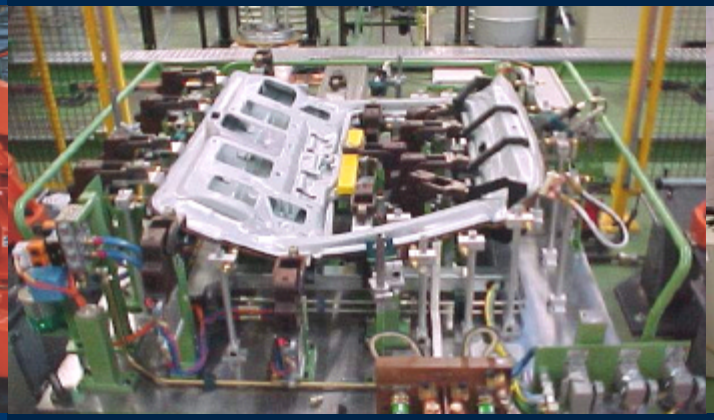
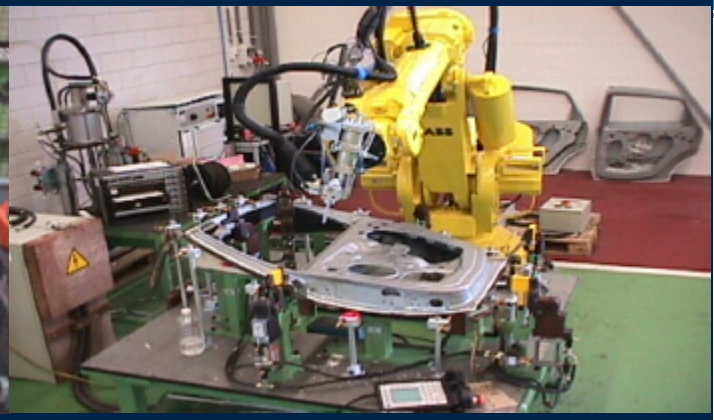




Presentation
VDL Steelweld

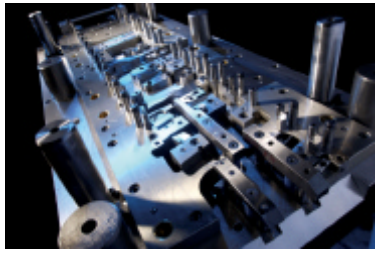
Strength through co-operation

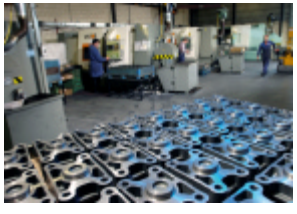
VDL Steelweld

VDL Group

Subcontracting

Surface Treatment
Assembly
Metal- and Plastics Processing



Bus Group

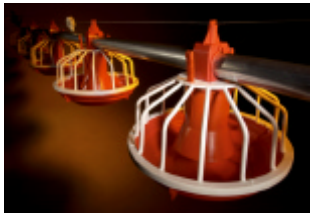
Busses
Bus Chassis




Finished Products

Production Automation
Various Finished Products

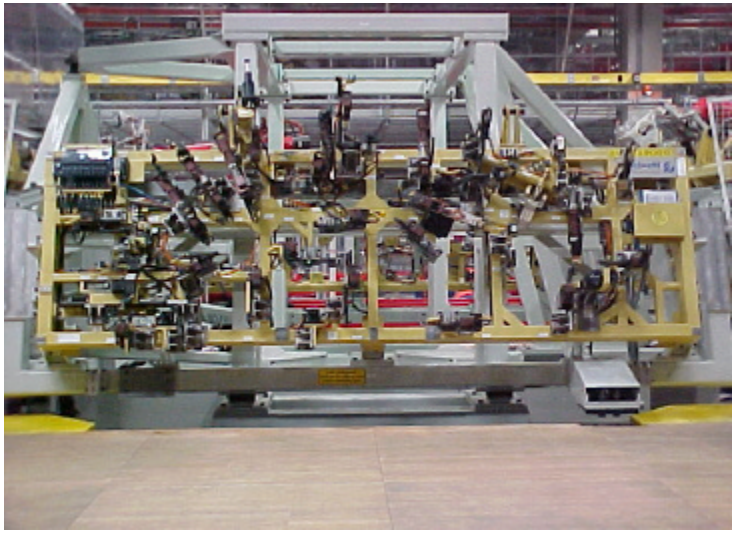


VDL Steelweld

Finish Lines

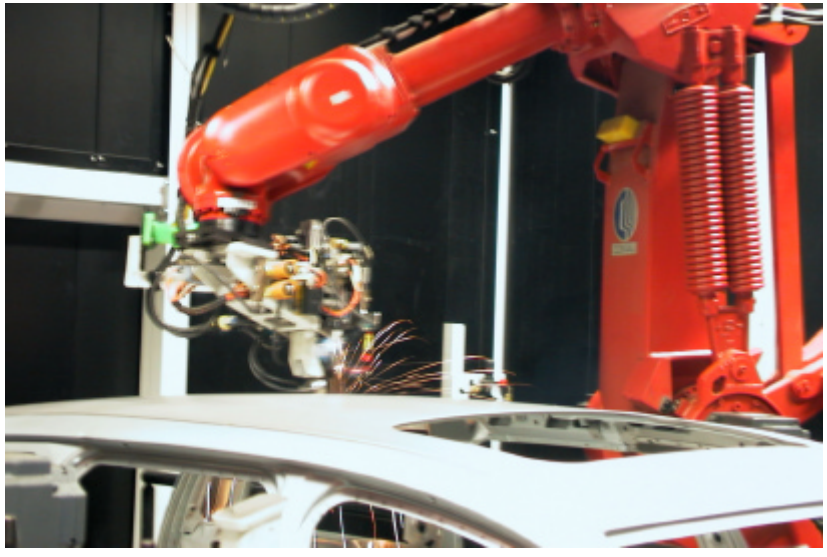
Flexible Pallet Systems



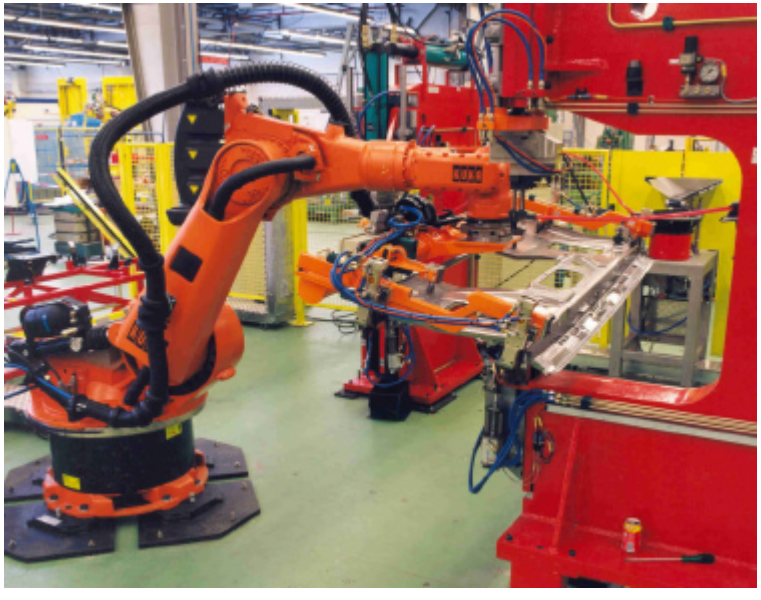
Production Automation

Automated Folding Machine

Laser Brazing

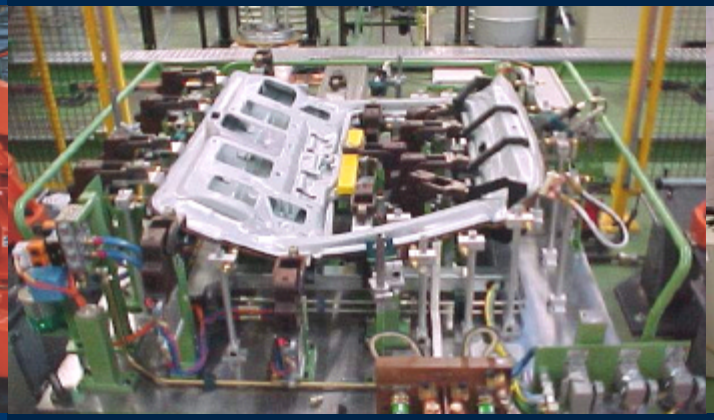
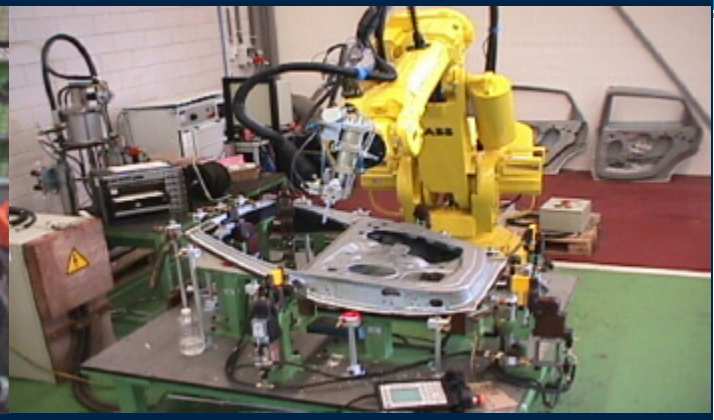


Laser Welding



Aluminium Joining

Technologies

Effective Process Time

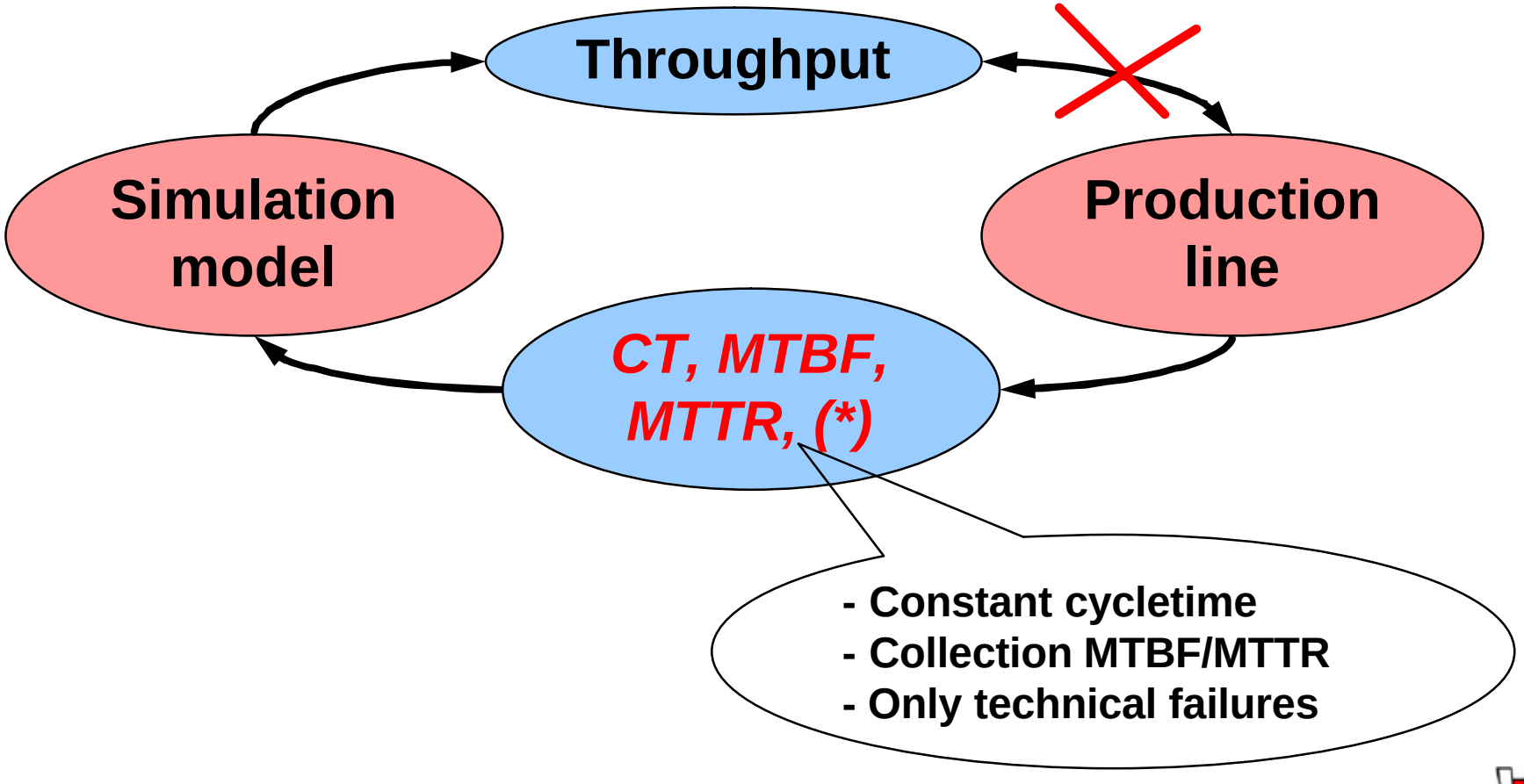
Strength through co-operation


Time!
EPT: Effective Process
Automotive

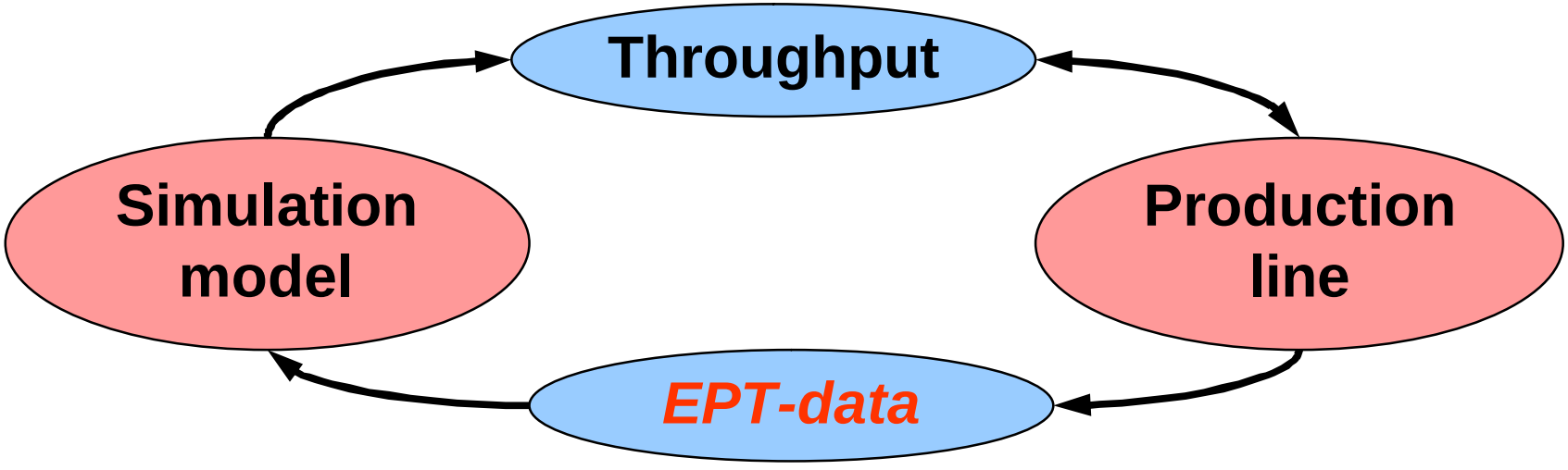
Content

1. Problem
2. EPT-method
3. Cost / Profit analysis

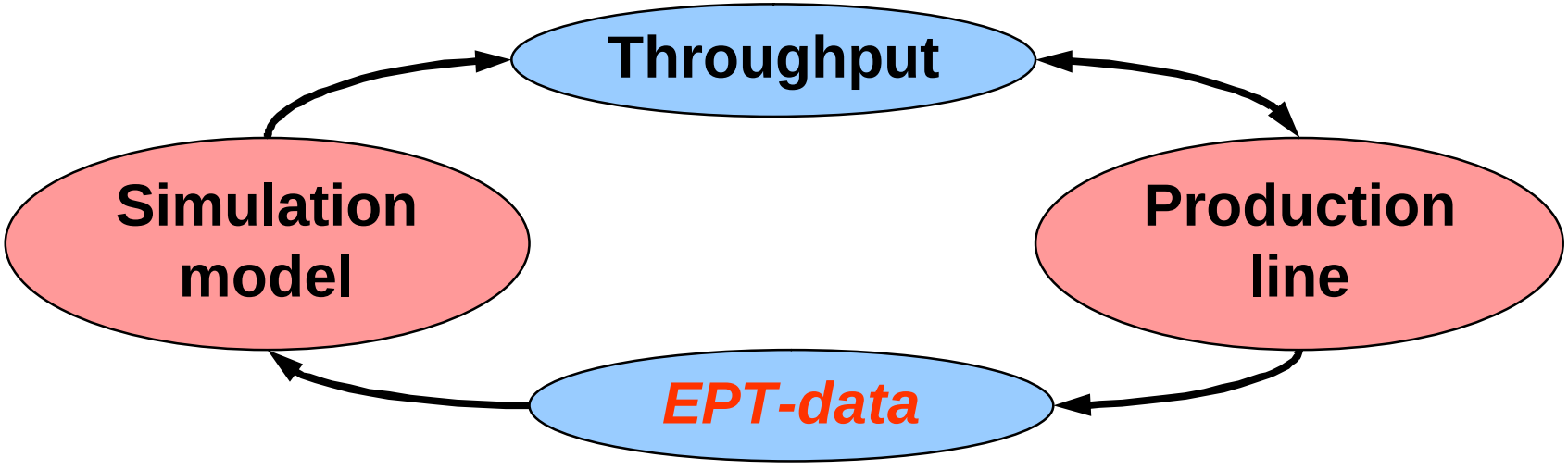
Current simulation



EPT simulation



EPT simulation



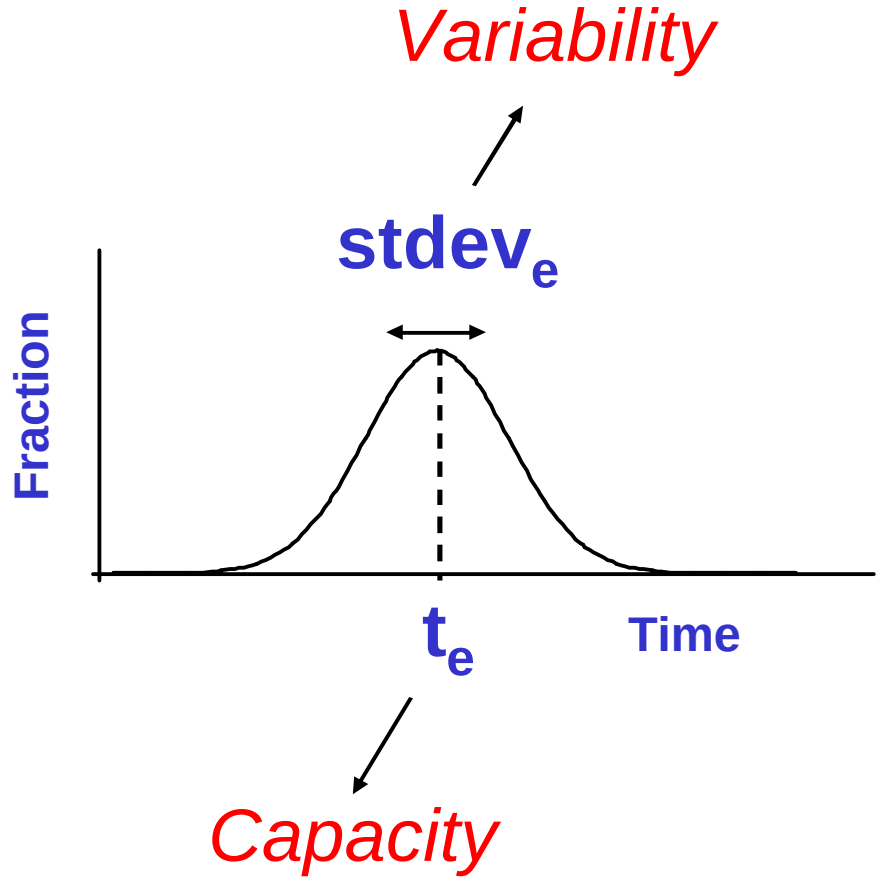
TU/e VOLVO VDL Steelweld

EPT idea

- Cycletime (t_0)

  +

- Machine failures
- Product mix
- Operators
- Setups
- Other



EPT science

- EPT basis automotive
  - Thesis Freek Wullems *(2002)*
- Formation theoretical
  - Thesis Ad Kock *(2003)*
- Simulation meta-modelling
  - Thesis Marco Vijfvinkel *(2005)*

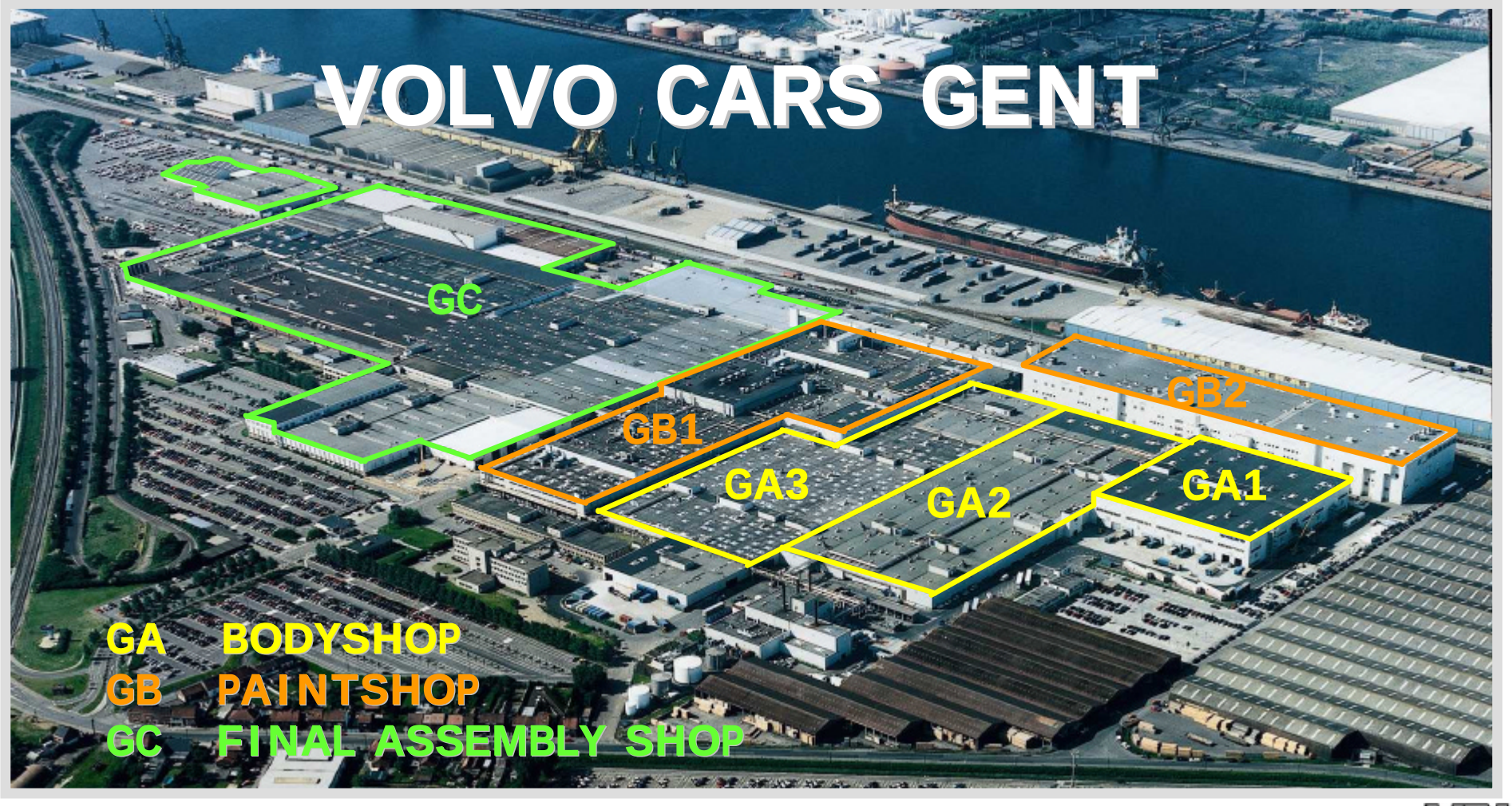
Content

1. Problem
2. EPT-method
3. Cost / Profit analysis

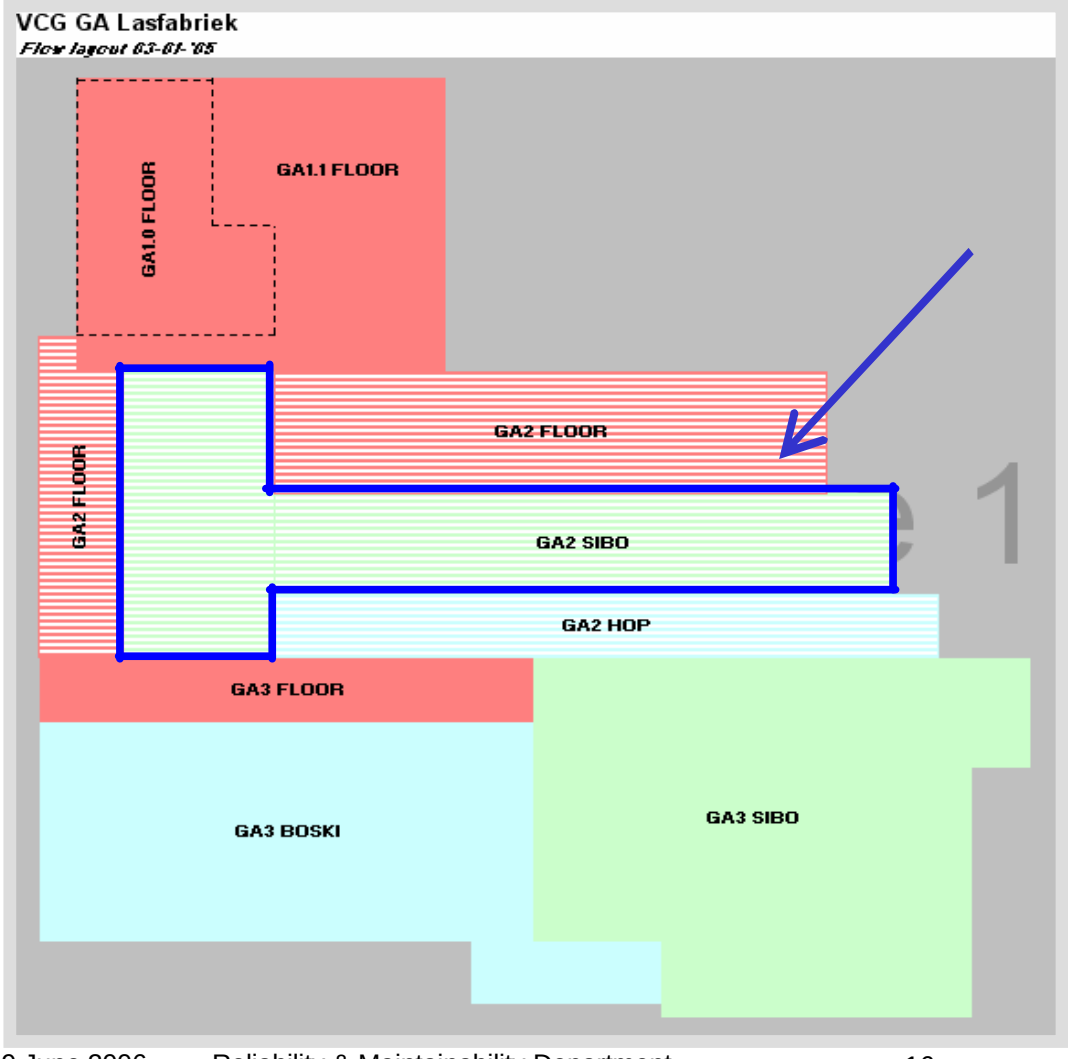
2. EPT-method

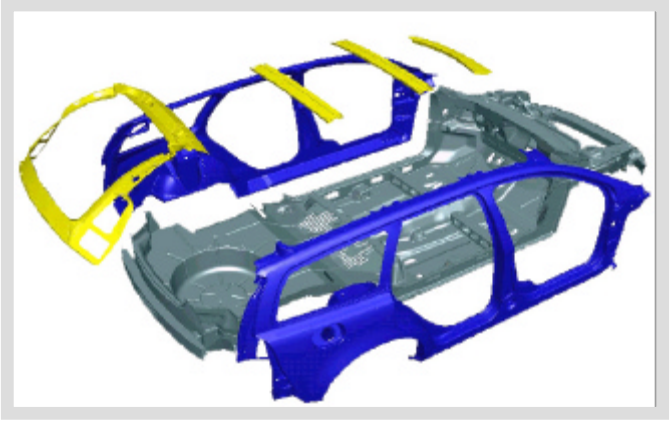
2.1 Definitions
2.2 Flow layout
2.3 Events
2.4 Database
2.5 Reports
2.6 Performance Control
2.7 Simulation

2.2 Flow layout

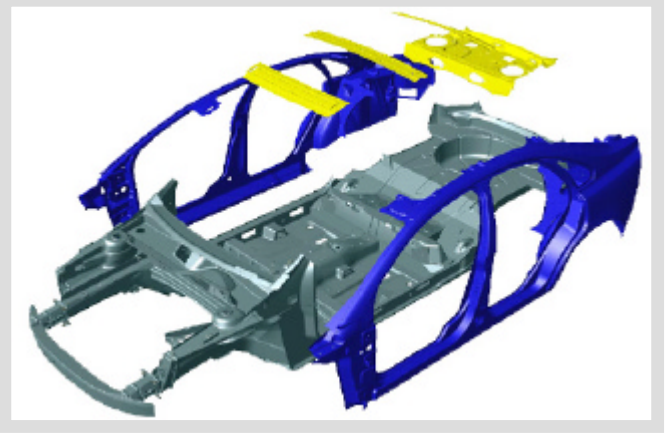


2.2 Flow layout



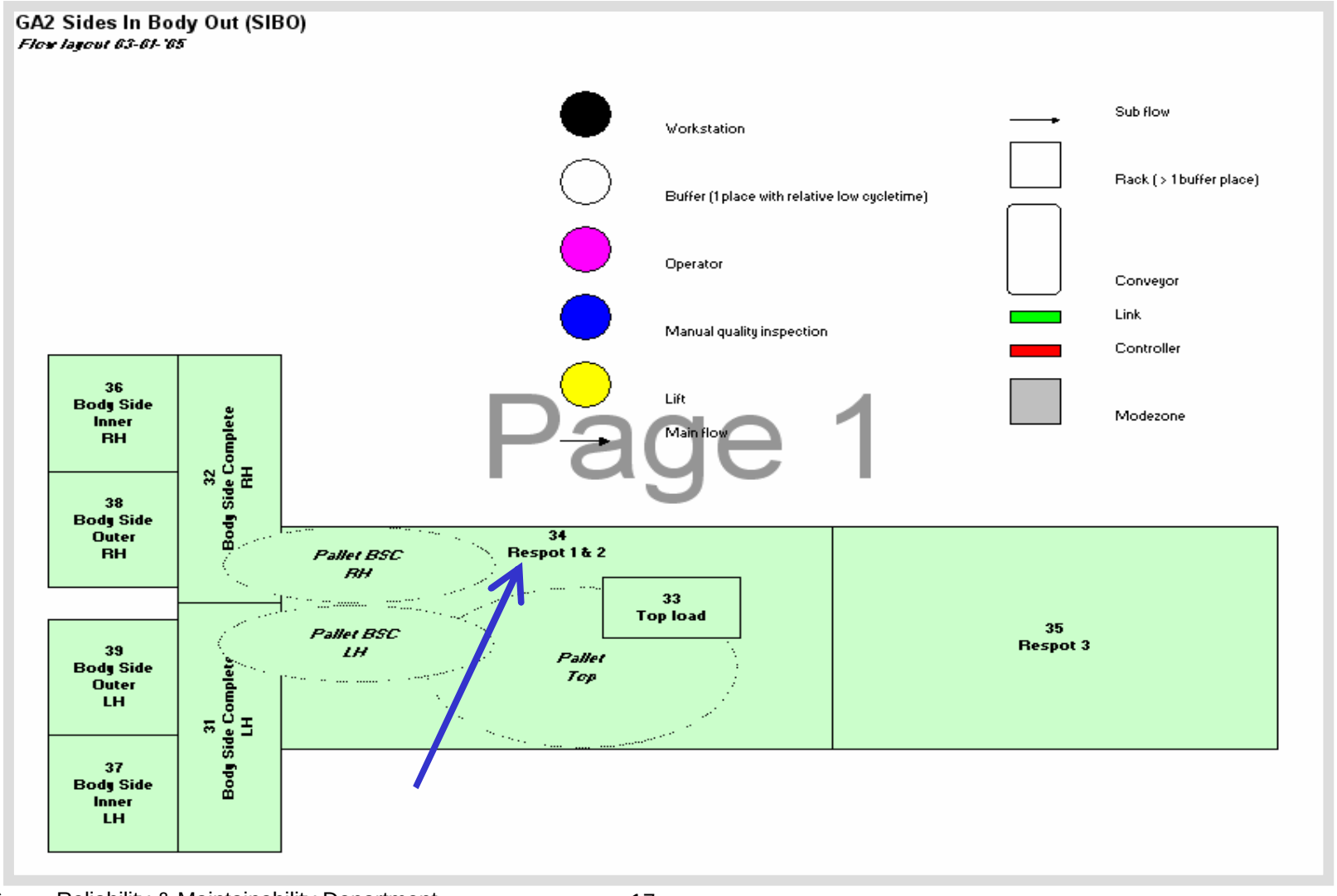


Volvo V50

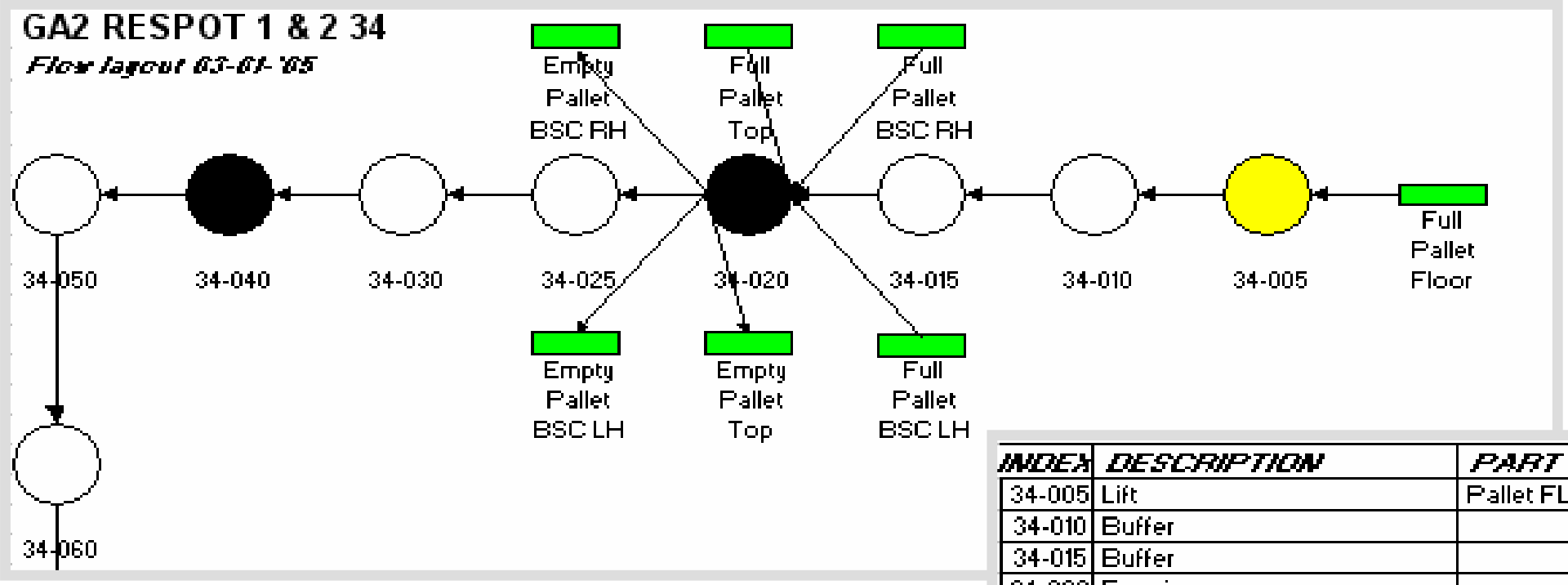


Volvo S40

2.2 Flow layout



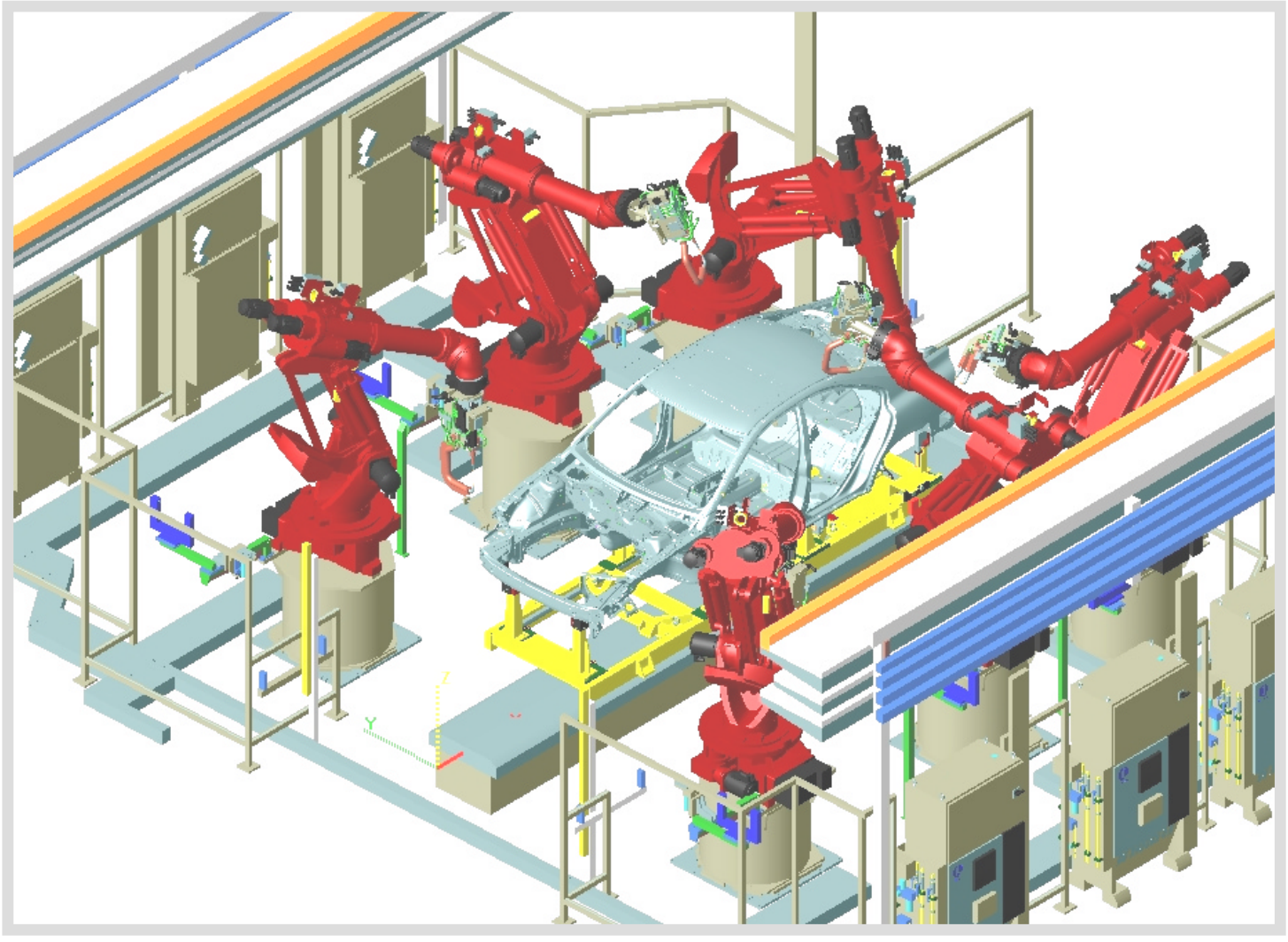
2.2 Flow layout



INDEX	DESCRIPTION	PART
34-005	Lift	Pallet FLOOR
34-010	Buffer	
34-015	Buffer	
34-020	Framing	
34-025	Buffer	
34-030	Buffer	
34-040	Robot spotwelding	
34-050	Turntable	
34-060	Buffer	

2.2 Flow layout

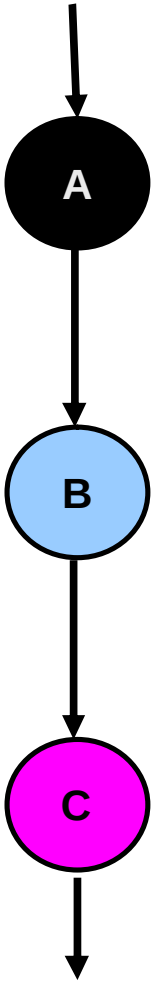
Robot spotwelding station



2. EPT-method

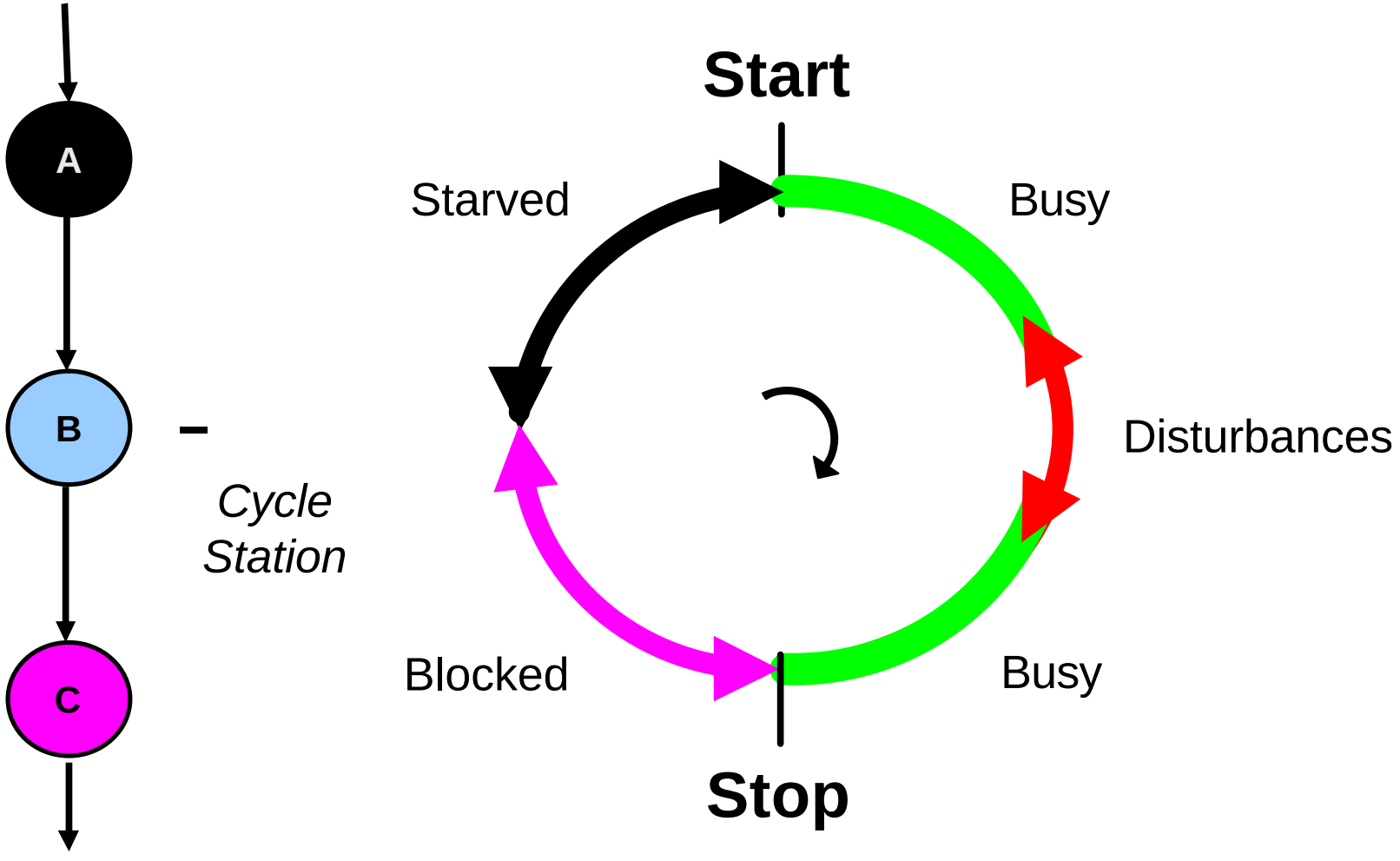
2.1 Definitions
2.2 Flow layout
2.3 Events
2.4 Database
2.5 Reports
2.6 Performance Control
2.7 Simulation

2.3 EPT events

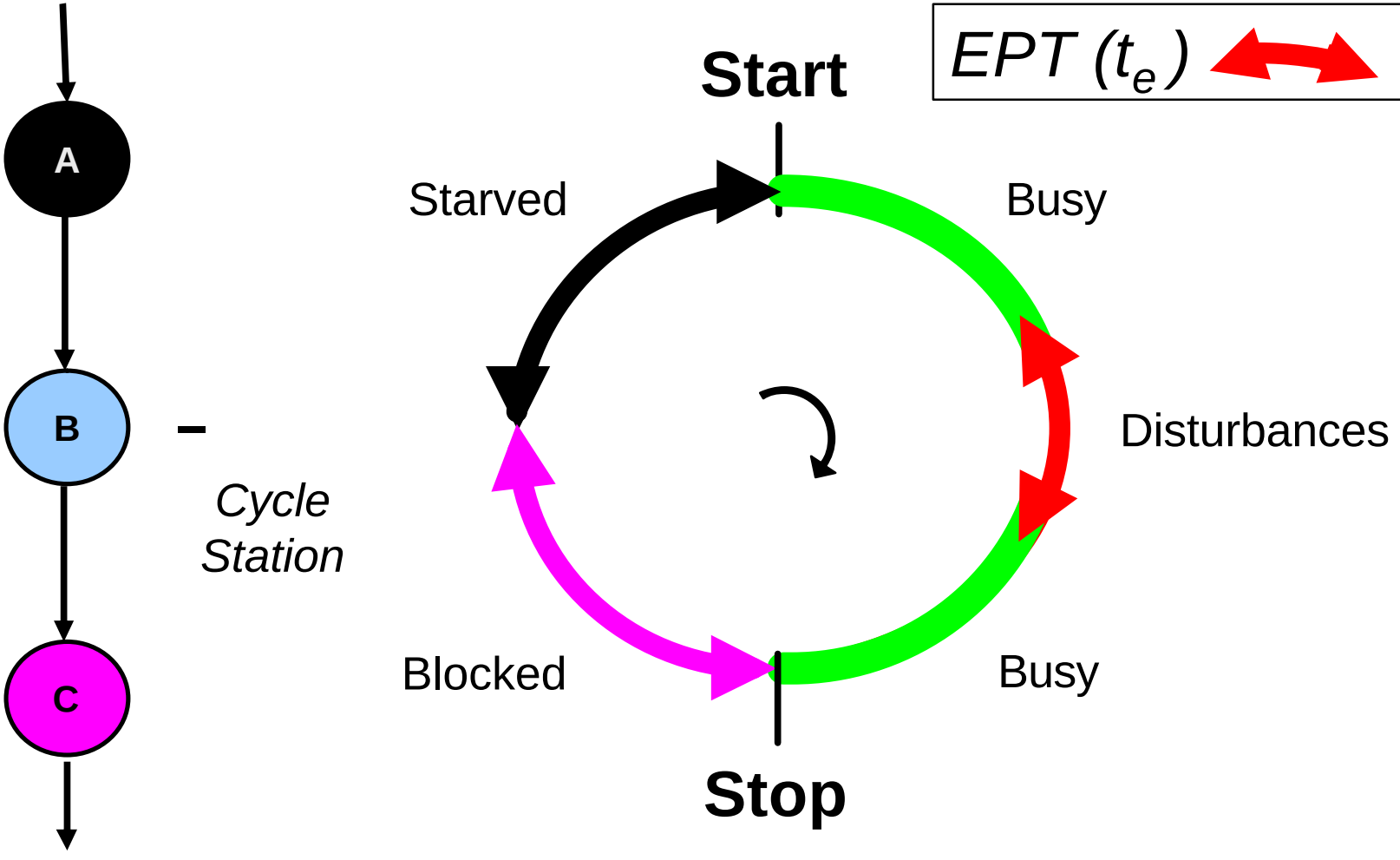


– *Cycle Station*

2.3 EPT events



2.3 EPT events



2. EPT-method

2.1 Definitions
2.2 Flow layout
2.3 Events
2.4 Database
2.5 Reports
2.6 Performance Control
2.7 Simulation

2.5 EPT Reports

Program TIPLOG

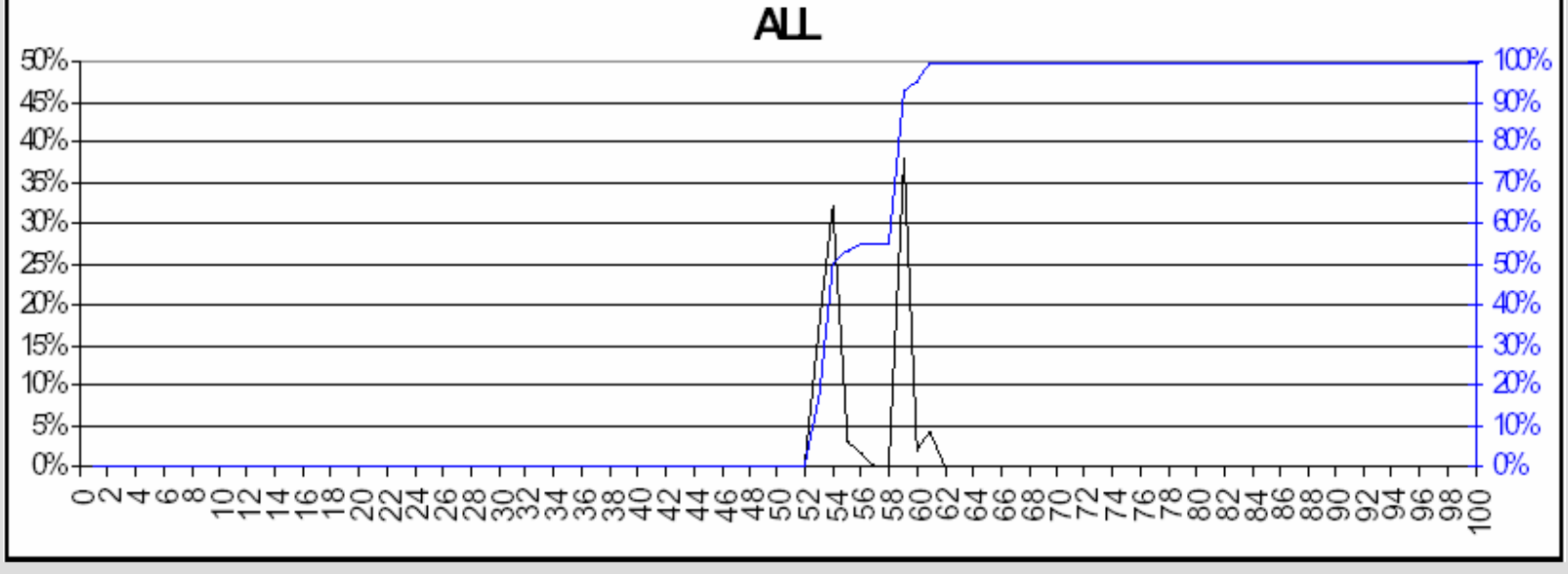
Selection criterion:

modezone	A29347A	start year	2006
line	34	stop year	2006
station	140	start week	16
> cycletime	20	stop week	16
< cycletime	7,200	start day	1
		stop day	5

Respot 1 & 2	
Robot spotwelding	4

Graph:

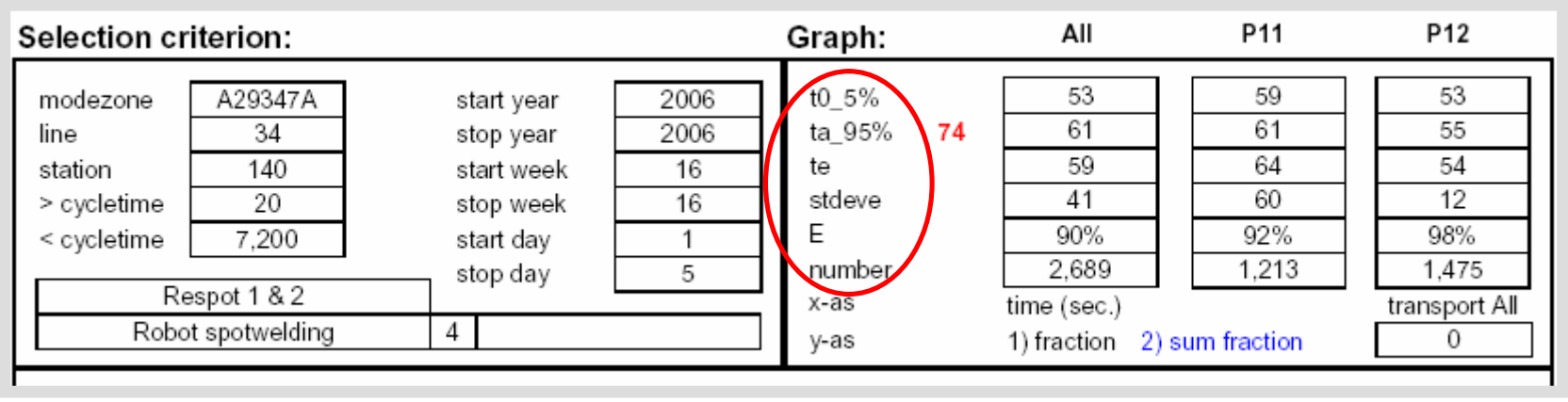
		All	P11	P12
t0_5%		53	59	53
ta_95%	74	61	61	55
te		59	64	54
stdeve		41	60	12
E		90%	92%	98%
number		2,689	1,213	1,475
x-as		time (sec.)		transport All
y-as		1) fraction	2) sum fraction	0



2. EPT-method

2.1 Definitions
2.2 Flow layout
2.3 Events
2.4 Database
2.5 Reports
2.6 Performance Control
2.7 Simulation

2.6 Performance control



Selection criterion:

modezone	A29347A
line	34
station	140
> cycletime	20
< cycletime	7,200

start year	2006
stop year	2006
start week	16
stop week	16
start day	1
stop day	5

Respot 1 & 2

Robot spotwelding | 4

Graph:

	All	P11	P12
t0_5%	53	59	53
ta_95% 74	61	61	55
te	59	64	54
stdeve	41	60	12
E	90%	92%	98%
number	2,689	1,213	1,475

x-as: time (sec.) — transport All: 0

y-as: 1) fraction 2) sum fraction

1) Trendline *Cycletime* (t_0)

2) Trendline *Capacity* (t_e)

3) Trendline *Variability* ($stdev_e$)

4) Trendline *Equipment effectiveness* ($E = t_0 / t_e$)

2.6 Performance control

Bottleneck analysis

station	te	te	stdev	stdev
	P11	P12	P11	P12
010	53	54	85	70
020	58	58	55	39
030	66	66	99	107
035				
040	54	55	52	95
050	53	53	48	45
060	56	57	36	60
070	61	60	80	61
080	55	54	49	39
100	53	54	65	79

Disturbance analysis

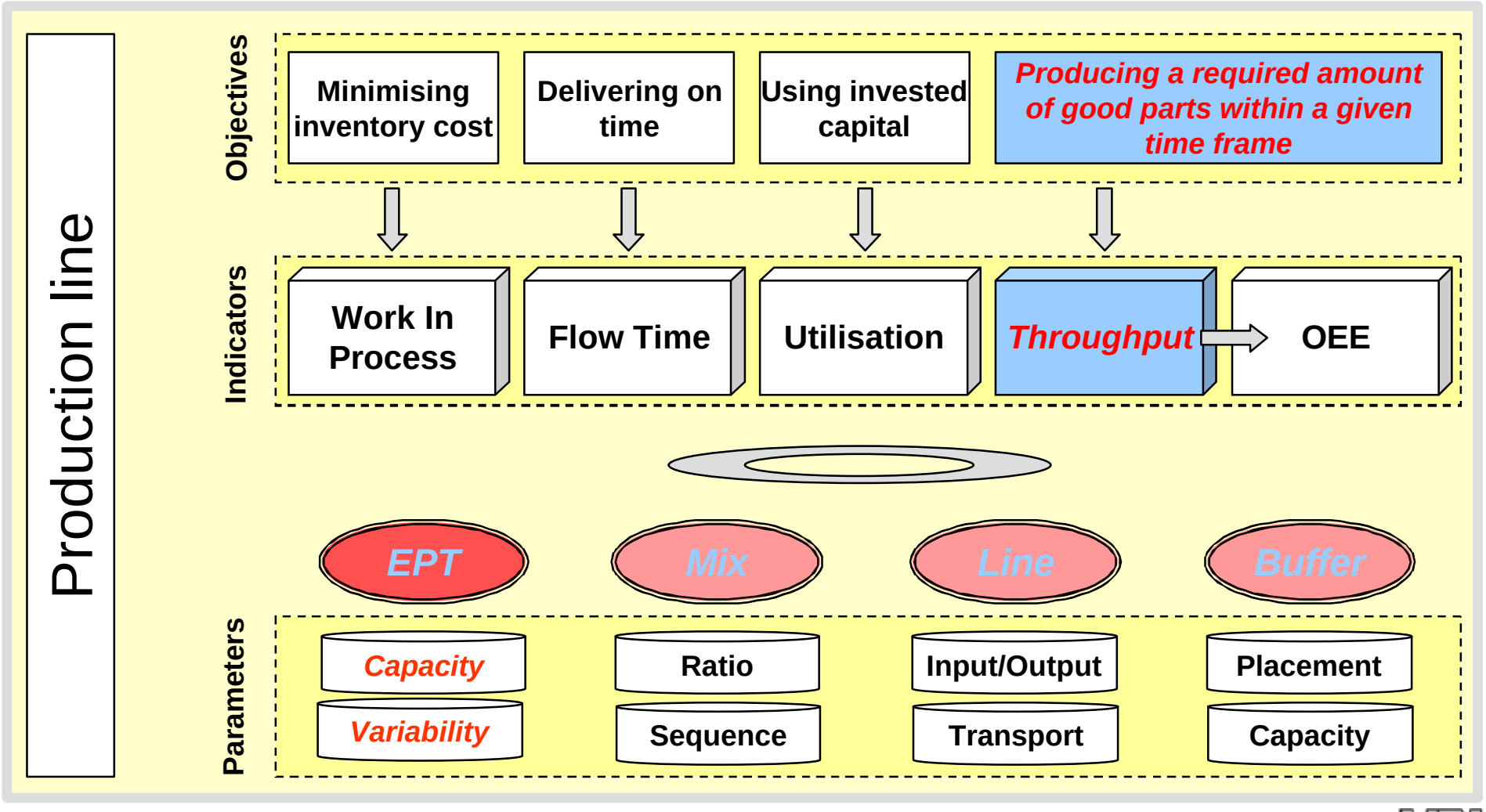
SUM	COUNT	CAUSE
2546	14	CHECK MEASUREMENT SYSTEM
2348	23	QUALITY SUCCESSION
2250	19	SCREW POSITION OF BOLTS NOK
1237	5	PICK FAILURE
913	7	EXTRA SUCCESSION / TESTS

2. EPT-method

2.1 Definitions
2.2 Flow layout
2.3 Events
2.4 Database
2.5 Reports
2.6 Performance Control
2.7 Simulation

2.7 EPT Simulation

Performance Framework



2.7 EPT Simulation

Example

EPT-metamodel SIBO

very high accuracy!!!

Content

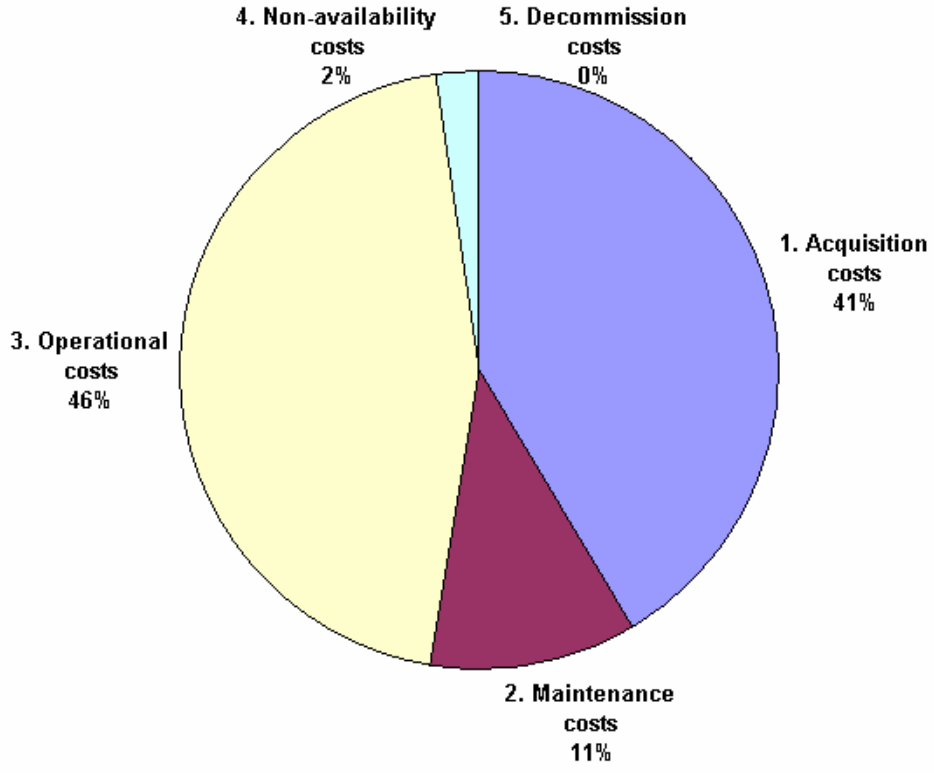
1. Problem
2. EPT-method
3. Cost / Profit analysis

3. Cost / Profit analysis

LIFE CYCLE COSTS SIBO

Currency = euro

100.000.000	Total
65	*Per body*
10	Years



1% throughput

~

100.000 Euro

minimum

per year

3. Cost / Profit analysis

station	te	te	stdev	stdev
	P11	P12	P11	P12
010	53	54	85	70
020	58	58	55	39
030	66	66	99	107
035				
040	54	55	52	95
050	53	53	48	45
060	56	57	36	60
070	61	60	80	61
080	55	54	49	39
100	53	54	65	79

A. Budget to optimise

B. Bottlenecks (high t_e / $stdev_e$)

C. Improvement opportunities

D. Simulation improvements

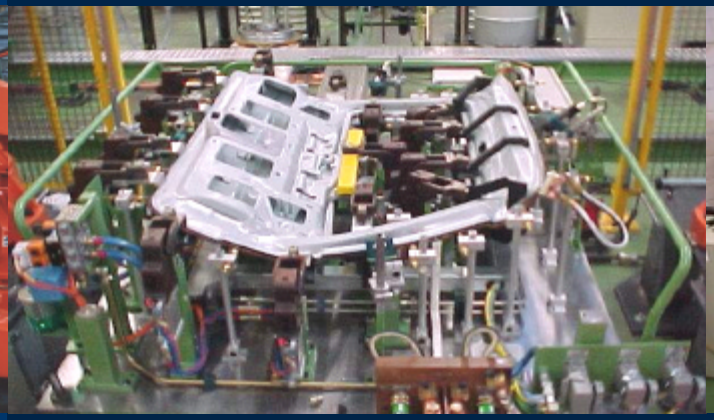
E. Cost / throughput ratio

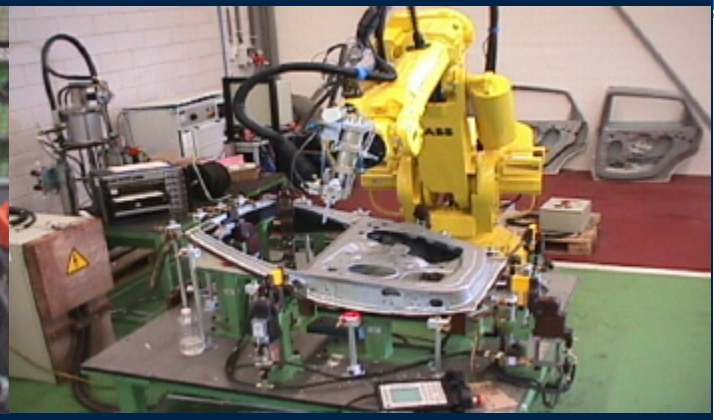
F. Return on investment

Summary

EPT Benefits

- ✓ Station Performance Control
- ✓ Bottleneck Analysis
- ✓ Simulation
- ✓ Cost / Profit Analysis
- ✓ Easy and Direct Data Feedback
- ✓ Fast Optimisation





VDL Steelweld

Strength through co-operation

VDL Steelweld
Terheijdenseweg 169
4825 BJ BREDA
The Netherlands

www.vdlsteelweld.com

EPT Throughput Control
a Major Breakthrough in the Industry!