Design in Practical Application,
Creativity and Process to form an Expertise L2

Lasciate ogni speranza, voi ch’entrate ; Dante Alighieri la comedia divina

L2 Internal Challenges

1. Departments and their roles
2. Product Creation Process
3. Challenges of implementation
4. Task 2 and Book 2

Lamentable Engineering

The solutions are not for our market !

New developments take far too long !

Engineers have no clue about costs !

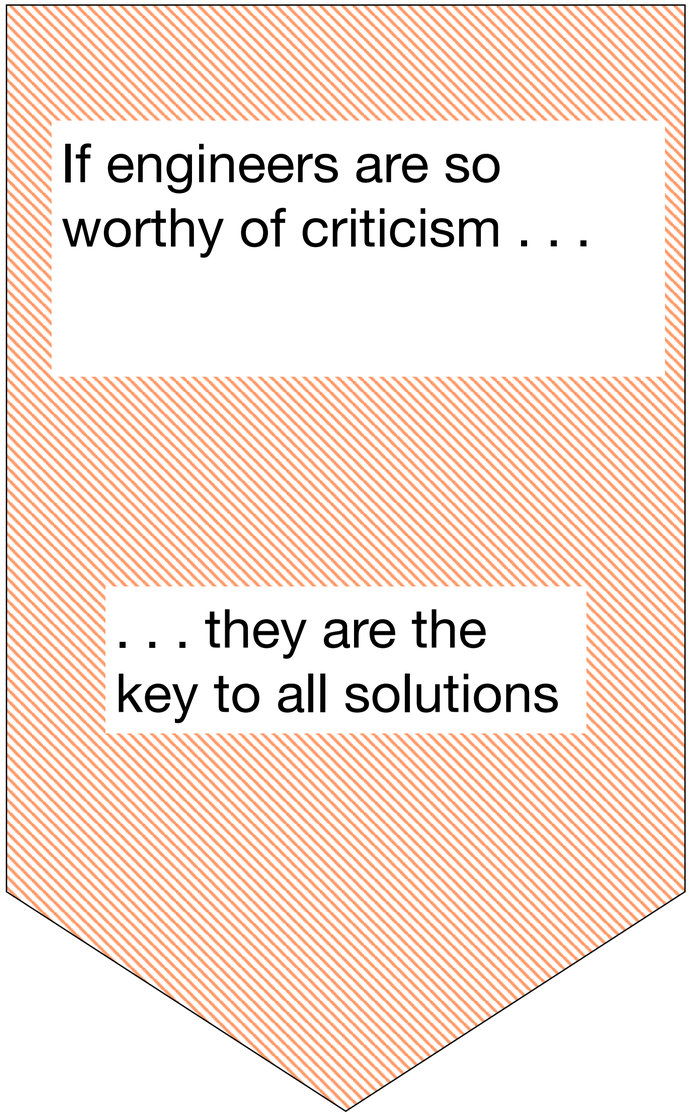
This cannot be produced, efficient !

Is it really possible to assemble this ?

What about a comprehensible documentation ?

Nobody can order the right spares !

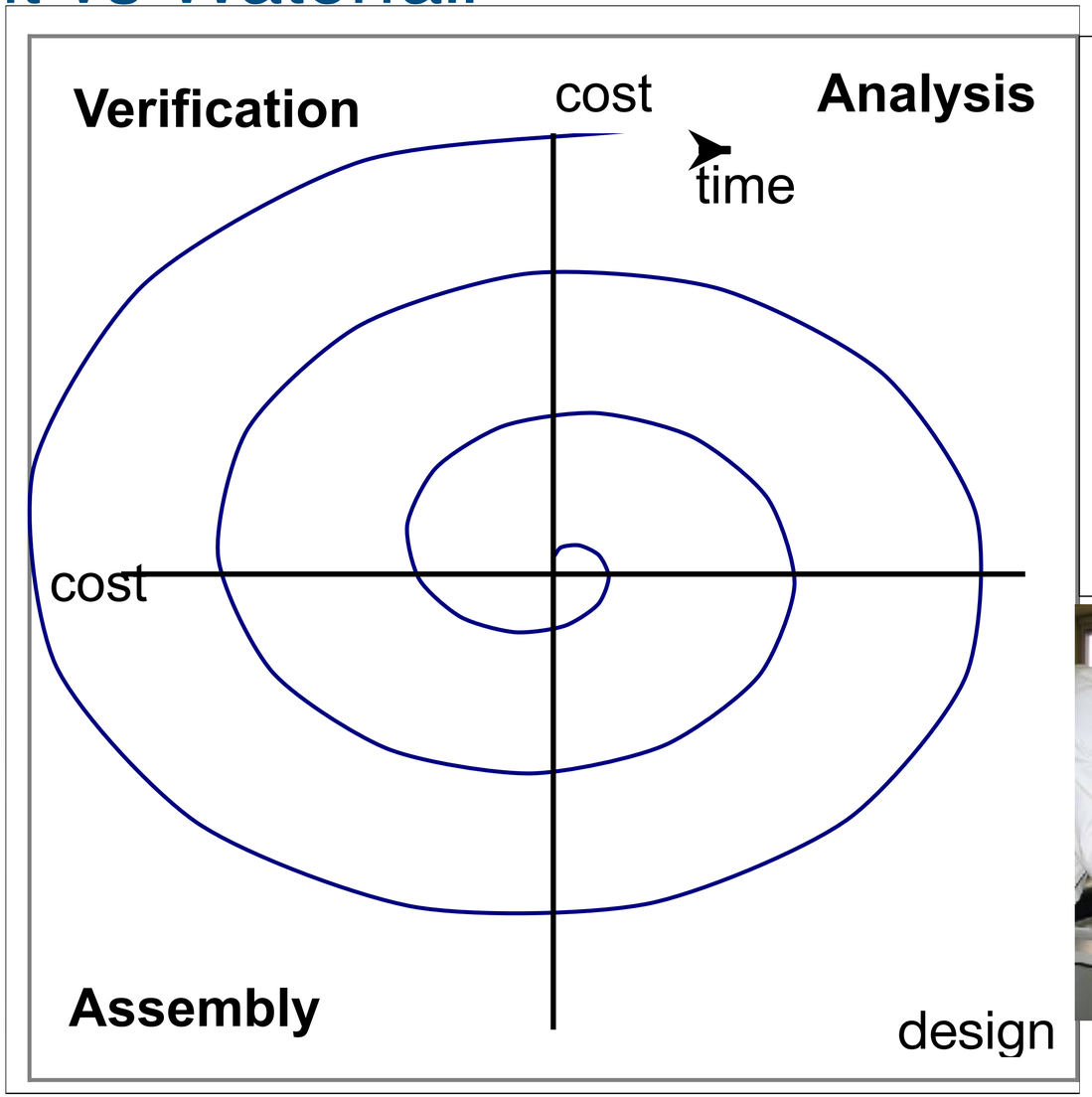
tbc . . .



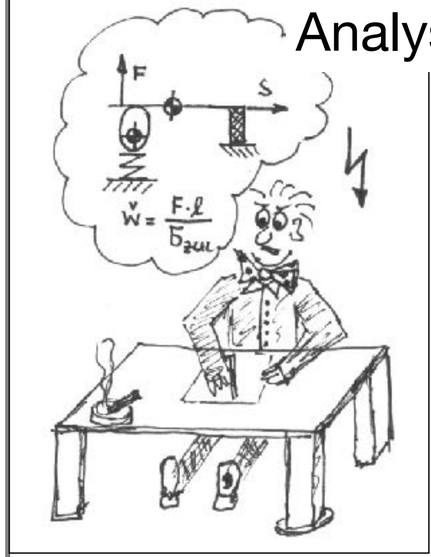
Continus Improvement vs Waterfall

Verification

Assembly



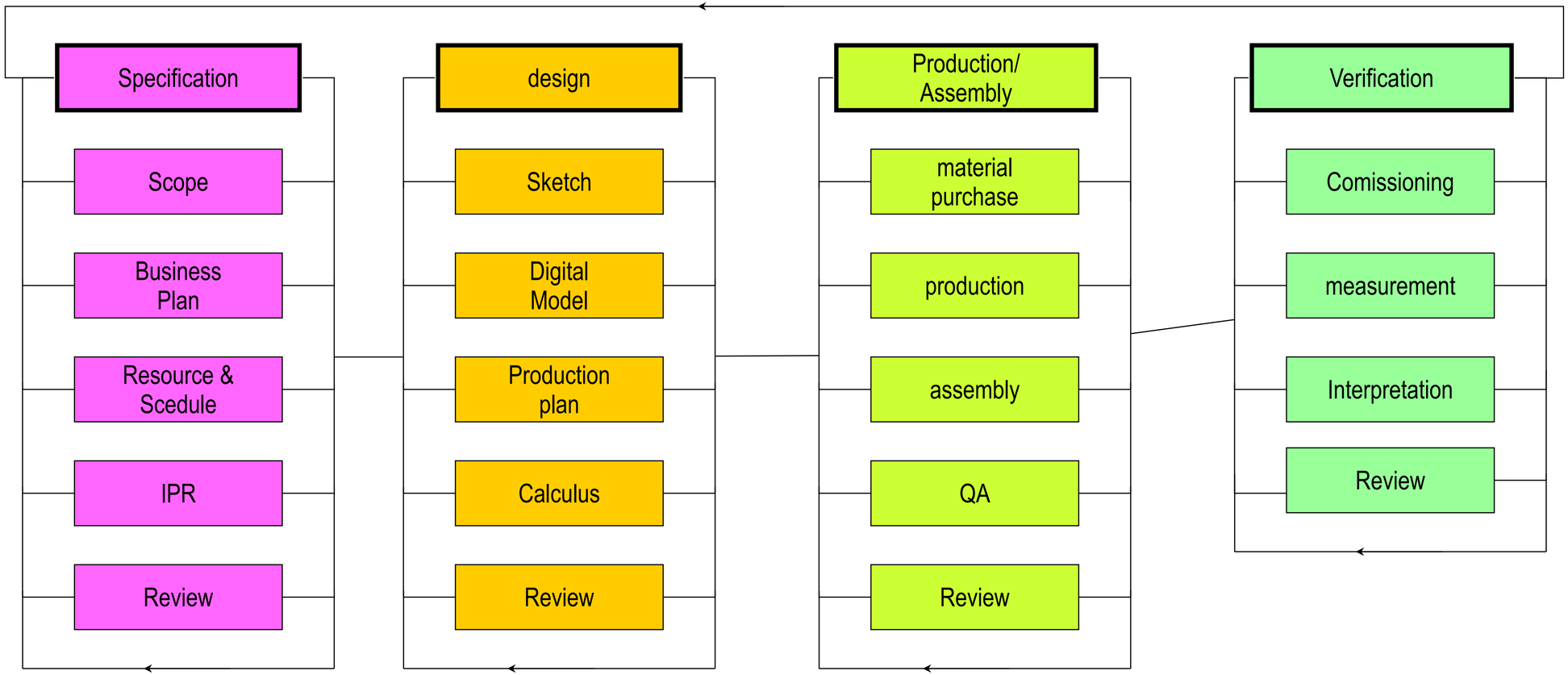
Analysis



Cooperation in Process

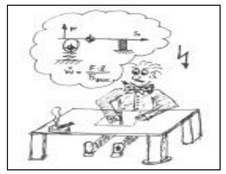
It is ALL connected

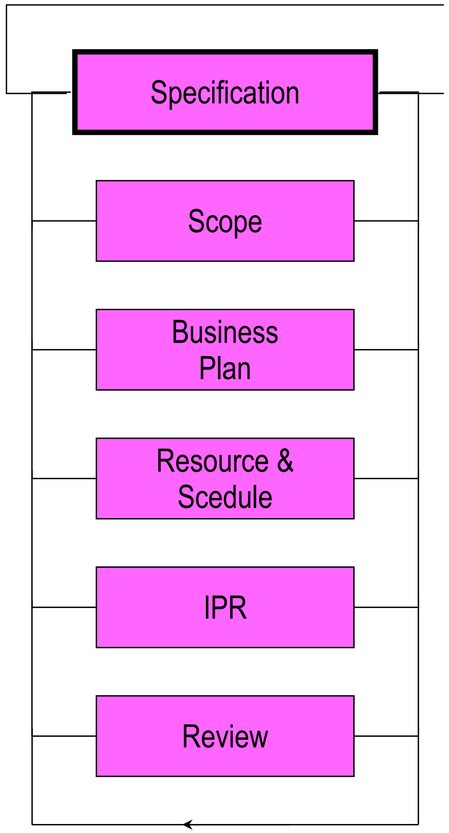
Design Process

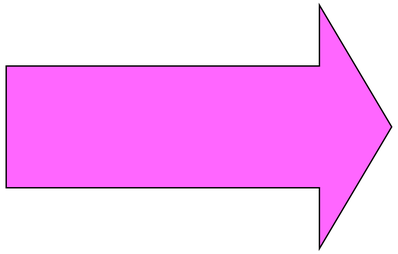


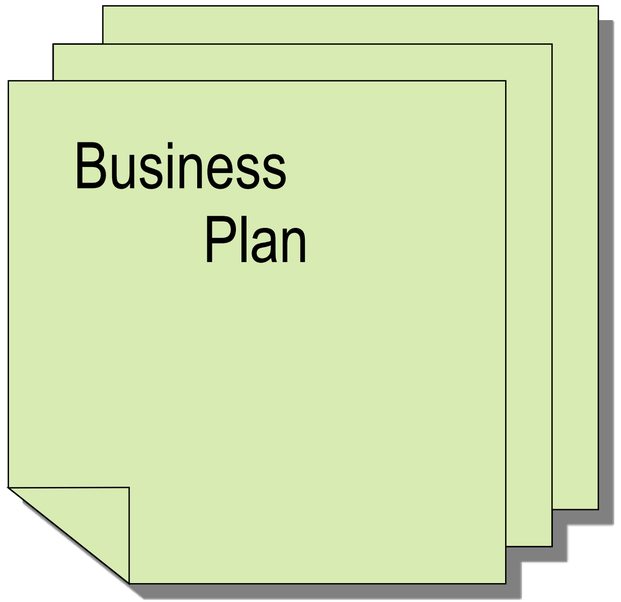
The Preparation of Design

Analysis





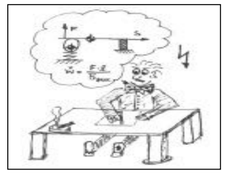




Remarks from the wooden siege

Business Plan

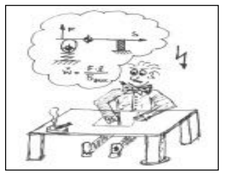
Analysis



1. Project description on LCD level
2. Technical description of the development
3. Conflicts with existing and potential **new** IPRs
4. Required internal and external resources
5. Task & responsibility assignement to r&d and production
6. Resource plan and schedule
7. Risk analysis
8. Financial plan

Business Plan (2)

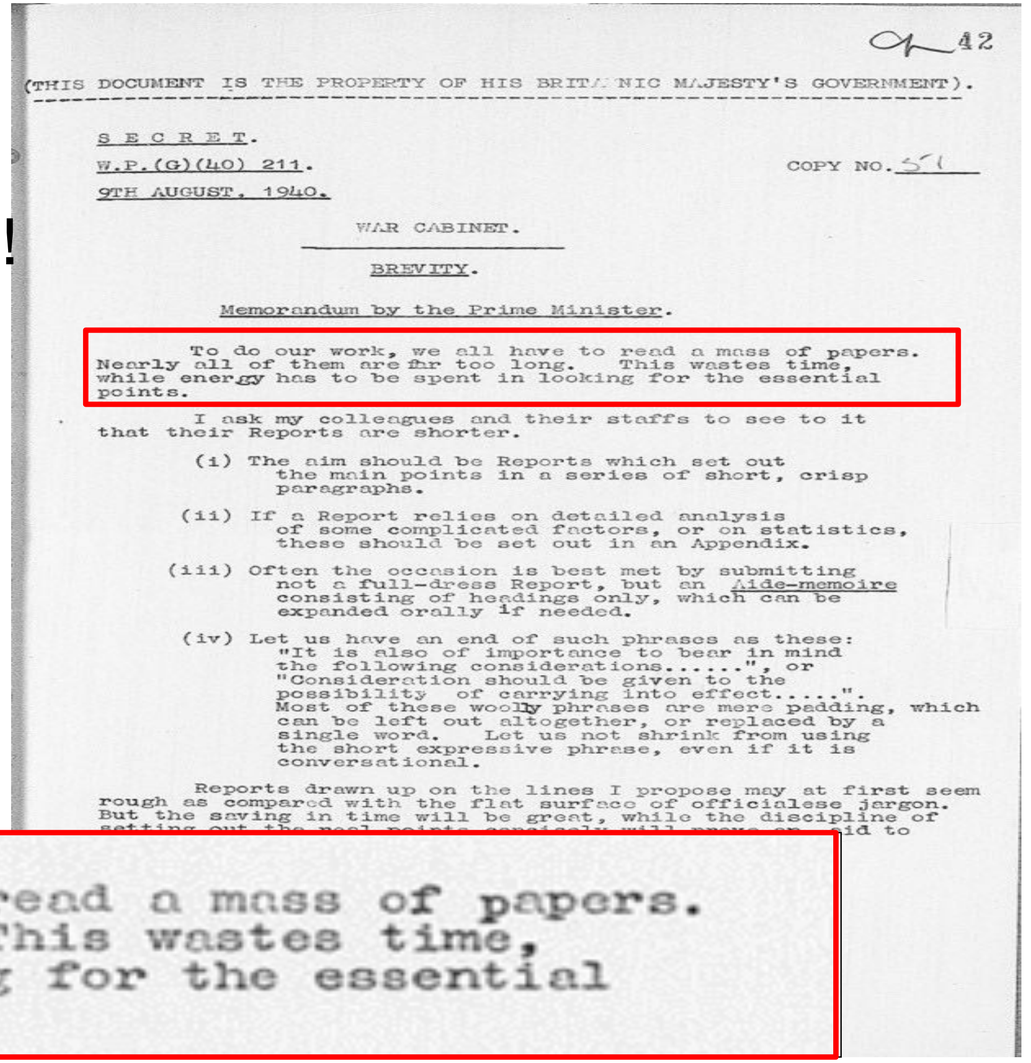
Analysis



1 Project description on LCD level max. 1 page !!

Winston Churchill : ONE page Memo

S ynopsis
F acts
A lternatives
R ecommendation



42

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SECRET.

W.P.(G)(40) 211. COPY NO. 51

9TH AUGUST, 1940.

WAR CABINET.

BREVITY.

Memorandum by the Prime Minister.

To do our work, we all have to read a mass of papers. Nearly all of them are far too long. This wastes time, while energy has to be spent in looking for the essential points.

I ask my colleagues and their staffs to see to it that their Reports are shorter.

(i) The aim should be Reports which set out the main points in a series of short, crisp paragraphs.

(ii) If a Report relies on detailed analysis of some complicated factors, or on statistics, these should be set out in an Appendix.

(iii) Often the occasion is best met by submitting not a full-dress Report, but an Aide-memoire consisting of headings only, which can be expanded orally if needed.

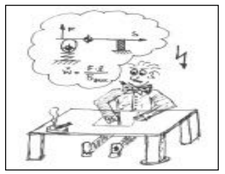
(iv) Let us have an end of such phrases as these: "It is also of importance to bear in mind the following considerations.....", or "Consideration should be given to the possibility of carrying into effect.....". Most of these woolly phrases are mere padding, which can be left out altogether, or replaced by a single word. Let us not shrink from using the short expressive phrase, even if it is conversational.

Reports drawn up on the lines I propose may at first seem rough as compared with the flat surface of officialese jargon. But the saving in time will be great, while the discipline of

To do our work, we all have to read a mass of papers. Nearly all of them are far too long. This wastes time, while energy has to be spent in looking for the essential points.

Business Plan (3)

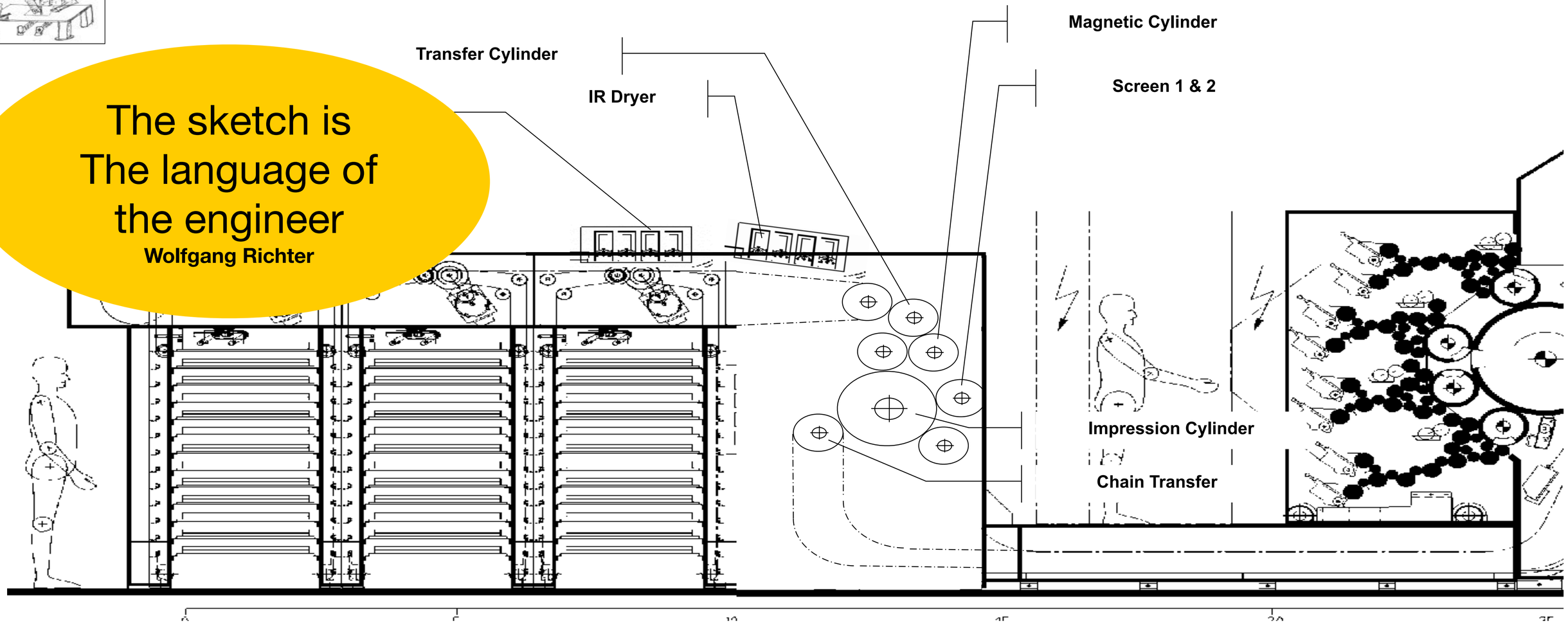
Analysis



2 Technical description of the development

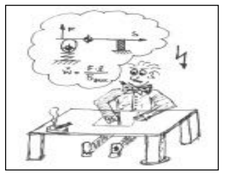
The sketch is
The language of
the engineer

Wolfgang Richter



Business Plan (4)

Analysis

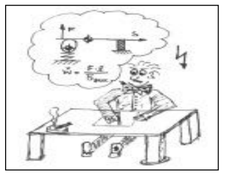


3 Conflicts with existing and potential new IPRs

- Patent research (competition, regions, categories)
- Novelty/strength of potential new IPRs
- Decide for formal application or trade secret
- Timely application (get the priority)
- Conscious publications ONLY

Business Plan (5)

Analysis

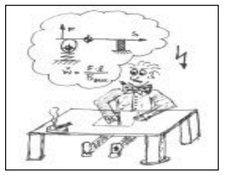


4 Required internal and external resources

- what can I do with resources “on bord” ?
  - Minimal : IPRs
  - Maximal : value chain
- what can / has-to-be done by partners
- how to integrate all partners

Business Plan (6)

Analysis



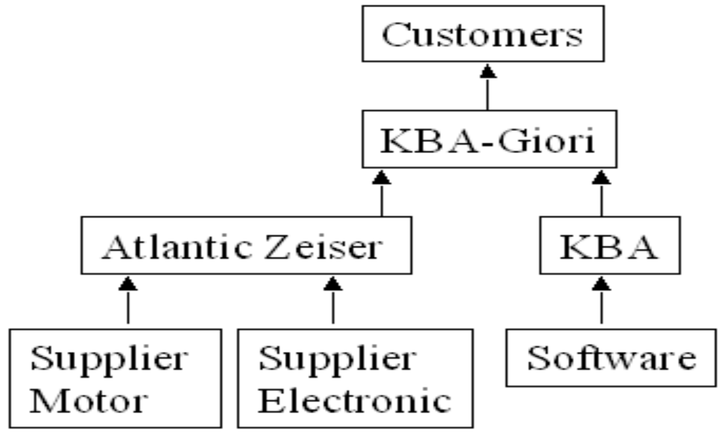
5 Task & responsibility assignement to r&d and production

5.2. Production model

For the production phase, we plan to propose a tender to Leibinger and to Atlantic Zeiser for the manufacturing of our new numbering box. This strategy will give a stronger position for negotiation.

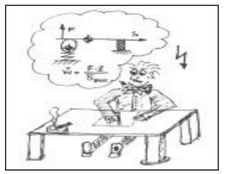
KBA-Giori will continue to sell the products directly to the customers and maintain exclusivity with the suppliers of the critical components, such as the motors and the electronic.

If the development of the electronic with KBA-Bielefeld starts, they would be the official supplier of all the electronic, control unit and of the software.



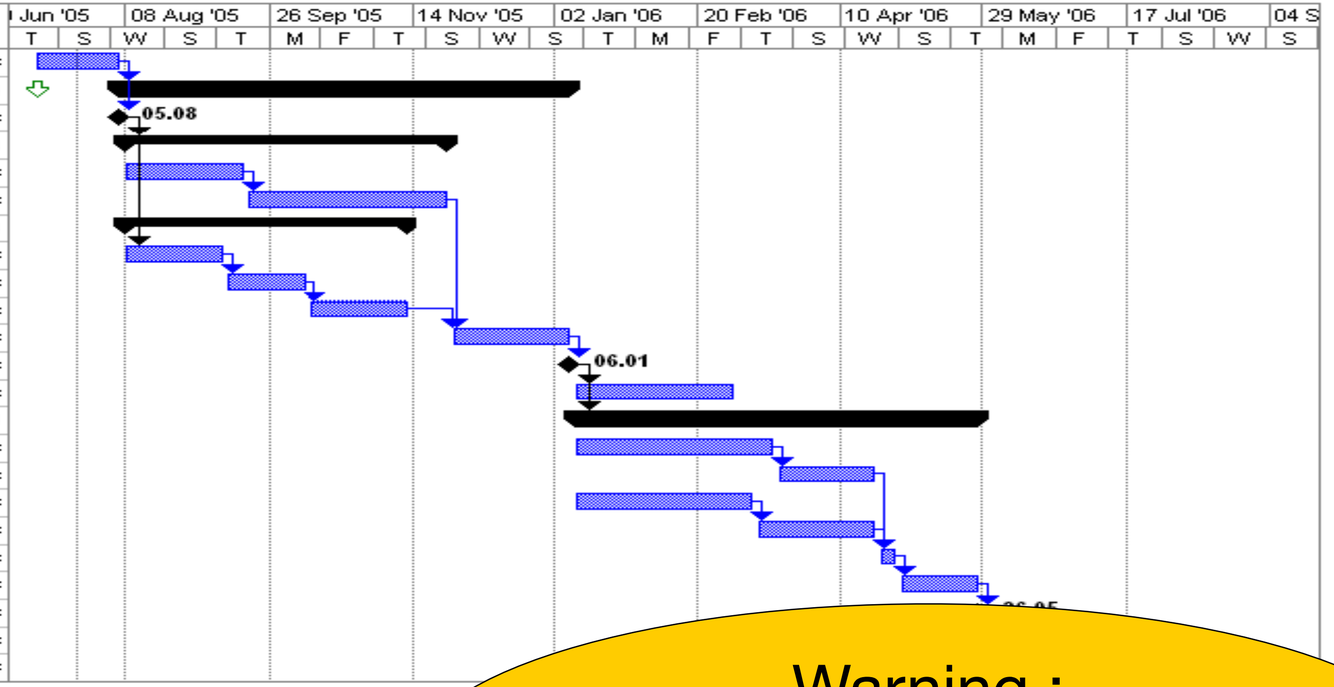
Business Plan (7)

Analysis



6 Resource plan and schedule

ID	Task Name	Duration
1	Selection of the partners	21 days
2	**Phase 1: demonstrator**	**110 days**
3	Kick-off	0 days
4	**Mechanical design**	**80 days**
5	Construction	30 days
6	Machining	50 days
7	**Electronic design**	**70 days**
8	Electronic selection	25 days
9	Ordering and assembly	20 days
10	Coding	25 days
11	Assembly and testing	30 days
12	Demonstrator acceptance	0 days
13	Ageing testing	40 days
14	**Phase 2: prototype**	**100 days**
15	Mechanical Design	50 days
16	Machining	25 days
17	Dedicated Electronic Design	45 days
18	Electronic Manufacturing	30 days
19	Prototype assembly	5 days
20	Prototype Quality Testing	20 days
21	Prototype acceptance	0 days
22	Ageing testing	40 days
23	Phase 3: Industrialisation -> AZ	60 days

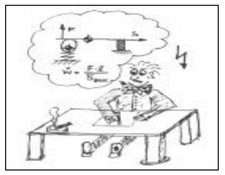


Warning :
Der Mensch denkt
Gott lenkt !

Wie heisst die Vergangenheitsform ?

Business Plan (7)

Analysis

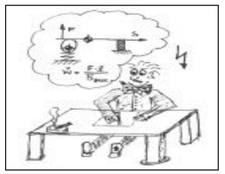


8 Risk analysis

- CYA
- What can go wrong :
  - Laws of physics in application
  - Production
  - Market
- Murphy’s Law
- Baden Powell
- What is the most useless possession in the world ?

Business Plan (7)

Analysis



9 Financial plan

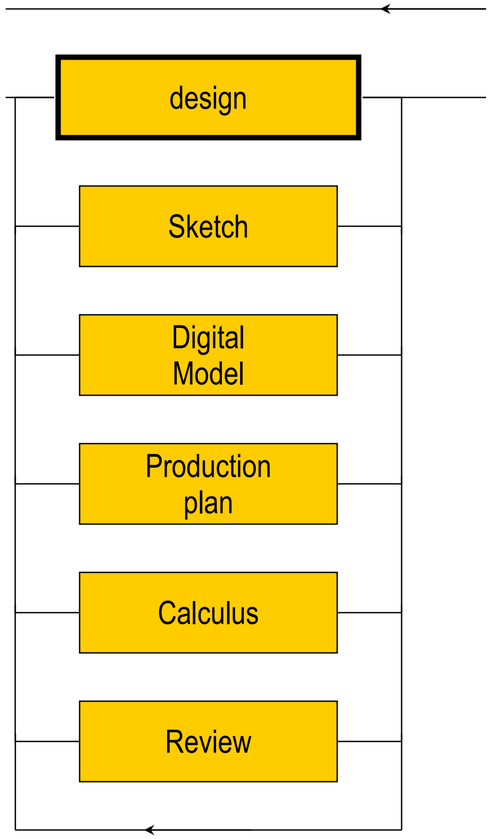
8.3. Financial summary

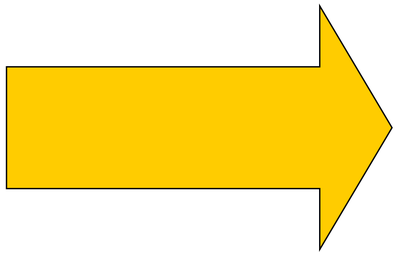
8.3.1. Profit & Loss statement (CHF 000)

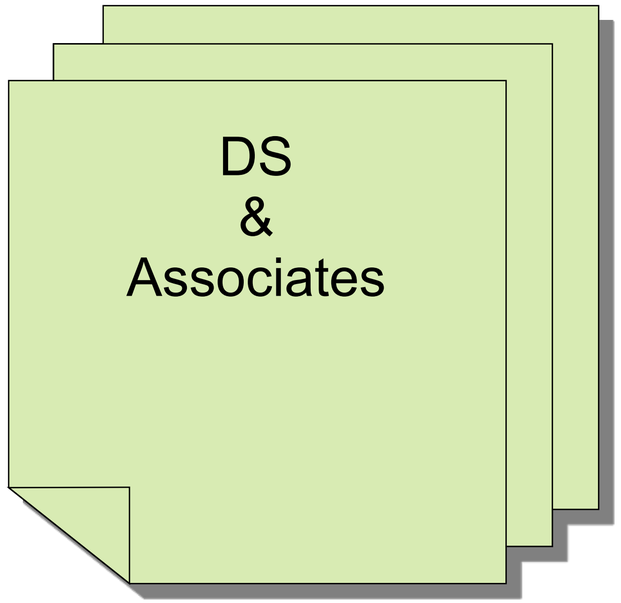
	2005	2006	2007	2008	2009	2010	2011	2012
Sales								
NumBox	0	0	480	1'920	3'360	3'840	4'800	2'400
Spare parts	0	0	12	60	144	240	360	420
Training service	0	0	24	96	168	192	240	120
Total Sales	**0**	**0**	**516**	**2'076**	**3'672**	**4'272**	**5'400**	**2'940**
Cost of good sold	0	0	246	990	1'752	2'040	2'580	1'410
Gross Margin	**0**	**0**	**270**	**1'086**	**1'920**	**2'232**	**2'820**	**1'530**
Operating expenses								
Product overhead costs	0	0	96	384	672	768	960	480
Training costs	0	0	12	48	84	96	120	60
R&D internal	100	200	0	0	0	0	0	0
Development costs external	120	330	50	50	50	0	0	0
Total operating expenses	**220**	**530**	**158**	**482**	**806**	**864**	**1'080**	**540**
EBIT	**(220)**	**(530)**	**112**	**604**	**1'114**	**1'368**	**1'740**	**990**
Net Income (15% taxes)	**(220)**	**(530)**	**112**	**513**	**947**	**1'163**	**1'479**	**842**

Design

Design







Remarks from the wooden siege

Design (2)

Design

1. Design Specification DS
2. Open Points List OPL
3. Model (3D?)
4. Calculation
5. Production Specification

Design (3)

Design

1. Design Specification DS

Microsoft Excel - KPH smart skip Vorl.

File Edit View Insert Format Tools Data Window Help

C10

	A	B	C	D	E	F	G
1	Konstruktions Pflichtenheft smart skip				5/28/2007		
2							
3	Agg	item	explanation	BGR	BGRname	date	rev
4	DW	Nummerierwerkskurven Entnahme	Die Nummerierwerkskurven können mit der Nummerierwerkswelle entnommen werden. Ablage auf Quick release device im Farbwerk	202	Nummerierwerkskurven	2003-03-11	4/1
5	DW	Nummerierwerkswellen Entnahme	Die Nummerierwerkswellen können mit der Nummerierwerkskurven entnommen werden. Ablage auf Quick release device im Farbwerk. Die Anschlüsse von ENC etc. sind für die schnelle Entnahme (ohne Stecker) auszuführen.	204	Nummerierwerkswelle	2003-03-11	6/1
6	DW	Nummerierwerkswelle Register	Seiten und Umfangsregister der gesamten Welle +/- 1.0 im Lauf verstellbar. Achtung mit Nummereierwerkskurven überprüfen	207	Register Verstellung	2003-03-11	11/2
7	DW	Nummerierwerke Reinigungseinrichtung	Die Reinigungseinrichtung ist zu verbessern. Die manuelle Reinigung ist als Vorbild zu nehmen. Evemtuell dünner Film der Reinigungsflüssigkeit aus FW beziehen. Die Bewegung ist zirkular.	253	Reinigungseinrichtung	2003-03-11	11/2
8	DW	Nummerierwerke Justieren	Die Nummerierwerke werden auf ihre endgültige Position im Druckwerk positioniert. Minimal in Seite und Umfang 3.0 mm. Wahrscheinlich durch Tool im Aussenbereich der Welle.	276	Vormontagevorrichtung	2003-04-11	6/1
9							
10							
11							
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26							

BG 276 | BG 253 | BG 207 | BG 204 | BG 202 | Gesamt

Ready

assembly
or
functions ?

Design (4)

Design

2. Open Points List OPL

Microsoft Excel - BEP_16_06_05 [Read-Only]

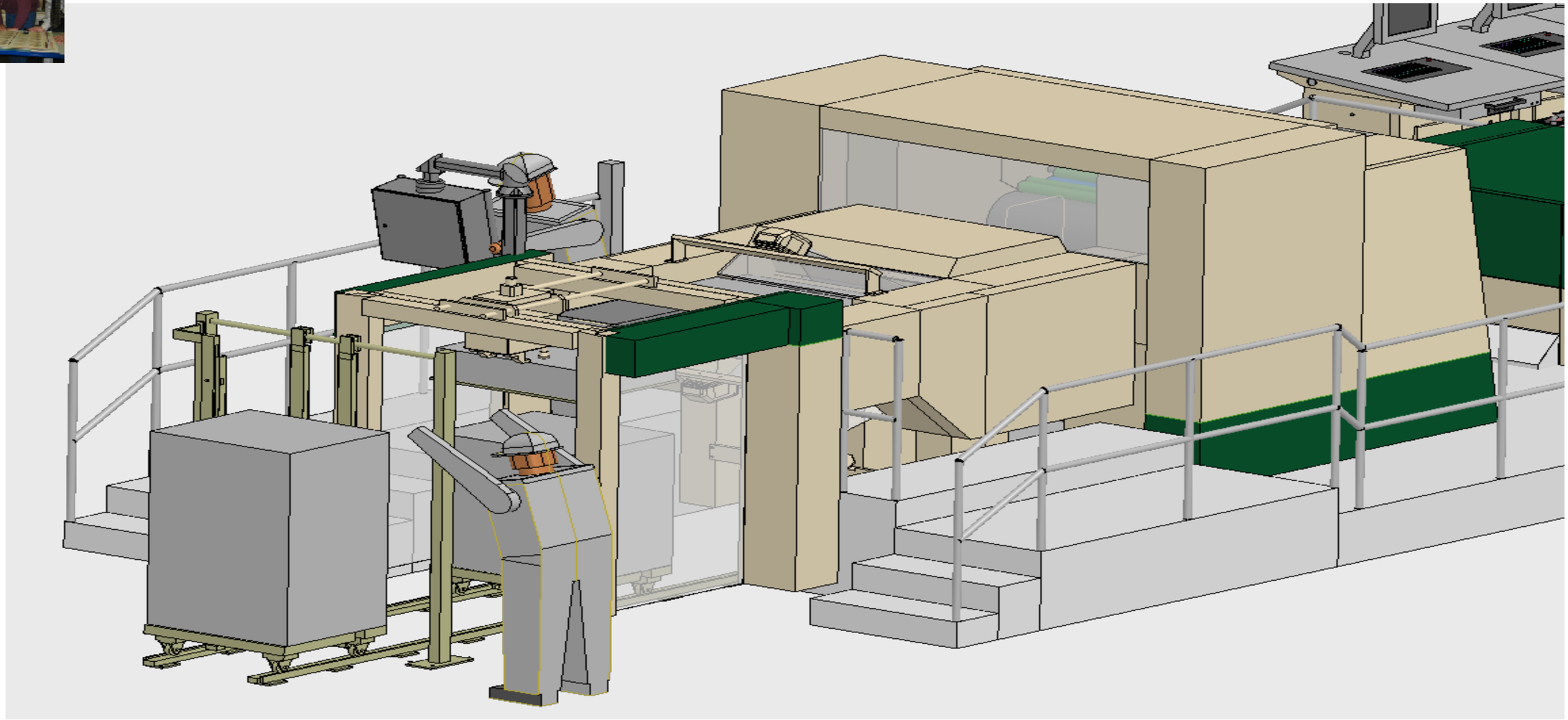
Necessary Reworks on M/s 63402401 / 02 BEP — **16/06/05**

Nr.	Open Points	Solution	Parts	Responsible	63402401	finished	63402402	finished
1	Emission capture system	Modification as discussed with Volkmar and Michael	new	Ch. Kapper / K. Pappenscheller	6/26/2005		7/5/2005	
2	new Plexiglas doors for the Inking unit	new Design / Modification	new	Ch. Kapper / K. Pappenscheller	6/26/2005		7/5/2005	
3	Modification of Ink leveler (combine with the Emission capture)	new Design / Modification	new	Ch. Kapper / K. Pappenscheller	6/26/2005		6/25/2005	
4	Duct handles must be improved - safety	new Design / Modification	new	Ch. Kapper / K. Pappenscheller	6/26/2005		7/5/2005	
5	Hydraulic blade spray - change to old system	new Design / Modification	new	V. Schwitzky / K. Pappenscheller	6/26/2005		7/5/2005	
6	Replace the blade control (Hydraulic) of the wiping tank		no	R. Gerdenitsch / K. Pappenscheller	6/17/2005	6/14/2005	6/17/2005	6/9/2005
7	Change the Ink fountain to the Standard Colotronic System		no	K. Pappenscheller	6/17/2005	6/14/2005		6/15/2005
8	Overshoot area needs to be made of Plexiglas or perforated metal	new Design / Modification	new / rework	Ch. Kapper / K. Pappenscheller	6/19/2005		6/19/2005	
9	Gripper control: Support with a new guide and new timing point for gripper opening	new Design / Modification	new / rework	K. Nagler / K. Pappenscheller	6/19/2005		6/19/2005	
10	**This point has been resolved with point No. 11**	new Design / Modification	new	K. Nagler / K. Pappenscheller				
11	**Installation of ventilators in the modular delivery**	new Design / Modification	new	K. Nagler / K. Pappenscheller	6/21/2005		6/18/2005	
12	Modular delivery - lengthen the chain from the pile board		rework	K. Pappenscheller	6/17/2005			
13	On / Off Position of wiping cylinder - movement problems on side 1 ; rework of the hydraulic cylinder holder		rework	K. Pappenscheller	6/17/2005	6/14/2005	6/17/2005	6/15/2005
14	new wash position of Inking unit (new bar and limit switch)		no	K. Pappenscheller	6/17/2005	6/15/2005	6/17/2005	6/16/2005
15	Rework of the Ink agitator		rework	Ch. Kapper / K. Pappenscheller	6/20/2005		6/20/2005	
16	Valve for front air control to be reworked (new position of the pin)		rework	K. Nagler / K. Pappenscheller	6/17/2005	6/16/2005	6/17/2005	6/16/2005
17	add emergency stop on the drive side of the press		new	T. Kühnke / K. Pappenscheller / J. Horvath	6/15/2005	6/15/2005	6/15/2005	6/15/2005
18	Install safe ready collars on all emergency stop buttons		new	T. Kühnke / K. Pappenscheller /	6/15/2005	6/16/2005	6/15/2005	6/15/2005

Design (5)

Design

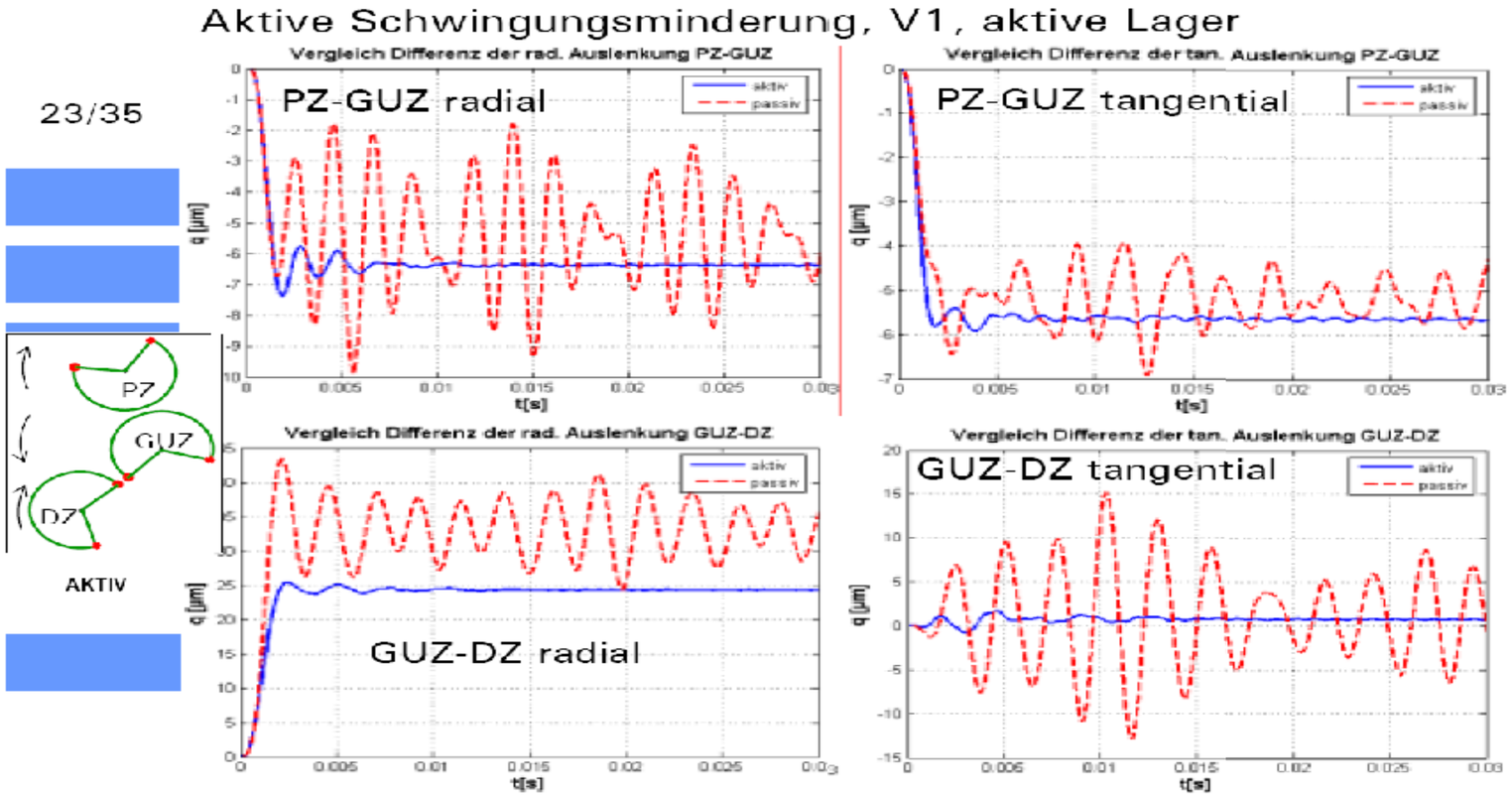
3. Model (3D?)



Design (6)

Design

4. Calculation



Design (7) Product Specification

Design

Geometrie

L_1,..,L_i,.....

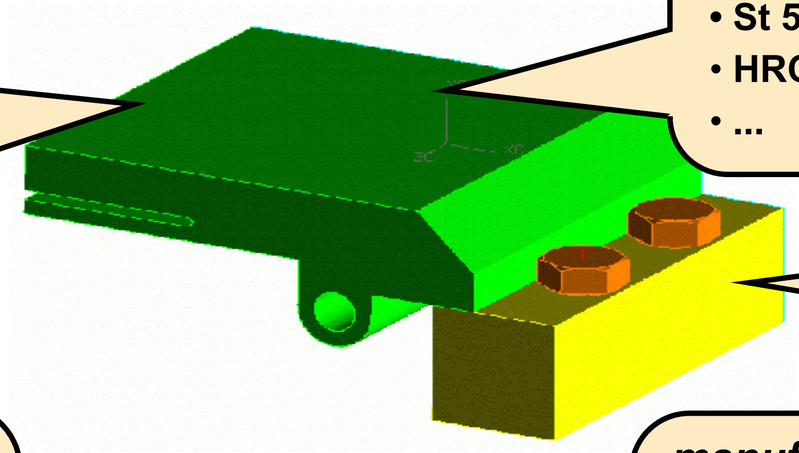
- **Tolerance**
  - fit
  - form
  - position etc
- **...**

Function:

- **$\tilde{O}_1$=150 N/mm²**
- **St 52,3**
- **HRC 54**
- **...**

Referencobjekt:

- **Navigations-instrument**
- **ID No (Who are you?)**
- **Order No**
- **Assembly No**
- **(x,y,z)(t)**
  (Where do you belong?)
- **....**



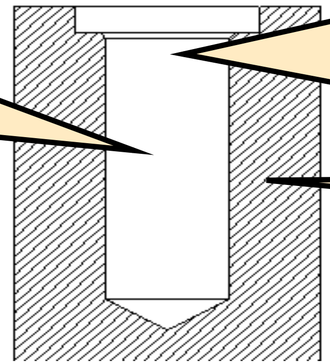
Geometrie

L_1,..,L_i,.....

- **Tolerances**
  - fit
  - form
  - position etc
- **...**

manufacturing:

- **machines**
- **tools**
- **cycles, trajectories**
- **speeds**
- **...**



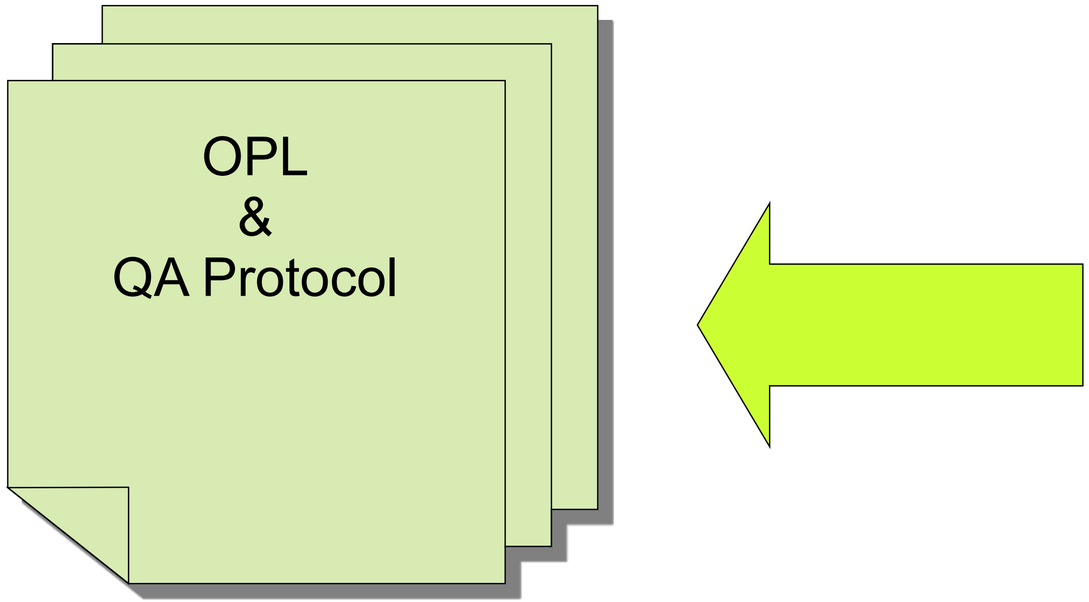
Design - features:

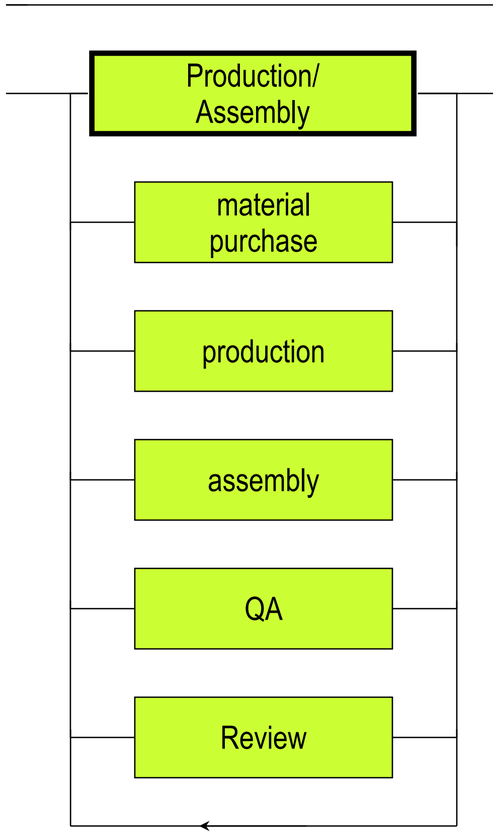
- **Further geometries**
- **Assembly elements**
- **....**

Remarks from the wooden siege

Production (1)

Production / Assembly





Production (2) Progress & Cost Control

Production / Assembly

1. Open Points List OPL

Microsoft Excel - BEP_16_06_05 [Read-Only]

Necessary Reworks on M/s 63402401 / 02 BEP — **16/06/05**

Nr.	Open Points	Solution	Parts	Responsible	63402401	finished	63402402	finished
1	Emission capture system	Modification as discussed with Volkmar and Michael	new	Ch. Kapper / K. Pappenscheller	6/26/2005		7/5/2005	
2	new Plexiglas doors for the Inking unit	new Design / Modification	new	Ch. Kapper / K. Pappenscheller	6/26/2005		7/5/2005	
3	Modification of Ink leveler (combine with the Emission capture)	new Design / Modification	new	Ch. Kapper / K. Pappenscheller	6/26/2005		6/25/2005	
4	Duct handles must be improved - safety	new Design / Modification	new	Ch. Kapper / K. Pappenscheller	6/26/2005		7/5/2005	
5	Hydraulic blade spray - change to old system	new Design / Modification	new	V. Schwitzky / K. Pappenscheller	6/26/2005		7/5/2005	
6	Replace the blade control (Hydraulic) of the wiping tank		no	R. Gerdenitsch / K. Pappenscheller	6/17/2005	6/14/2005	6/17/2005	6/9/2005
7	Change the Ink fountain to the Standard Colotronic System		no	K. Pappenscheller	6/17/2005	6/14/2005		6/15/2005
8	Overshoot area needs to be made of Plexiglas or perforated metal	new Design / Modification	new / rework	Ch. Kapper / K. Pappenscheller	6/19/2005		6/19/2005	
9	Gripper control: Support with a new guide and new timing point for gripper opening	new Design / Modification	new / rework	K. Nagler / K. Pappenscheller	6/19/2005		6/19/2005	
10	**This point has been resolved with point No. 11**	new Design / Modification	new	K. Nagler / K. Pappenscheller				
11	**Installation of ventilators in the modular delivery**	new Design / Modification	new	K. Nagler / K. Pappenscheller	6/21/2005		6/18/2005	
12	Modular delivery - lengthen the chain from the pile board		rework	K. Pappenscheller	6/17/2005			
13	On / Off Position of wiping cylinder - movement problems on side 1 ; rework of the hydraulic cylinder holder		rework	K. Pappenscheller	6/17/2005	6/14/2005	6/17/2005	6/15/2005
14	new wash position of Inking unit (new bar and limit switch)		no	K. Pappenscheller	6/17/2005	6/15/2005	6/17/2005	6/16/2005
15	Rework of the Ink agitator		rework	Ch. Kapper / K. Pappenscheller	6/20/2005		6/20/2005	
16	Valve for front air control to be reworked (new position of the pin)		rework	K. Nagler / K. Pappenscheller	6/17/2005	6/16/2005	6/17/2005	6/16/2005
17	add emergency stop on the drive side of the press		new	T. Kühnke / K. Pappenscheller / J. Horvath	6/15/2005	6/15/2005	6/15/2005	6/15/2005
18	Install safe ready collars on all emergency stop buttons		new	T. Kühnke / K. Pappenscheller /	6/15/2005	6/16/2005	6/15/2005	6/15/2005

Production (2) Progress & Quality Control

Production / Assembly

2. QA Protocol

ABNAHMEZERTIFIKAT

DIESES ABNAHMEZERTIFIKAT WIRD IN GEGENSEITIGEM EINVERNEHMEN ZWISCHEN DEM AUFTRAGGEBER UND DEM AUFTRAGNEHMER ERSTELLT UND LEGT DAS DATUM DER ERFOLGREICHEN ABNAHME FEST.

1.	AUFTRAGGEBER	Papierfabrik Louisenthal GmbH Louisenthal 1 Postfach 1 185 83701 Gmund am Tegernsee, Deutschland
2.	AUFTRAGNEHMER	KBA-GIORI S A. 4, rue de la Paix CH-1003 Lausanne, Schweiz Ref. des Auftragnehmers: 220596
3.	BESTELLUNGSNUMMER UND DATUM	4500044321 / 17. August 2006
4.	ERKLAERUNG	Beide Parteien erklären hiermit, dass die nachstehend aufgeführte Maschine die Inbetriebnahme Funktion registerhaltige OVI erfolgreich bestanden hat und somit vom Auftraggeber akzeptiert wird.
5.	ANLAGE	1 (ein) WebSave Inspektionsystem.
6	ORT UND DATUM	Gmund am Tegernsee, den 29. M. 2006

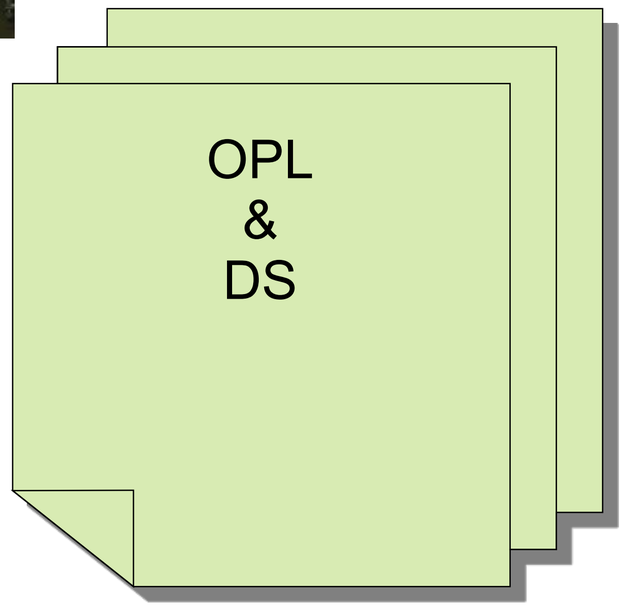
UNTERSCHRIFTEN

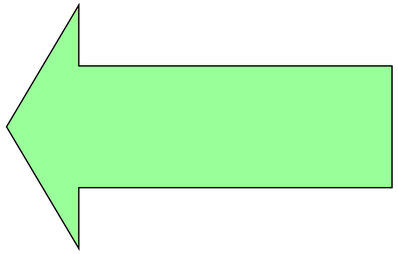
FUER DEN AUFTRAGGEBER
PAPIERFABRIK LOUISENTHAL GmbH

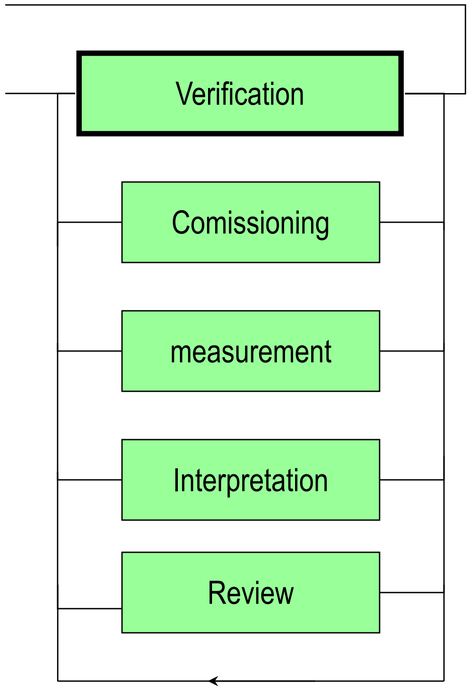
FUER DEN AUFTRAGNEHMER
KBA-GIORI S A.

Verification (1)

Verification



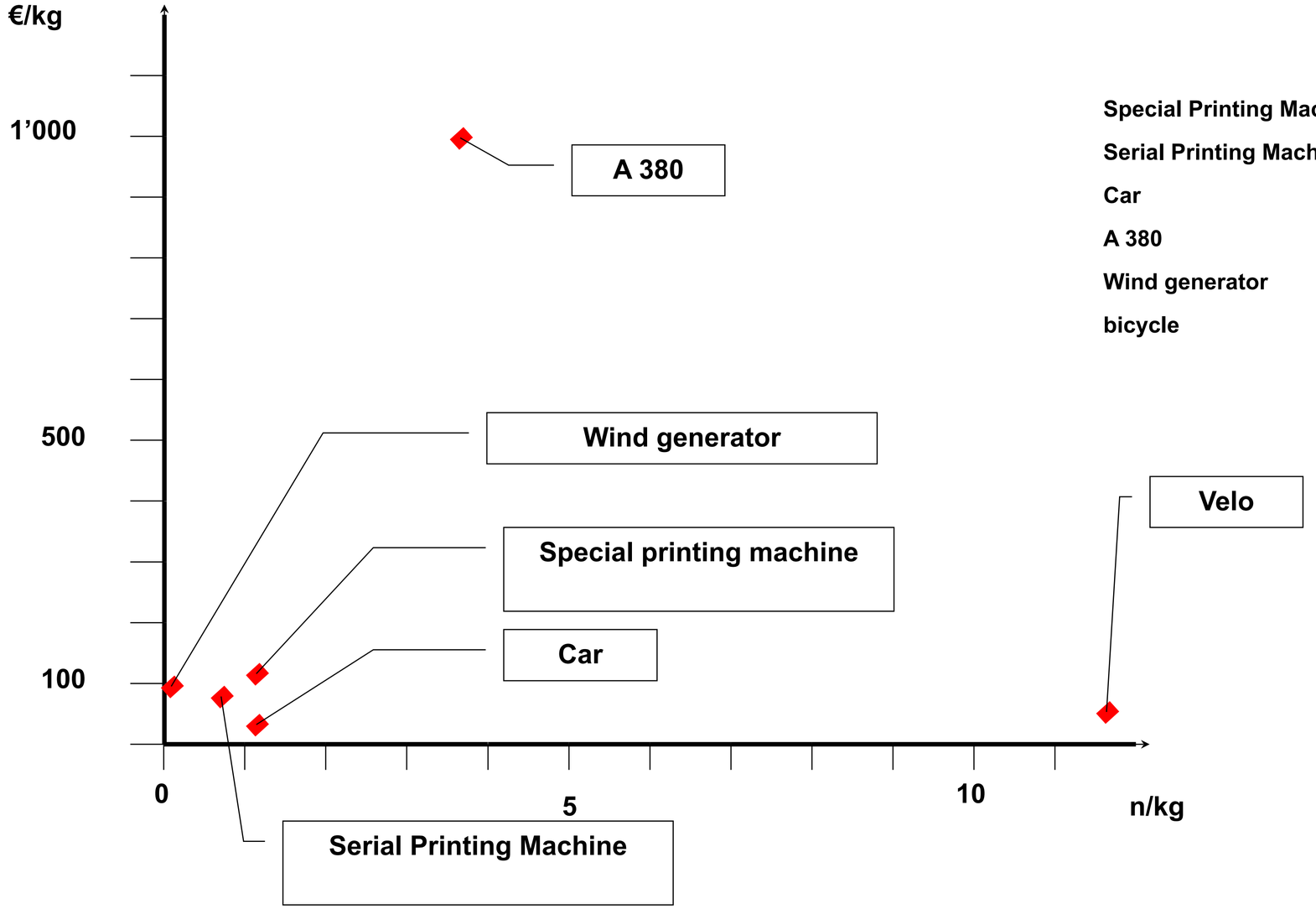




Estimate the Unknown (1)

	weight	VK_0	spez. price	parts	complex
	kg	€	€/kg	n	n/kg
Special printing machine	24,500	2,800,000	114.29	25,000	1.02
Serial printing machine	32,000	2,600,000	81.25	20,000	0.63
Car	1,560	47,000	30.13	1,800	1.15
A 380	243,000	250,000,000	1,028.81	750,000	3.09
Wind generator 2MW	120,000	12,000,000	100.00	3,600	0.03
bicycle	15.0	850	56.67	180	12.00

Estimate the Unknown (2)



	spez. Preis €/kg	complex n/kg
Special Printing Machine	114.29	1.02
Serial Printing Machine	81.25	0.63
Car	30.13	1.15
A 380	1,028.81	3.09
Wind generator	100.00	0.03
bicycle	56.67	12.00

Design Management

When are changes in design allowed ?

1. Does not work !

- It does not work as intended; trap : correct Analysis
- The customer requires a different (better?) functionality ; trap : customer abuse as whip

2. Too expensive !

- The competition is so much cheaper ; trap : miracles are the monopoly of gods not engineers
- The customer does not get the required ROI; trap : trimester-bean-counting-acrobats
- The savings come back immediately; trap : missing facts

All other reasons are PURE waste

Estimate the Unknown (3) Resources

How to estimate project costs ?

Analysis

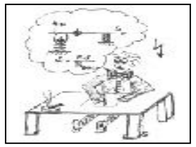
Design

Production/
assembly

Verification

Resources	Dimension	Tarif
Genius	€/hr	50
Designer	€/hr	100
assemblies	€/kg	115
field engineer	€/hr	85

Estimate the Unknown (3) Resources and Stages



Analysis

Design

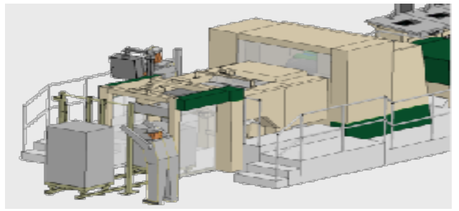
Assembly

Verification

description	example	per assembl	average values		
		Analysis [hr]	design 3D CAD Para [hr]	Assembly[%]	Verification [hr]
more than 30% new parts; basically different function	Change from gear to seperate servo drives	8	200	50	60
max 30%new parts, function is basically identical	Change of bearing due to supplier constraint	4	100	30	40
max 10% new parts;function identical; variant is foreseen in parameter set of the basic function	Adaptation of diameter of plate cylinder for Offset web press	0	16	10	5
max 3% new parts, function and design remain identical	change of paint due to customer specification	0	8	0	0

Estimate the Unknown Variants and True Costs (1)

model calcul special print machine		2,800,000 €
weight	24,500	kg
No. of assemblies	250	-
average assembly weight	98	kg
average assembly cost	11,200	€



machine project	no of assembl	Analysis	design	assembly	verification
completely NEW	250	100,000 €	5,000,000 €	4,226,250 €	1,275,000 €
specific changes	0	0 €	0 €	0 €	0 €
adaptation	0	0 €	0 €	0 €	0 €
maintain/repeat	0	0 €	0 €	0 €	0 €
Total	**10,601,250 €**	100,000 €	5,000,000 €	4,226,250 €	1,275,000 €

All New

machine project	no of assembl	Analysis	design	assembly	verification
completely NEW	50	20,000 €	1,000,000 €	845,250 €	255,000 €
specific changes	50	10,000 €	500,000 €	732,550 €	170,000 €
adaptation	50	0 €	80,000 €	619,850 €	21,250 €
maintain/repeat	100	0 €	80,000 €	1,127,000 €	0 €
Total	**5,460,900 €**	30,000 €	1,660,000 €	3,324,650 €	446,250 €

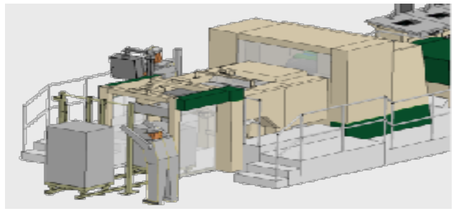
new main aggregates

machine project	no of assembl	Analysis	design	assembly	verification
completely NEW	20	8,000 €	400,000 €	338,100 €	102,000 €
specific changes	70	14,000 €	700,000 €	1,025,570 €	238,000 €
adaptation	70	0 €	112,000 €	867,790 €	29,750 €
maintain/repeat	90	0 €	72,000 €	1,014,300 €	0 €
Total	**4,921,510 €**	22,000 €	1,284,000 €	3,245,760 €	369,750 €

New main assemblies

Estimate the Unknown Variants and True Costs (2)

model calcul special print machine		**2,800,000 €**
weight	24,500	kg
No. of assemblies	250	-
average assembly weight	98	kg
average assembly cost	11,200	€



machine project	no of assembl	**Analysis**	**design**	**assembly**	**verification**
completely NEW	0	0 €	0 €	0 €	0 €
specific changes	30	6,000 €	300,000 €	439,530 €	102,000 €
adaptation	60	0 €	96,000 €	743,820 €	25,500 €
maintain/repeat	160	0 €	128,000 €	1,803,200 €	0 €
Total	**3,644,050 €**	6,000 €	524,000 €	2,986,550 €	127,500 €
machine project	no of assembl	**Analysis**	**design**	**assembly**	**verification**
completely NEW	0	0 €	0 €	0 €	0 €
specific changes	0	0 €	0 €	0 €	0 €
adaptation	0	0 €	0 €	0 €	0 €
maintain/repeat	250	0 €	200,000 €	2,817,500 €	0 €
Total	**3,017,500 €**	0 €	200,000 €	2,817,500 €	0 €

Customer adaptation
In parameter set

Maintained
Series

Tips ’n’ Tricks

Problem-Solving
fatal exception 0E

Remarks from the wooden siege

A small little exercise

A small little exercise for you :

Write a One Page Memo to convince your board to implement your favourite idea for a disruptive product

A reading recommendation

Thank you, and

have fun !