

# Keep the Customer Satisfied

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Dick van Hees 04-11-2015/D&E Event

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Agenda

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# **Customer Expectation**

#### Expose Wafers

- Resolution (..nm)
- Field size (..\*..mm)
- Overlay (.nm)
- Throughput (...wph)
- Cost of Operation (. €/exposure)



#### **Functional Breakdown**

### Expose Wafers: €/exposure

- System Availability
- System Cost of Operation
- System Delivery Time



**Operational Breakdown** 

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# Translate Expectation $\rightarrow$ Specification

### **Operational Requirements**

- Availability (SEMI)
  - Reliability (MTBI, MTBF)
  - Serviceability (MTTR)
- Cost
  - System Cost
- Delivery Performance
  - Cycle Time (CT)
  - Part Quality (FPY, ZHDR)



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# Translate Expectation $\rightarrow$ Specification

Availability (wpy)

- Up Time
- Down Time
- Non Scheduled Time



Figure 2 SEMI E10 Summary of Time

# Translate Expectation $\rightarrow$ Specification

### €/exposure

- Cost Of operation
  - Maintenance Cost
  - Gas/fluids/electricity
  - Repair cost
- System Cost
  - Part Cost (Supplier Parts)
  - Build Cost

# **Delivery Performance**

- Time to Complete a system
  - Cycle time (build and test)
  - Disturbance Time (Part Quality/Part Availability/...)





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# Translate Expectation $\rightarrow$ Specification

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Functional Requirement/Part

**Operational Requirement/Part** 

- Part Quality (FPY & Zero Hour Defect Rate)
- Part Cost (€)
- Cycle Time (h)
- Reliability (Hits/part/year)
- Serviceability (MTTR)

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# **Prediction Methodologies**

#### **Operational Requirement/Part**

• Part Quality (Zero Hour Defect Rate)

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- Part Cost (€)
- Cycle time (h)
- Reliability (Hits/part/year)
- Serviceability (MTTR)

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Operational Requirements		РСВ	PCBA	Electro Mechanical	Mechanics	Mechatronics	
Part Quality							
FPY	%	$\checkmark$					
ZHDR	%/ppm						
Reliability	Hits/part/year						
Servicability							
Diagnostic	h						
Repair	h						
Recovery	h						
Part Cost	€	$\checkmark$					
Cycle Time	h						

# **Prediction Methodologies**

#### **Operational Requirement/Part**

Part Quality (Zero Hour Defect Rate)

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- Reliability (Hits/part/year)
- Serviceability (MTTR)
- Part Cost (€)
- Cycle time (h)

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# Zero Hour Defect Rate (ZHDR) Definition

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Zero Hour Defect Rate (ZHDR) Definition



Maximum accepted failure rate during system build (%) measured over an agreed period of time.

#### **Specification**

Requirement	Requirement	Verification		Source				
ID	Text	Min.	Тур.	Max.	Unit	method	Status	ID
	First Pass Yield (FPY). Required ability to manufacture part without rework or test.				%			
	Zero Hour Defect Rate (ZHDR). Maximum allowed part failure rate.				% DPMO			

#### Prediction

Requirement	Requirement	Verification		Source				
ID	Text	Min.	Тур.	Max.	Unit	method	Status	ID
	First Pass Yield (FPY). Calculated ability to manufacture part without rework or test.				%			
	Zero Hour Defect Rate (ZHDR). Calculated maximum allowed part failure rate.				% DPMO			
	Zero Hour Defect Rate (ZHDR) Manufacturing				% DPMO			
	Zero Hour Defect Rate (ZHDR) Design				% DPMO			

# Part Quality (ZHDR) Prediction Part Defect Opportunities



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 $ZHDR = 1 - \prod_{i=1}^{DO} [1 - DPMO_i * 10^{-6}]$ 

# Parts Quality (ZHDR) Prediction

#### Process ZHDR





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# Parts Quality (ZHDR) Methodology

#### New Product Introduction (NPI)

- Predict Supplier/Factory Part Quality in Design Phase
  - Based on the Preliminary BOM (PBOM)

MEM	DESCRIPTION	UNIT	ASSEMBLY	QUANTITIES		
NO.			OR FSN NO.	TROP	NORTH	
1-1	Louise Batter - santet sus an passie	14	3011	1		
1+1	Ports 205	14.	1647	1 .		
1-1			100-10-04	1 .	1	
1- 1	LANY CLOSTERS, WER BARE, INCHE PROPERTY, SHE'R (128 T	11	\$240-100 -010			
1-1	PERSTANCEMENT, & WINE, IL ANY, ILE .	11	1030-102-380	11	1.	
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	nee, second, 2/4 "s sta"	14	15+5-100-000		11	
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1-11		14	1070-111-000	1		
1+11	14.10, BAIRIE 199	11	3241-102-185			
1+4	DEITER, SAFETY, 868 AN7, 5157, 57	1.0	3838 - 101-100	1 1		
1-16	PRIE, ACARPANI,		\$1.13 - 182 - 541	•		
3-15	Unt. fest, tes ast, tis +			1.		
	7885 Parts . 38 Aur. 123 7	1110-10-10	11			
		E		E		



base

DPMO



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# Parts Quality (ZHDR) Prediction

Outcome is the Zero Hour Defect Rate



- Risk mitigation to bring the ZHDR at specified level
  - Design Change
  - Process change at Supplier/factory

• Test



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