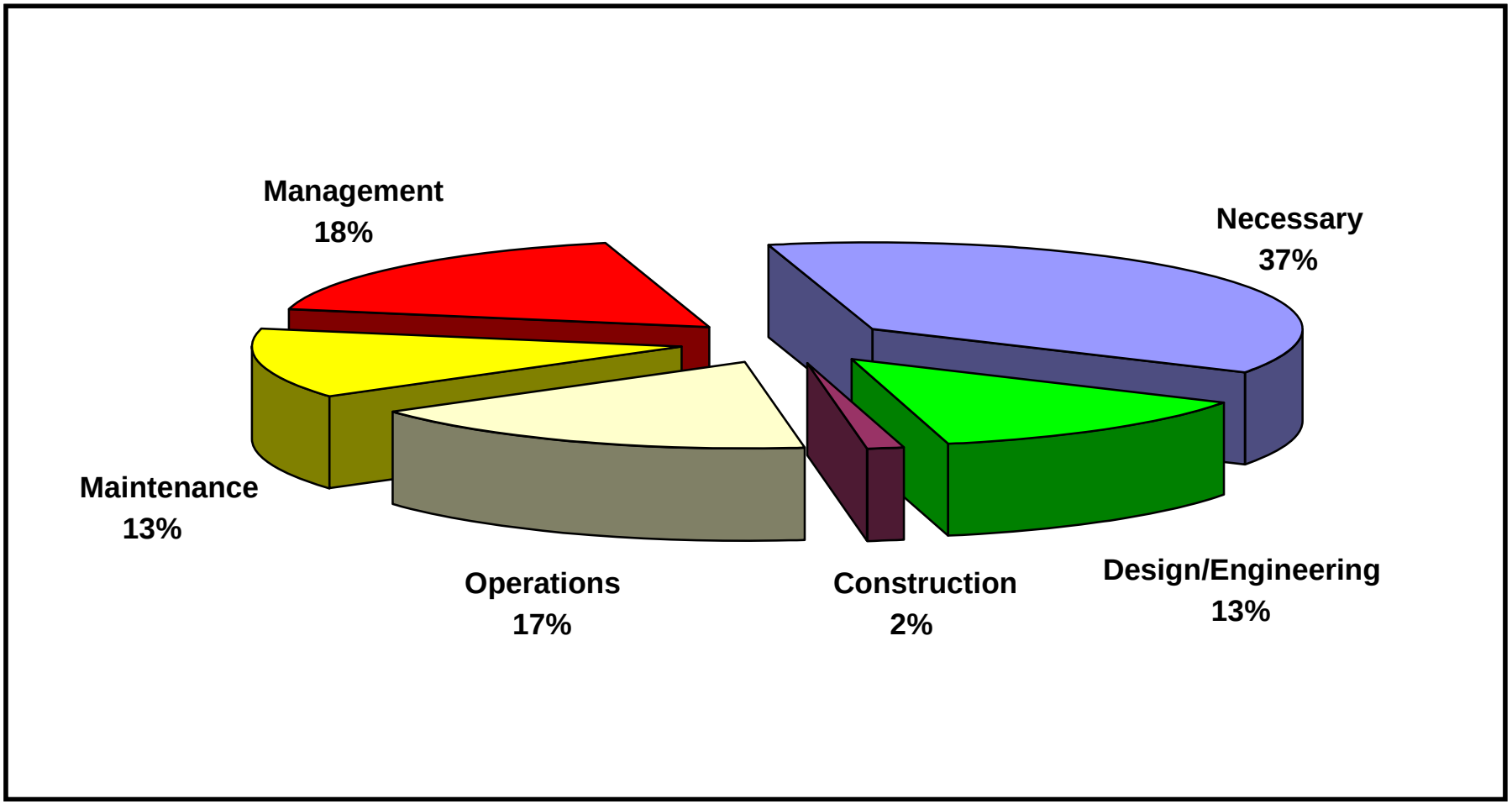
PAP = PHYSICAL ASSETS PROGRAM

CE = CONTINUING EDUCATION

PA = PERFORMANCE ASSURANCE

Overall Benchmark result: 4,5

During the Benchmark, We Determined That Over 60% of Our Maintenance Work was Avoidable



Strong Reactive Maintenance ?

CEZinc in 2001

- Many breakdowns were considered ‘’normal’’ on some critical equipment
- Less than 40% of maintenance work orders were planned
- 70% of maintenance work orders were emergency (or high priority)
- No work order scheduling was done
- The backlog was out of control with over 60,000 hours (+/- 12 weeks)
- We regularly skipped and cancelled Preventive maintenance work orders
- Production employees did not participate in any inspection task
- Maintenance employees were rarely asked to participate on failure analysis
- Warehouse inventory accuracy was below 75%

2nd Benchmark Comparison 2001 / 2005

1- Management Leadership

2- Organizational Structure

3- Roles & Responsibilities

4- Responsive Maintenance

5- Preventive & Predictive Maintenance

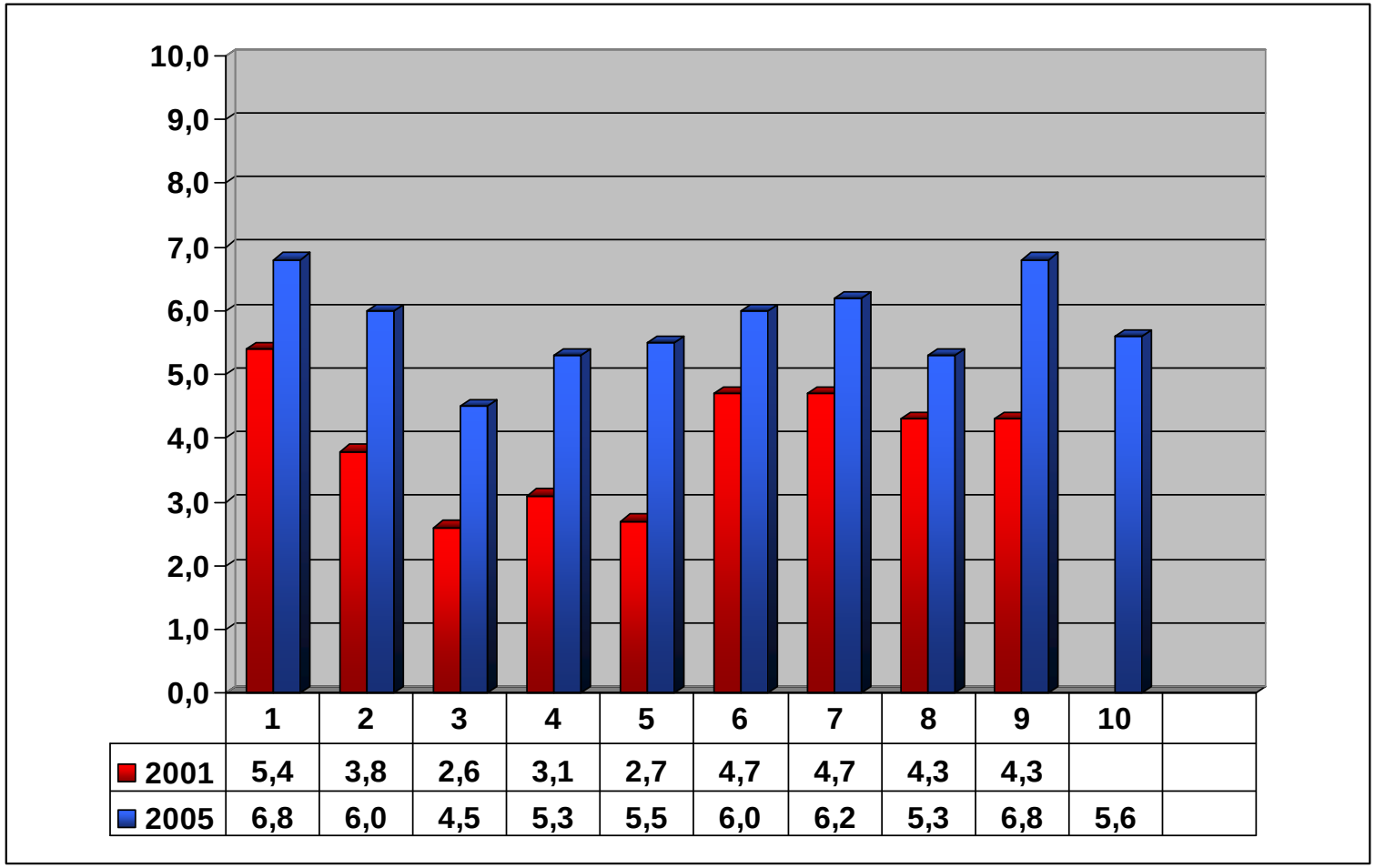
6- Suppliers & Services Integration

7- Physical Assets Program

8- Continuing Education

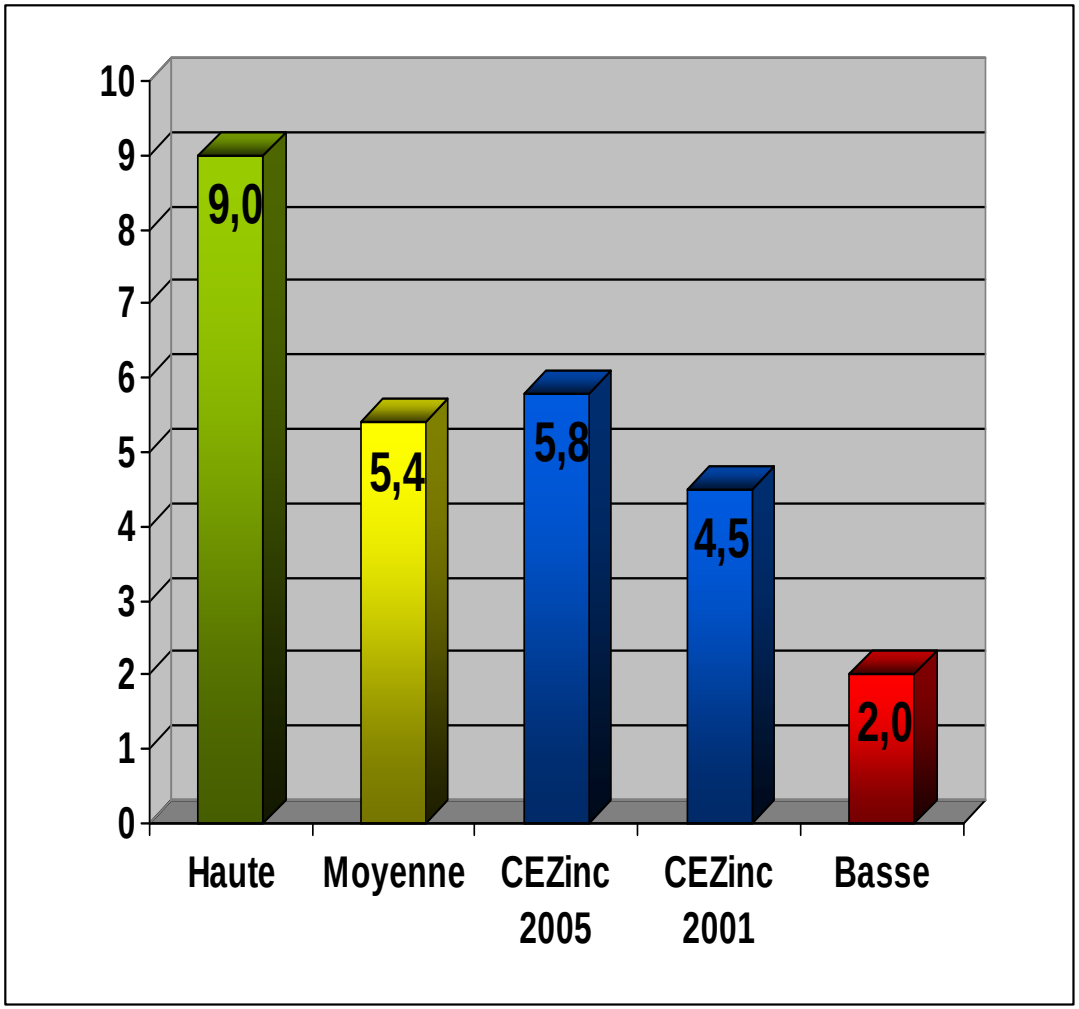
9- Performance Assurance

10- Information Technology for Reliability



	1	2	3	4	5	6	7	8	9	10	
2001	5,4	3,8	2,6	3,1	2,7	4,7	4,7	4,3	4,3		
2005	6,8	6,0	4,5	5,3	5,5	6,0	6,2	5,3	6,8	5,6	

Benchmark overall result



Reliability Deployment Update - 2006

Planning & Scheduling

- Developed and implemented new processes for Planning and Scheduling
- Implemented daily review meetings between maintenance and operation
- Implemented weekly scheduling meetings between maintenance and operation

Roles and Responsibilities

- Roles and Responsibilities were defined and communicated to Planners, Supervisors (maintenance and production) and Production Coordinators

CMMS Optimization

- Review of functions and implemented changes for work order processing

Materials Management

- A focus group reviewed and implemented new processes and key indicators

Reliability Deployment Update - 2006

Reliability Engineering

- RCM analysis are performed on targeted critical equipment
- RCFA are performed on a regular basis
- Reliability review meetings are held every two weeks
- Criticality evaluation of all equipment is complete (11,000 equipments)
- Bad actors equipment are tracked on a monthly base and eliminated when possible
- Technical review of the Preventive maintenance is ongoing
- Predictive Maintenance now implemented in all production areas of the plant

Positive Elements - 2006

- The deployment of Predictive Maintenance technologies
- Hourly participation in the work groups
- Management's growing intolerance towards equipment failures and related production losses
- The desire of maintenance employees to make the planning process a priority for the plant
- The experienced and knowledgeable consultants we had to guide and coach us through every step of the deployment

On going Challenges - 2006

- Fostering leadership from maintenance planners and supervisors to drive and support the change
- The creation of a partnership between maintenance and operation to work together and address repetitive and/or avoidable maintenance
- Ensuring adequate, mature and consistent utilization of performance indicators
- Overcoming resistance of both staff and hourly employees to change

Lessons Learned - 2006

- It's a CULTURE CHANGE, the deployment of Reliability is more about people than about process
- We must seek employee's participation in all improvement or change activities (work groups, Kaizen, 5S, etc)
- We need to change our approach towards equipment failures, we must challenge the way we do things and identify the root cause of failures
- If some individuals are barriers to make change happen, we must address them as quickly as possible

Firefighting culture to a Reliability Culture

CEZinc in 2008

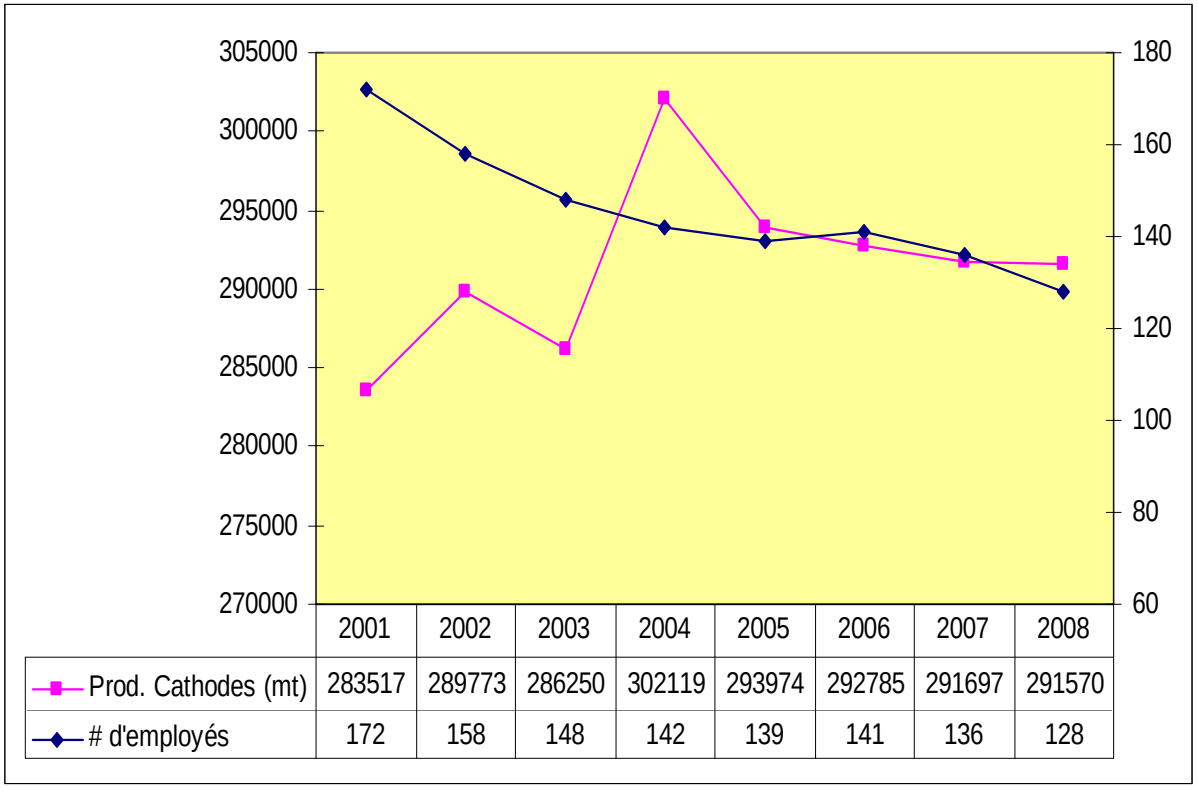
- Many breakdowns were considered ‘’normal’’ on some critical equipment
  - **Breakdowns are systematically analyzed to determine the root cause**
- Less than 40% of maintenance work orders were planned and none are scheduled
  - **85% of work orders are planned and scheduled**
- 70% of maintenance work orders were emergency (or high priority)
  - **25 % of work orders are emergency (or high priority)**
- The backlog was out of control with over 60,000 hours (+/- 12 weeks)
  - **The backlog is managed and stable (+/- 6 weeks)**

Firefighting culture to a Reliability Culture

CEZinc in 2008

- We regularly skipped and cancelled Preventive maintenance work orders
  - **Schedule compliance for PM and PdM is above 95% in many areas (target is 100%)**
- Production employees did not participate in any inspection task
  - **Production employees do some visual inspection task**
- Maintenance employees were rarely asked to participate on failure analysis
  - **Maintenance employees regularly participate in failure analysis teams**
- Warehouse inventory accuracy was below 75%
  - **Warehouse inventory accuracy has improved to 89%**

More tons produced with less mtce employees

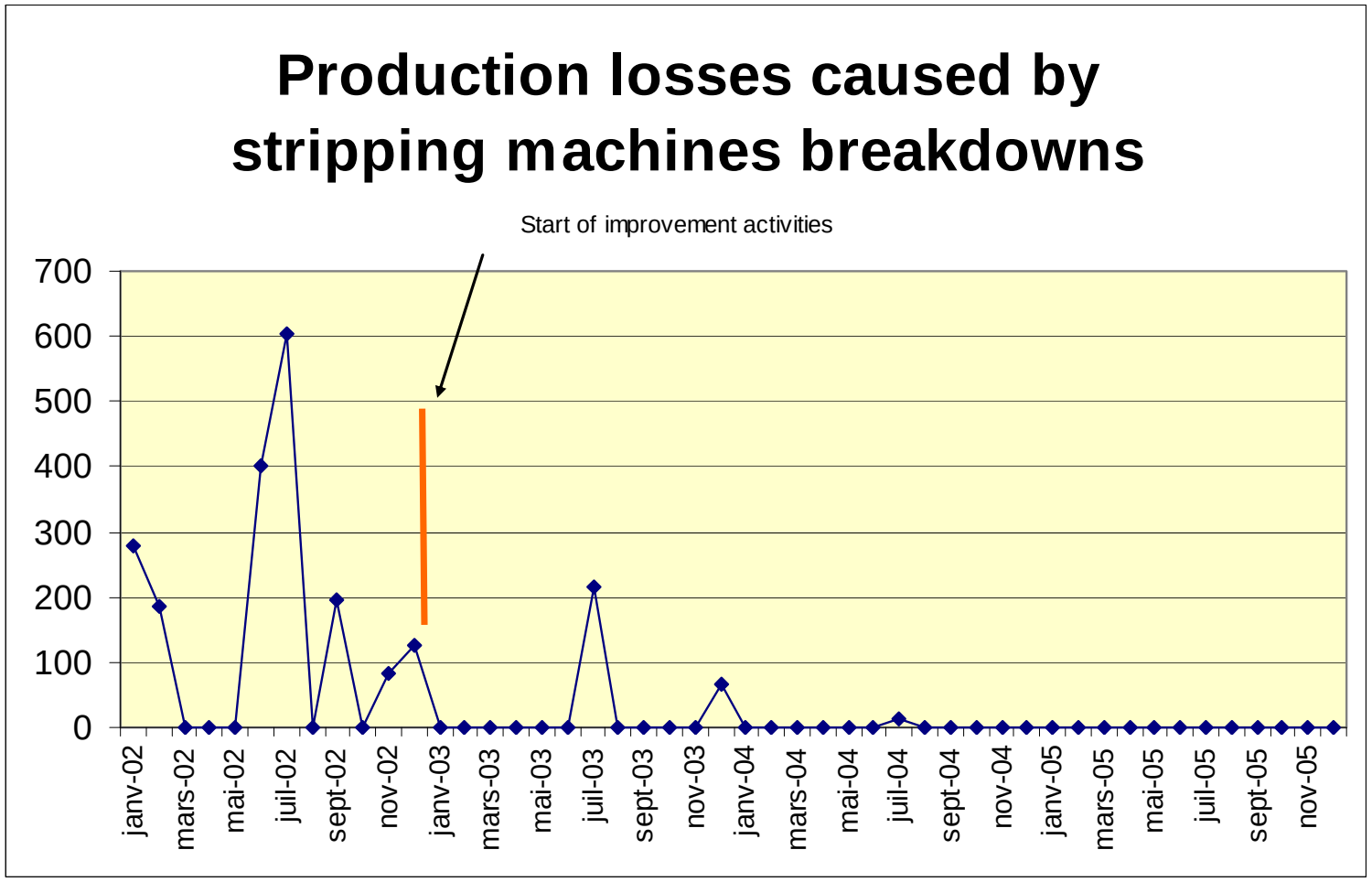


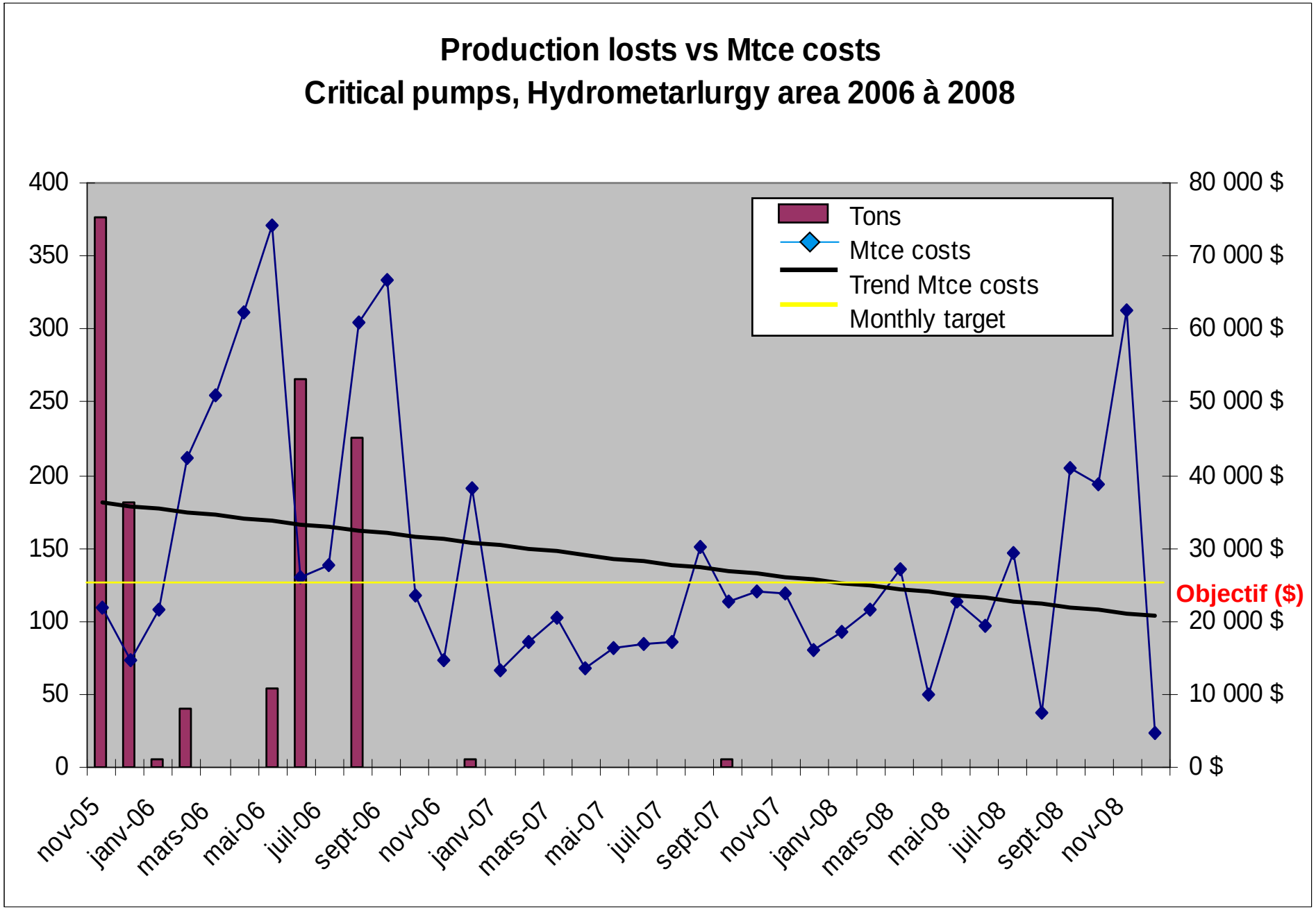
	2001	2002	2003	2004	2005	2006	2007	2008
Prod. Cathodes (mt)	283517	289773	286250	302119	293974	292785	291697	291570
# d'employés	172	158	148	142	139	141	136	128

Total Plant Reliability (TPR) implementation has been an important contributor to plant production capacity improvement and costs reduction.

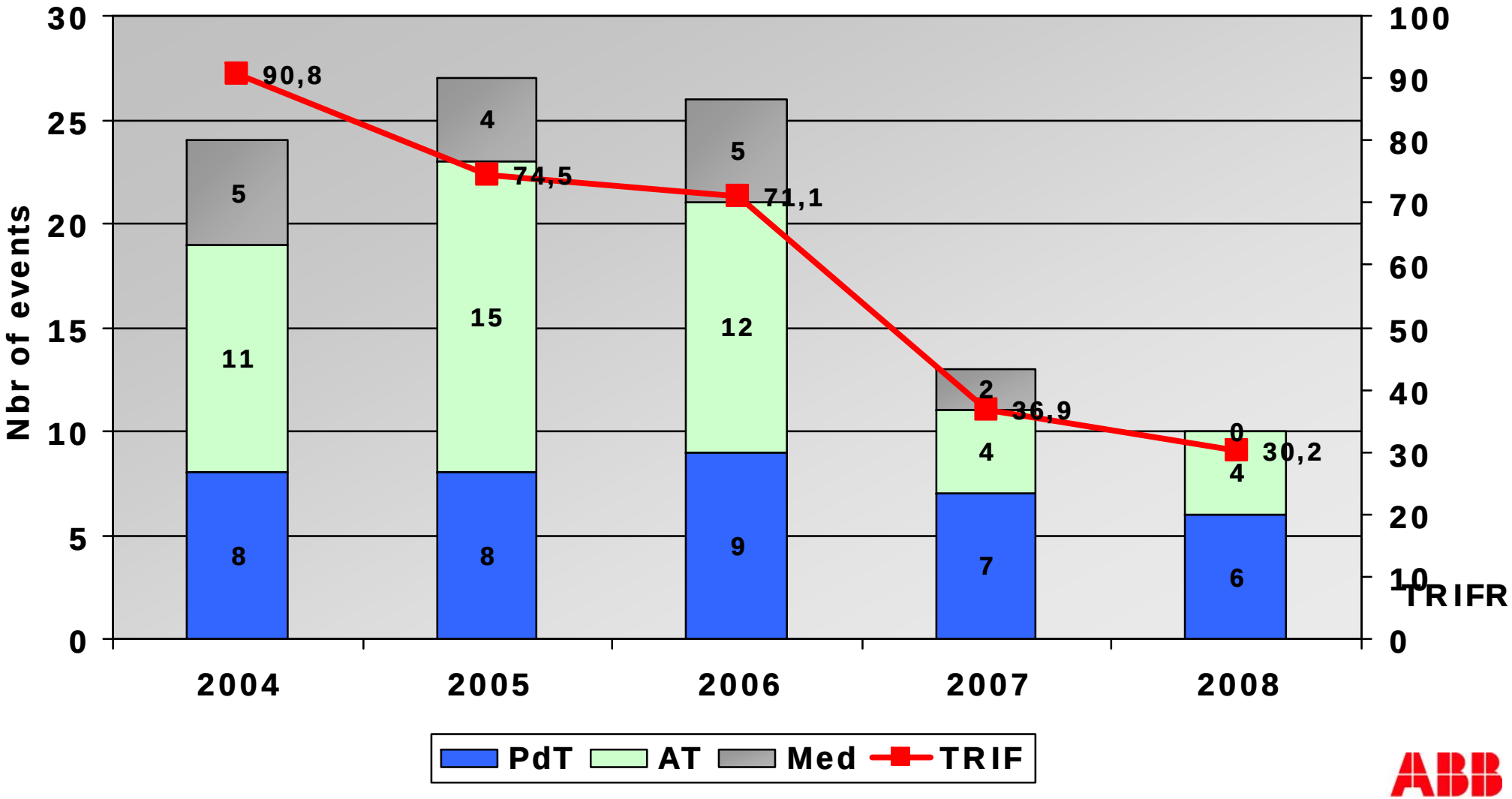
RCM Activity on Stripping Machines

- **In 2002, a total of 15 events on the stripping machines resulted in production losses of over 2200 metric tons.**
- **An RCM activity was started in November of 2002 on the cell house stripping machines**
- **Since January of 2003, only 3 events resulted in production losses of 293 metric tons.**





Mtce Safety - Results
2004 - 2008



2001 - 2008 – Value added

	2001	2008
▪ Hourly employees	174	129
▪ Staff employees	29	22
▪ Trades		Autonomous teams
▪ CMMS	MPAC	Same, minor modification
▪ Production capacity	283,517 T	291,570 T
▪		

2008 – Inventory Value added

	2001	2008
Report to	procurement	maintenance
Inventory value	10,2M$	7.9M$
Service level to Mtce	86.2%	95,7%
Inventory accuracy	75%	95%
Delivery area	>100	34
Warehouse counter delivery/year	>10000	<100
Warehouse employees	8	7
Turnover rate (0 to 12 months)	5.7	3.8

Conclusion

- We have improved, but still have a lot of work to do (The Culture)
- To convert from a firefighting mode to a Reliability culture maintenance **takes time and energy**
- We need continuous support from top management to keep a strong focus on the objectives and persevere
- We need the participation of hourly employees to support the change
- A strong partnership with our consultant (ABB) has helped us considerably in our quest to develop a Reliability culture at CEZinc

Questions? Comments?

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