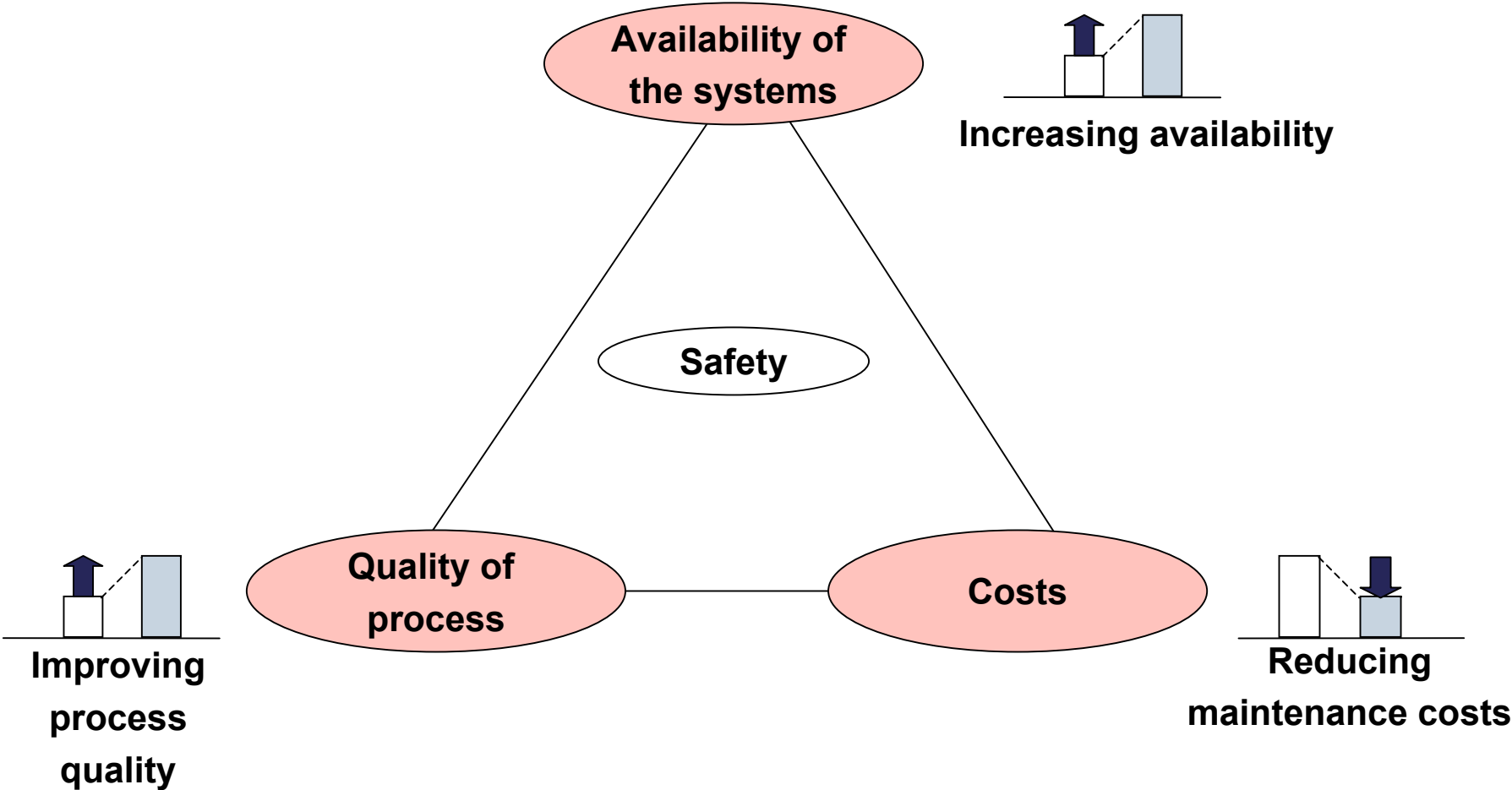


Reorganisation of Maintenance Systems

Heiner Huesmann
Deutsche Bahn AG

24th June 2004



➔ **MILAS: all-embracing concept for optimising maintenance**

Maintenance disciplines

Track

Signalling and safety technology

Electricity

- Catenary
- 50 Hz

Maintenance tasks

Items of the railway infrastructure

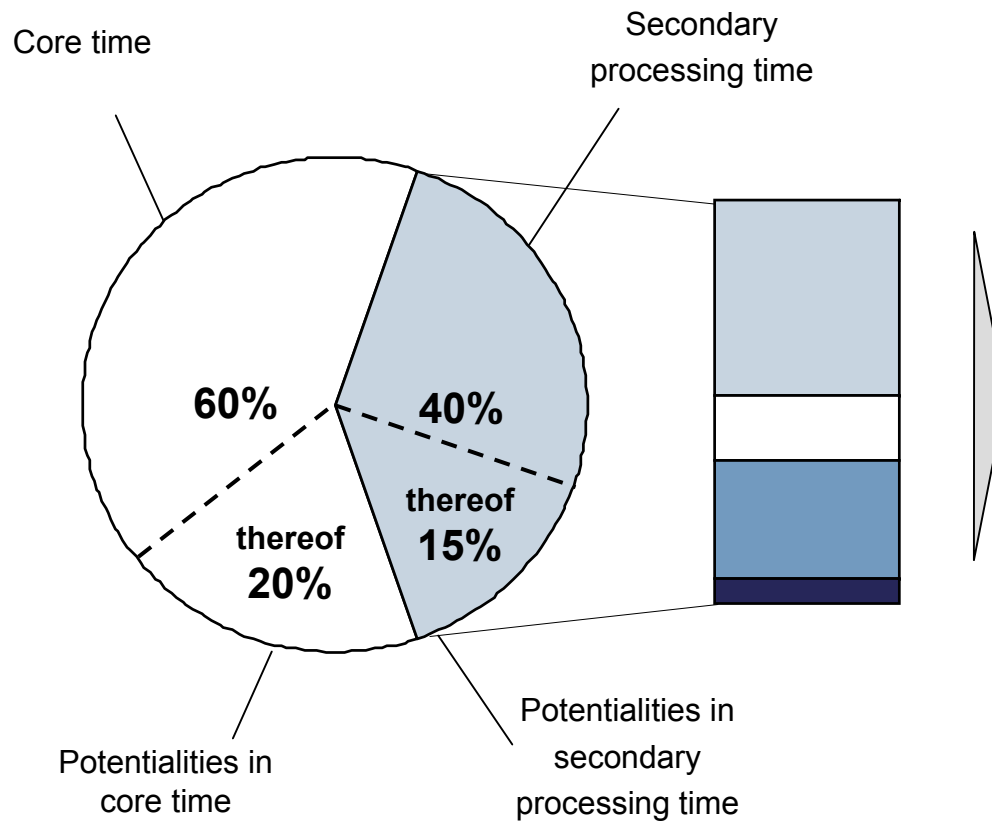
- Points
- Rails
- Bridges, tunnels
- Level crossings

- Signals
- Points
- Signal boxes
- Inductive train control
- Level crossings
- and much more besides

- Overhead lines
- Power supply
- Lighting

- **Inspection and servicing**
- **Corrective maintenance**
- **Repair**

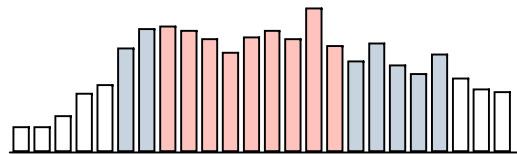
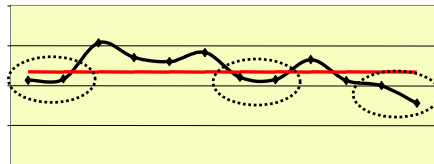
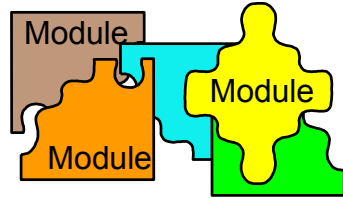
Total working time by activities (actual analysis)



- Proportion of core time can be considerably increased by
- reducing travelling times
 - avoiding other unproductive times

 **There is still potential in maintenance**

Source: proLean's own statistics by more than 1000 audits on site for various maintenance companies



Modularisation of maintenance activities

Working in integrated teams

Harmonisation of capacities

Reorganisation of repair and on-call periods

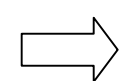
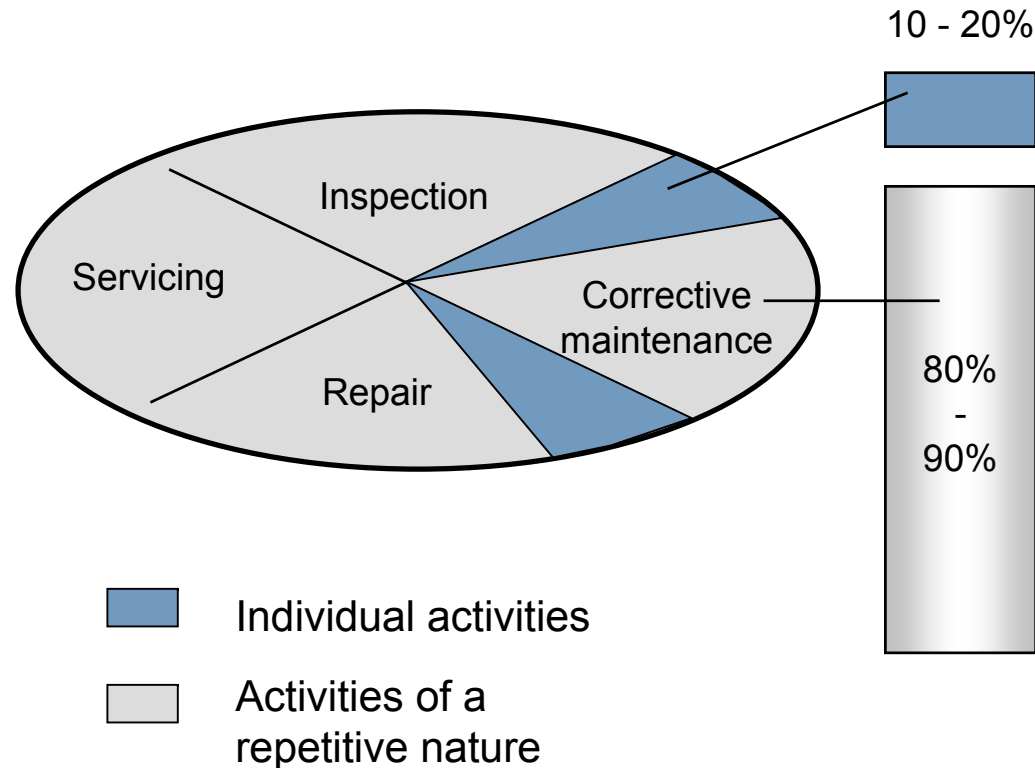
Making use of slack periods

Optimising the order handling processes

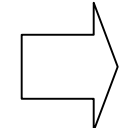
Systematic capacity and personnel deployment planning

Work organisation and processes

Basic idea



Activities cannot be modularised

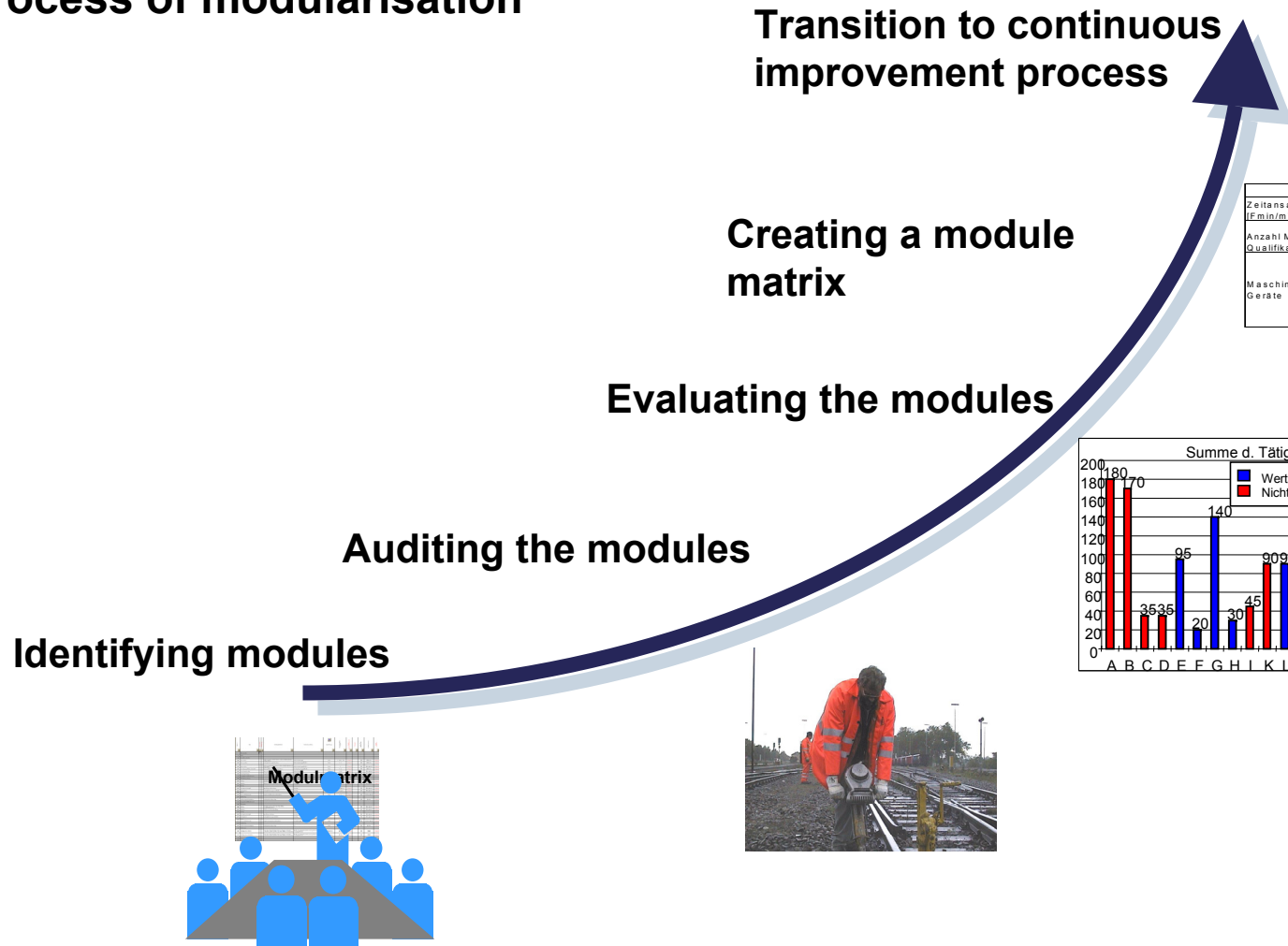


A large proportion of maintenance activities are highly repetitive and can be standardised and clearly described

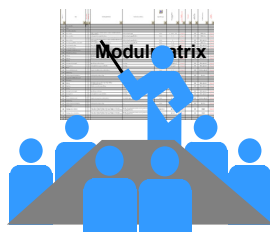
The maintenance activities are available as modules in all disciplines for the following areas of responsibility:

- Inspection/servicing
- Minor plan able corrective maintenance
- Repairs

Process of modularisation



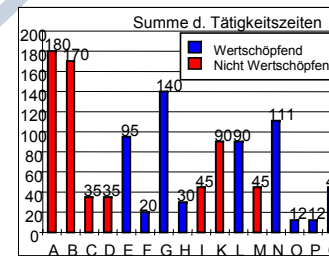
Identifying modules



Auditing the modules



Evaluating the modules



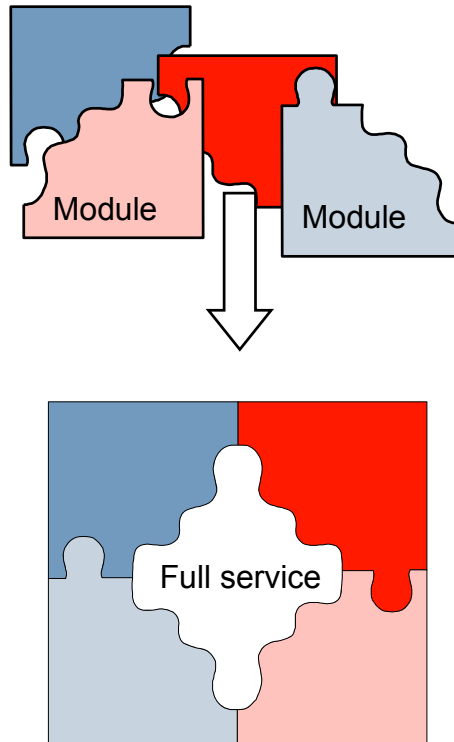
Transition to continuous improvement process

Creating a module matrix

	IST	SOLL
Zeitansatz (Fmin/m)	1,55 und 1,88	1,55
Anzahl MA.	3 OI-Monteur, 1 EuP, 1 Bed. FMW, 1 Bed.	3 OI-Monteur, 1 EuP, 1 Bed. FMW, 1 Bed.
Qualifikation	Trommelwagen	Trommelwagen
Maschinen, Geräte	MZA, Az-Lok, FMW m. Trommelwagen, Standardwerkzeug, Kettenzug 6m, 4 SIEMENS-Klemmen, 2 Kabelscheren, el. Presse	MZA, Az-Lok, FMW m. Trommelwagen, Standardwerkzeug, Kettenzug 6m, 4 SIEMENS-Klemmen, 2 Kabelscheren, el. Presse

➔ Using the modules leads to an optimised maintenance process

Using the modules



- Capacity planning and personnel deployment planning
- Calculation of maintenance costs
- Work preparation
- Scheduling of vehicles and equipment
- Creation of maintenance orders in the DP system
- Tendering for external services
- Order accounting

Current situation

Several consecutive maintenance actions carried out by single-discipline teams

Approach

Amalgamating the inspection dates of different disciplines under a single item

Result

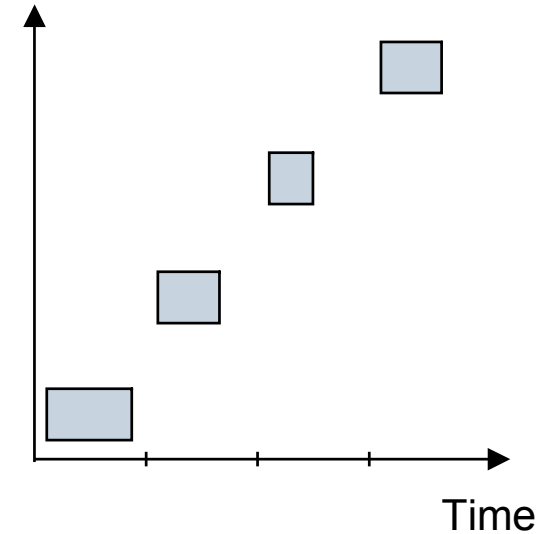
An interdisciplinary team carries out all the necessary maintenance actions in one go

Maintenance: signalling&safety/track

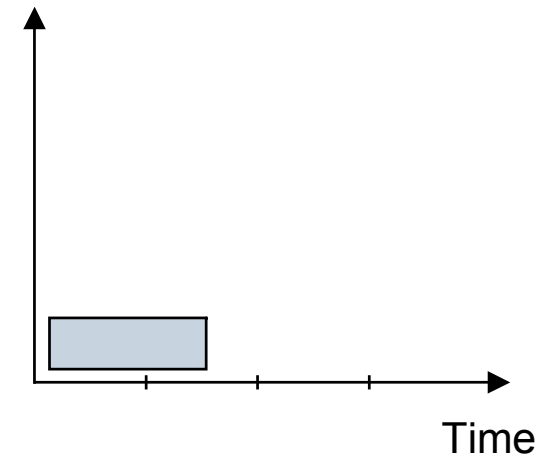
Inspection: electricity

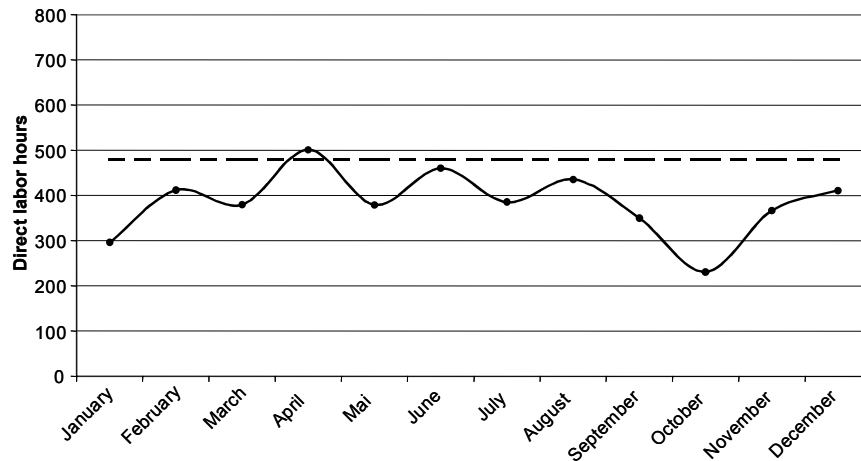
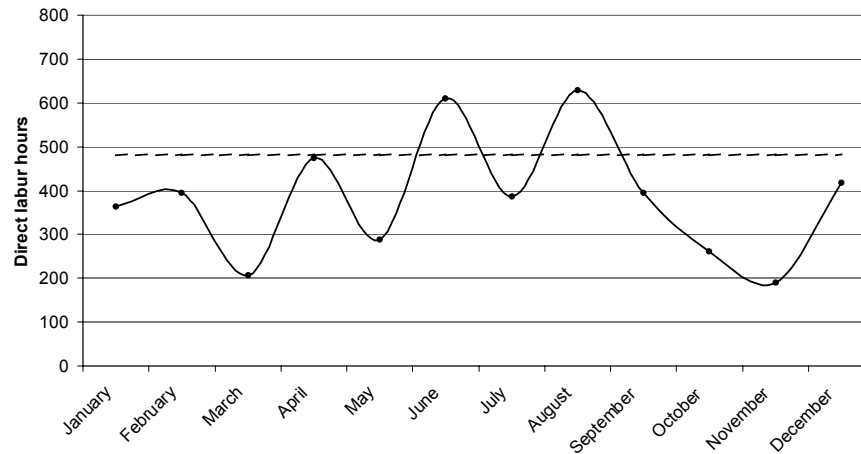
Inspection: track

Inspection: signalling&safety



Inspection team (incl. Immediate repair)





□ Reorganisation of Repairs

- Flexible working times models
- Use of slack periods

□ Optimisation of order handling process

- Maintenance planning and control
- Technical equipment management
- Purchasing
- Administration

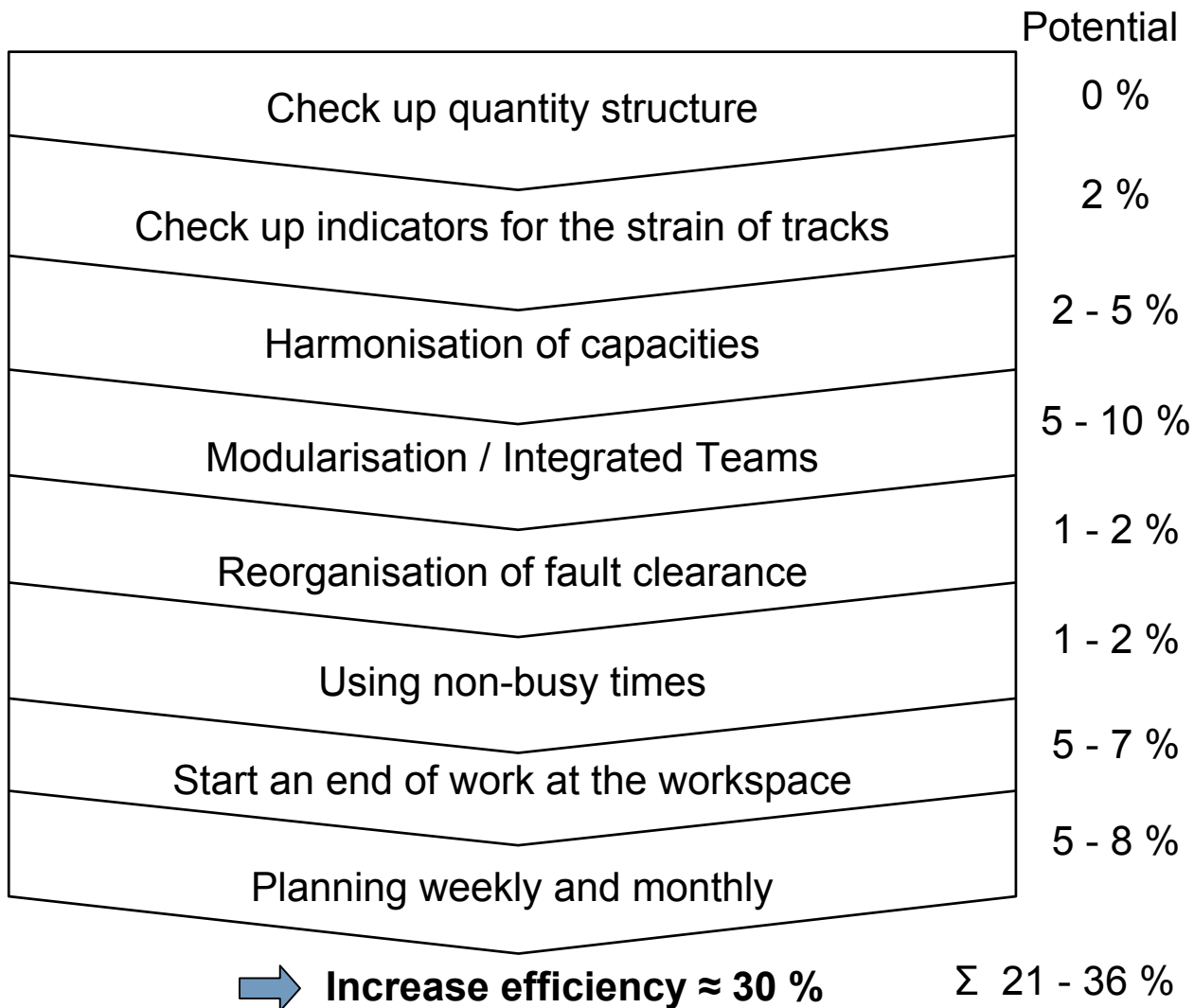
Structure of measures

Clearing up data pool

Standardisation and synchronise work processes

Reorganisation work time application


Adjustment capacity-management



Planning with use of modules - results

Modification of switches, PB Nürnberg


Planning before modularisation
328 working hours; 3 workers

- 58 %


Planning with modules
138 working hours; 3 workers

Renewal electrical heater for switches EEA, PB Dresden


Planning before modularisation
276 working hours; 3 workers

- 33 %


Planning with modules
184 working hours; 3 workers

Renewal of switches, PB Hamburg


Planning before modularisation
24 hours track closed; 9 workers

- 45 %


Planning with modules
24 track closed; 5 workers

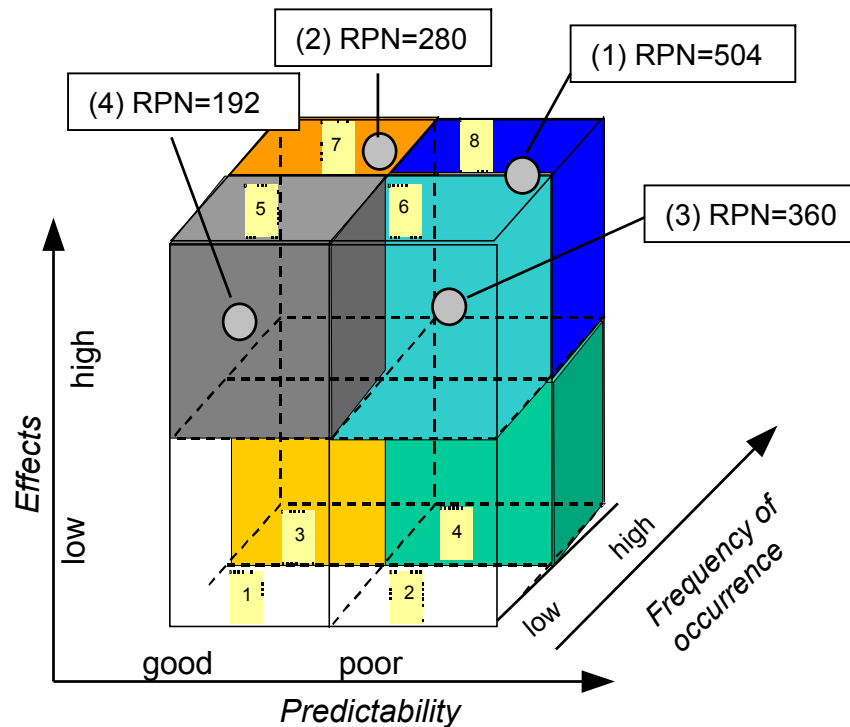
Renewal signals, PB Köln

Planning before modularisation
176 working hours; 11 workers

- 24 %


Planning with modules
135 working hours; 9 workers

Failure classification and derivation from maintenance strategies

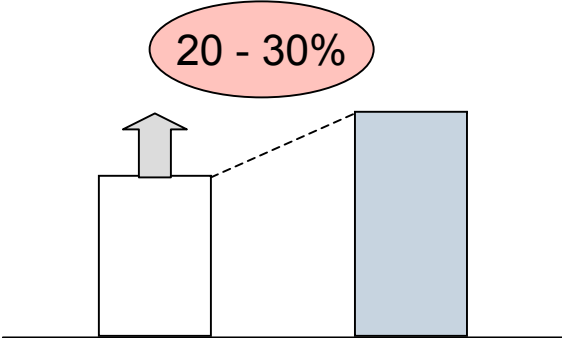


RPN = Risk Priority No.

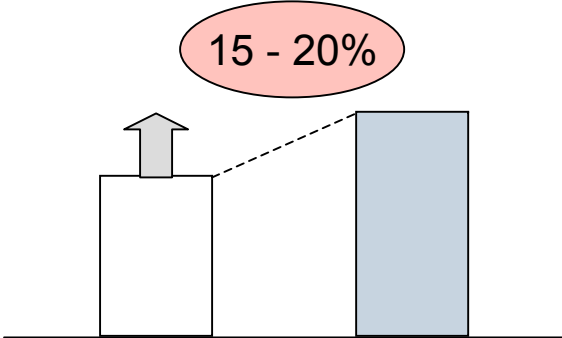
Nr.	Failure		Measures
(1)	Defective connecting and locking elements - SK8 -	CM	• Use self-locking connecting elements
		MS	• Design must be overhauled
(2)	Drive/limit switch soiled/oxidized	CM	• Do not open motors more often than is technically necessary
		MS	• General replacement of the contacts after a certain number of switching movements
(3)	Stiffness in interlock - SK6 -	CM	• Install latch fastenings (CKA 12) on critical switches
		MS	• Use of remote diagnosis on critical equipment
(4)	Shorter/longer tester set inadequately - SK5 -	CM	• Implement new tongue testers with simplified adjustability
		MS	• Further constructive optimizing (sliding tongue tester)

CM = corrective measures
MS = maintenance strategy

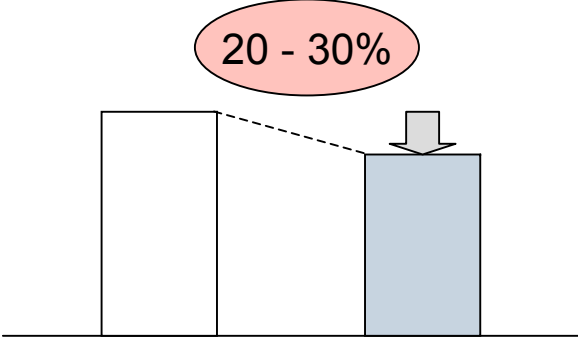
Increased productivity



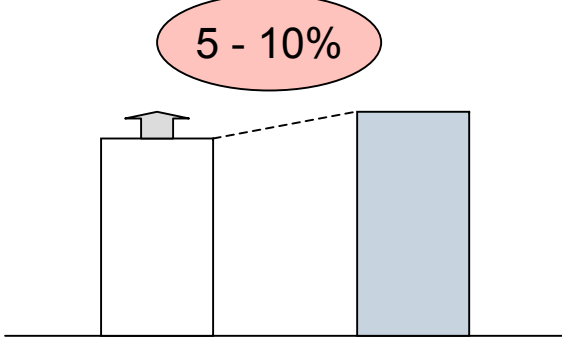
Improved quality



Lower maintenance costs



Higher availability



Results of following projects

