



Bu bildiri 6. Uluslararası Ankiros Döküm kongresinde sunulmuştur

This paper was presented on 6th Ankiros Foundry Congress

http://kongre.tudoksad.org.tr/

Eylül 2012 September 2012 Tüyap, İstanbul



Optimised Computer-Aided Product Planning & Costing in the Foundry Industries with the Help of RGU OPTI

September 2012 Dr. Christiane Pacyna-Friese, Kai Bembenek

RGU

Content

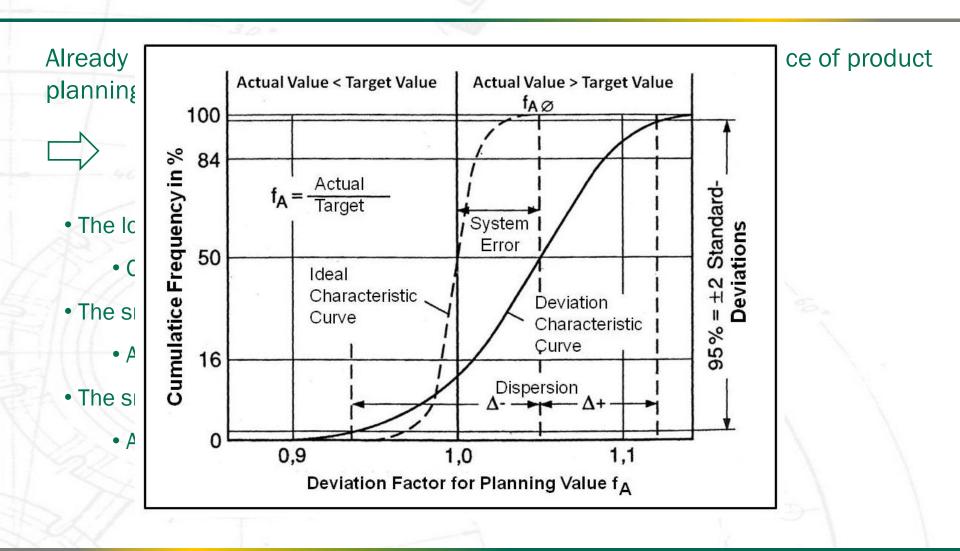
A Historical Approach

- A Study from 1968
- Weight Calculation and Classification

Some Current Features of RGU OPTI

- Multiple Cause Variable Calculation
- Inquiry Calculation
- Cost Calculation
- Pricing
- Simulation Tools and Decision Helper
- Information Systems for the Production
- Integration of the Planning System

Is there a Future for Foundries?



September 2012

RGU



Is there a Future for Foundries?

Already in **1968** a study was published which proved the importance of product planning for the foundry industry

The lowest prime costs

- Optimise the processes start with the biggest influences
- The smallest system error of the deviation factors
 - Analyse your system error (in detail)
- The smallest dispersion of the deviation factors
 - Analyse your dispersion (in detail)



Measures

Invest in more effective facilities, tools etc.

Revise your logistic processes, your suppliers etc.

Train you Clarify the details

Revise y

Elimate

Start with the big issues

calculate

Eliminat unsyster

difficulti

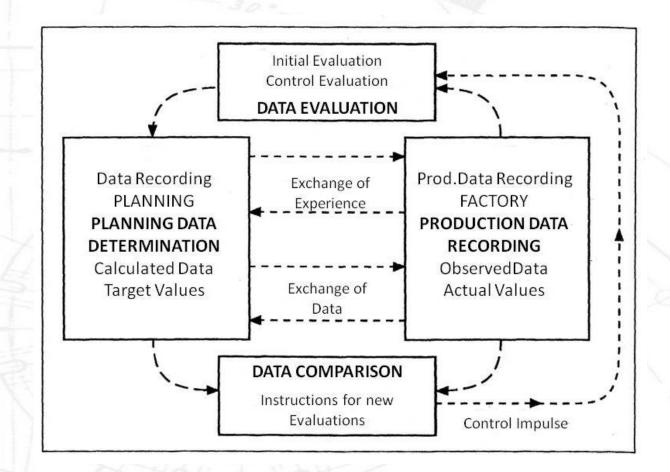
Figure out ... and change it

bad

son,

Set up an effective control loop of information in your the factory

Control Loop of Information



The goal of a successful planning system is to set up and support the control loop of information in the factory in order to achieve an improvement of the calculation systems step-by-step and to show ways to more effective technical and logistical solutions.

Planning - Production - Feedback-Reporting - Analysing - Adjustment

September 2012

RGU



The Results are still valid

Measures:

Invest in more effective facilities, tools etc. Revise your logistic processes, your suppliers etc. Train your staff ... in the factory shops, in the offices Revise your cost calculation and your cost building system Elimate inappropriate basis data, formulas or nomograms, bad calculated weights etc Eliminate errors e g forgotten materials or operations

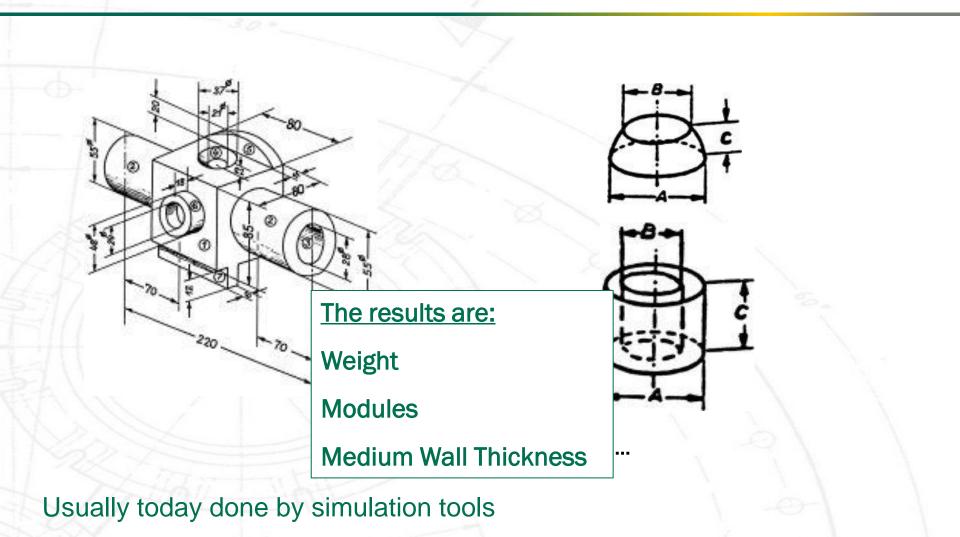
Eliminate errors, e.g. forgotten materials or operations, unsystematic calculation system (e.g. it depends on the person, difficulties are underestimated etc.)

Data Preparation, Calculation, Negotiation

September 2012



Weight Calculation

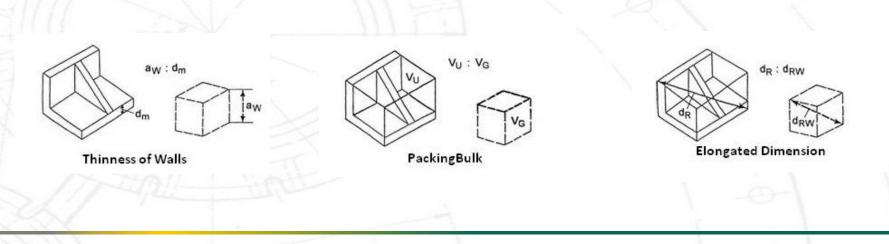


September 2012



Classification

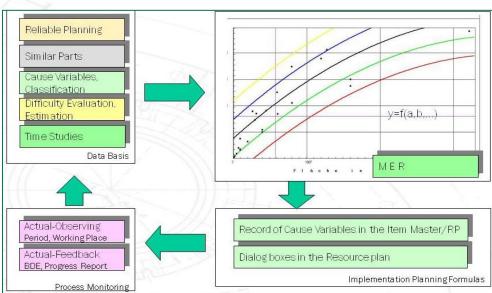
To provide the foundries better possibilities to use their historical data the so-called **part classification** was integrated in the planning methods of RGU-Opti. Because of the use of **dimension-less classificationcharacteristics** it is easier to find <u>similar parts</u> in order to use them as the basis for new calculations. On the other side the determined formulas become together with the volume class <u>scalable</u>.



Cause Variable Analysis

Colortion

Caus	e \	/a	ria	able /	٩n	al	ysis M	A-TS		Selection:		
Target:	Oper	atio	n 2	Moulding	9	Calci	ulation run		1	. 29		
Cause Varia	ables											
Variable	ariable T-Index		log		(Constant	Std Erro	or	T-Test			
ABG2fo	(43)			2,	52478900	0,169	1	14,9332		
D	(13)			-0,	11576230	0,039	8	-2,9105		
VKL	(16)			0,:	30073640	0,050	2	5,9907		
VK	(18)			0,0	07648648	0,021	1	3,6272		
GVF	(23)			-0,1	05323470	0,021	8	-2,4473		
VS	i	25)			0,0	66364510	0,049	2	13,4947		
F	(26)			-0,	56886670	0,049	2	-11,5715		
Coefficient	of Det	ermi	natio	nin% =						94,83319		
Coefficient	of Cor	relat	ion	=						0,97382		
Conficence	(FRa	tio)	=					3	2438,06421			
Standard er				mation =						0,56108		
Degree of F	reedo	m tot	al	=		803	N1 =	6	N2 =	797		
Logarithr	nic Re	egre	ssic	on equati	on					1.29		
Moulding tin	ne			AB	G2fo	=	e	٨		2,524789		
Thinness of					*		D	٨		-0,115762		
Circuit Volur	ne				*		VKL	٨		0,300736		
Core Volum	е				*		VK	Λ		0,076486		
Total.VolFa				*		GVF	٨		-0,053235			
Prop. Mould	e tr			*		VS	٨		0,663645			
Mould Volur	ne Fac	tor			*		F	۸		-0,568867		



This gives an example for the logarithmic equation of moulding times. The evaluated formulas are useful for the calculation of moulding times of requested parts.

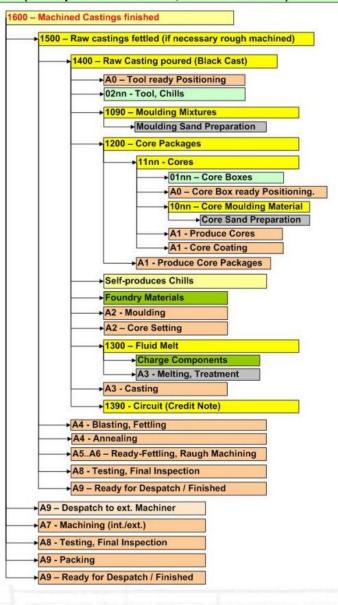
Offer Preparation in RGU-Opti

232 - Resource Plan - 1690-00021 .01 - ST Edit Information Text Related Program				-													Log Fi
formation • 📑 Text • 🙆 Course • 🗦		C	» · 🐚 🌆 🐺	Quick Dialling <id></id>	-	15											Resource
🖬 Calculation 📝 Edit 🔍 Go to 🗐 M	Header Rec. () Print () Info	Manifact.costs	2 total														
													_				
unp Volute casing ACP400-700 ACP400-700 Study Watchined Cast/Special Items Pump Volute	Part-Id-No.	1	690-00021	^w R	P-Va	ir	01	Last Char	nge at	10.	07.2012		or	1	4.03.20	012	
Fettled Cast Pump Volute casing ACP4 G Black Cast/Raw Cast Machine Pu	WP-Code	1	690-00021	.01				Drawing-	Number	701	619898						
Tool(Pattern) Ready Positionin	FacIdNo.			V	alid	Var.											
Cores CSM Pump Housing Co & Core Sand Chromite-Phen	Header Record	-															
- Pump Housing Core 1	Level	Ident-i		alGroup			tmp Te	-		valie	from	N	lateri	-1 0		DI- Dra	wing-Id
	Level	1690-0		and the second					ng ACP400-70			12.0	.4581	A CONTRACTOR OF			FO00286
Core Making Inspection/C Gres CSM Pump Housing Co														-			1000286
- Pump Housing Core 2 Core Sand Phenol-CD2-Ci	2 A	1600-0				st/Spec			ng ACP400-70				.4581		05-00		
	3 AA	1500-0		1 Fettled C					ng ACP400-70				.4581		05-00		
	▶4 AAA	1400-0				aw Cast			ng ACP400-70	0			.4581		05-00	02:	
🍄 Moulding Sand Moulding Sand	5 AAAA	1100-0		1 Cores CS			Pump I	Housing Co	re 1			0	.1500	0-00			
🖻 🌞 Pouring system Pump Volute c	6 AAAB	1100-0	01082 0	1 Cores CS	M		Pump I	Housing Co	re 2			0	.1500	0-00			
Nozzle 60d	7 AAAC	1414-0	01008 0	1 Pouring	syste	m	Pump \	Volute casir	ng ACP400-70	0		1	.4581	L 80	05-00	02:	
Downsprue 65d 📰	2	1000 0			· · · ·					^		^					
	Resource plan	- 1400-	01069 Pun	np Volute d	asin	a ACP4	00-700										
🧱 Ingate 60 * 18 🔯 Riser OXS	Code-No.	and the second second	Tetmp Term				nfotext 1	Infotext 2		FIC	Form Fa	actor N	umb Ta	arget Unit	Settin W	/orke HT	(a) ESP
- Riser 0×4	▶1 A0010		Tool(Patterr) Ready Pos		0				1	0	1	1	10 min.	0	0	0
Riser RND 150	2 1100-01081	01	Pump Hous	ng Core 1		0				1	0	1	1	1 Pcs	0	0	0
Riser RND 225	3 1100-01082		Pump Hous			0				1	0	1	1	1 Pcs	0	0	0
🔚 Riser 0×6	4 1090-00001		Moulding Sa			0				0	2314	1	1	2314 kg	0	0	0
Biser RND 80 Melt GX5CrNiMoNb19-11-2	5 6003-00013		Chill 100*1			0				1	0	1	1	5	0	0	0
GX5CrNiMoNb19-11-2 Circ.	6 1414-01008 7 1300-00302		Pump Volut GX5CrNiMol			0				0	1.291	1	1	1 Pcs 1,291 kg	0	0	0
Hand Moulding -	8 1390-00013		GX5CrNiMo			0				0	02.23	1		02.23 kg	0	0	0
	9 A2800		Hand Mould			0				1	02.23	1	1	35 min.	0	0	0
	10 A2830		Mould Cove			0				1	0	1	1	20 min.	0	0	0
	11 A2900		Hand Pourir			0				0	689	1	1	689 kg-li	0	0	1
	12 A2910		Cooling of M			0				1	0	1	1	24 h.	0	0	0
Grinding - Annealing, HTR wo. Feeders -	13 A2920	01	Shake out			0				1	0	1	1	15 min.	0	0	0
Repair by Welding - S Visual Inspection -	<						m										
Warehousing (in)	Resource P	lava.		Technique				Technique		C	ecial				age 05		Cha
	Hesource P	ian		i echnique				recrivique		50	ecidi						
S Visual Inspection - Machining - hu Sunnlier A -																	
In the second se																Part-Id-	No.: :1/1

quotations will become an order.

RGU-Opti's Recommended Product Structure

Product Structure Casting (Example for Sand cast, re-usable Tools)



Materials, operations, tools and patterns, quality control plans and services are possible elements of the resource plan including instructions for the shop floors, videos or pictures.

uct Planning

September 2012

On-line Cost Calculation

2	8						?				v5
	No.	Lev.	Code-Nu	Term	Nu	Quant	Unit	Record	prop	fixed	to
T	0054	1	6003-00012	Riser OX5 (*) MT-Component	1	4	Pcs	1,25	5	0	
	0055		6003-00013	Riser OX4 (*) MT-Component	1	1	Pcs	0,98	0,98	0	0,
	0056		6003-00014	Riser RND 150 (*) MT-Component	1	1	Pcs	2,34	2,34	0	2,
	0057		6003-00015	Riser VS191 (*) MT-Component	1	1	Pcs	2,3	2,3	0	2
	0058		6003-00019	Riser RND 225 (*) MT-Component	1	7	Pcs	1,44	10,08	0	10,
	0059		6003-00017	Riser VS159 (*) MT-Component	1	2	Pcs	6,56	13,12	0	13,
	0060		6003-00016	Riser OX6 (*) MT-Component	1	1	Pcs	1,5	1,5	0	1
	0061		6003-00018	Riser RND 80 (*) MT-Component	1	1	Pcs	0,56	0,56	0	0,
				Manufacturing costs I					55,76	0	55,
				Scrap Risk % 5 %					2,79	0	2,
				Reoperation % 3 %					1,67	0	1,
				Pattern Cost Allocation 0 //tem					0	0	
				Manufacturing costs II					60,22	0	60,
	****	AAAB	1100-00082	****Pump Core 2****	LG: 5						
	0043		0200-00018	Pump Core 2 (*) 701619898	1	1	Pcs	0	0	0	
	0044		A0010	Tool(Pattern) Ready Positioning Worker 1	1	10	min	1,2	1,4	1	2
	0045	AAAB	1010-00010	Phenol-CO2-Core Sand (*) Phenol-CO2-Core Sand	1	0	kg	0,08	0	0	
	0046		A1180	Core Making - Hand Worker 1	1	180	min	0,81	109,8	36	145
	0047		A1190	Core Making Inspection Worker 1	1	1	min	0,81	0,61	0,2	0,
				Manufacturing costs I .					111,81	37,2	149,
	****	AAAA	1100-00081	****Pump Core 1****	LG: 5						
	0038	AAAA	1010-00040	Chromite-Phenol-CO2-Core Sand	1	10	kg	0,6	5,7	0,3	
	0039		0200-00019	Pump Core 1 (*) 701619898	1	1	Pcs	0	0	0	
	0040		A0010	Tool(Pattern) Ready Positioning Worker 1	1	10	min	1,2	1,4	1	2
	0041		A1180	Core Making - Hand Worker 1	1	180	min	0,81	109,8	36	145
	0042		A1190	Core Making Inspection Worker 1	1	1	min	0,81	0,61	0,2	0,8
				Manufacturing costs I					117,51	37,5	155,0
	****	AAA	1400-00069	****Pump Volute casing ACP400-700****	LG: 5						
Г				III							

Example:

Hand made Steal Casting

September 2012

Pricing in RGU-Opti



component and material prices, the energy prices etc. extremely depend on the market development and fluctuations.

So the calculated plan production costs cannot be on a daily basis. The adjustment of the prices to the market will be done by pricing rules integrated in the <u>sales and</u> <u>planning</u> management.

Special Single Costs

RGU

Freight, Packaging



Pricing in RGU-Opti

The adjustment of the prices to the market will be done by pricing rules integrated in the <u>sales and planning</u> management.

- Energy surcharges adjustment
- Material surcharges adjustment
- Price increases using price master data
- Additional costs for special services, weight differences
- Online prices on a daily basis of the London Stock
 Exchange



The results are still valid

Measures:

Invest in more effective facilities, tools etc.

Revise your logistic processes, your suppliers etc.

Train your staff ... in the factory shops, in the offices

Revise your cost calculation and your cost building system

Elimate inappropriate basis data, formulas or nomograms, bad calculated weights etc

Eliminate errors, e.g. forgotten materials or operations, unsystematic calculation system (e.g. it depends on the person, difficulties are underestimated etc.)

Simulation, Decision Helper

September 2012



Simulation Tools and Decision Helper

It is possible to calculate cast parts by simulated cost basis of

- new machines
- new processes
- new suppliers
- estimated costs of the next period of time
- etc.

The **melting optimisation system** is an integrated part of RGU OPTI. Using this tool it is also possible to simulate the use of offered components, scrap etc. in order to find out which offers fit best to the material requirements of the melting shops.



The results are still valid

Measures:

Invest in more effective facilities, tools etc.

Revise your logistic processes, your suppliers etc.

Train your staff ... in the factory shops, in the offices

Revise your cost calculation and your cost building system

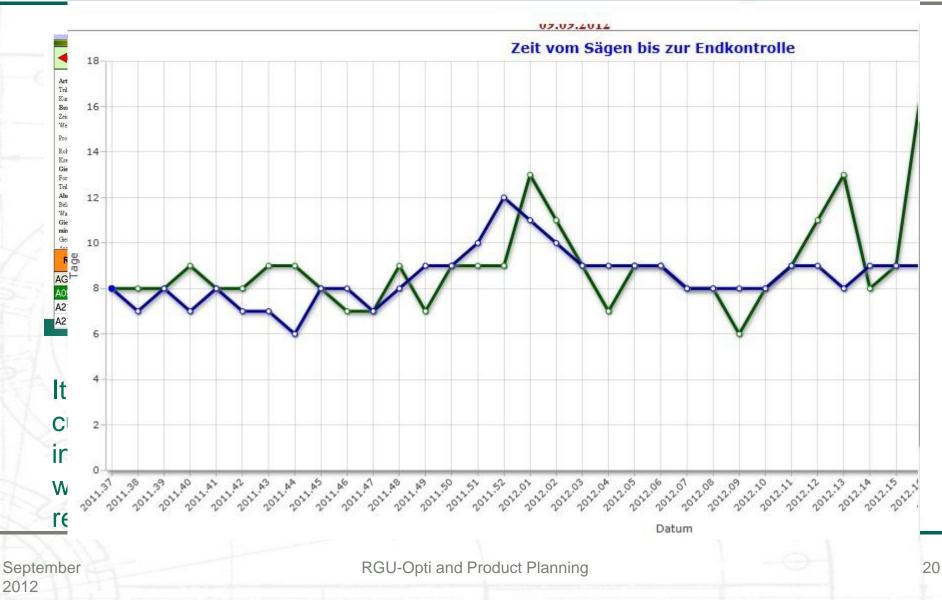
Elimate inappropriate basis data, formulas or nomograms, bad calculated weights etc

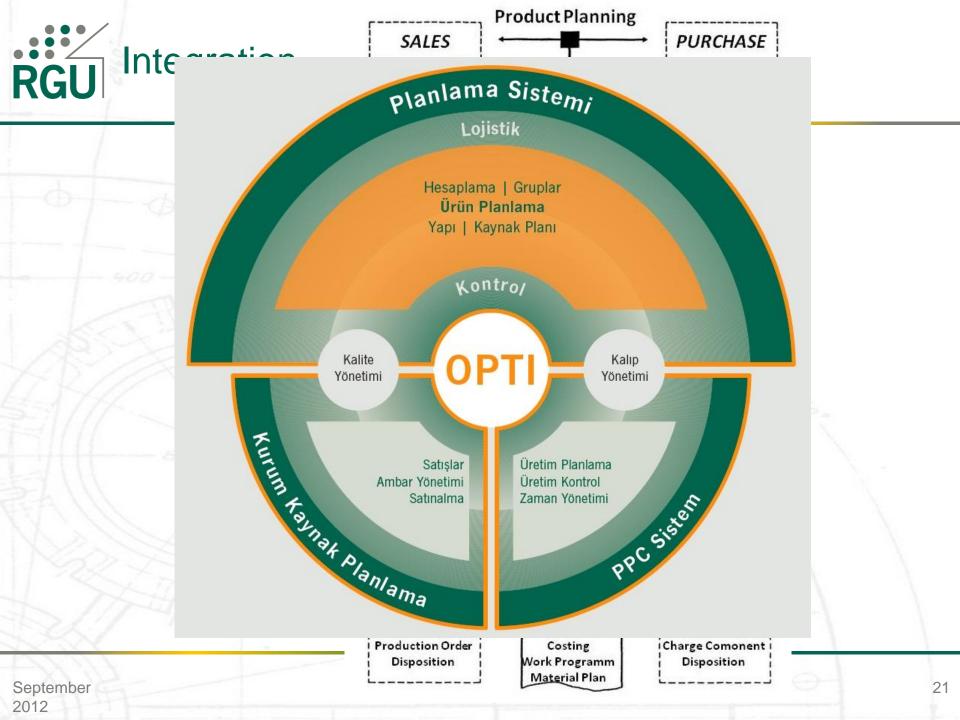
Eliminate errors, e.g. forgotten materials or operations, unsystematic calculation system (e.g. it depends on the person, difficulties are underestimated etc.)



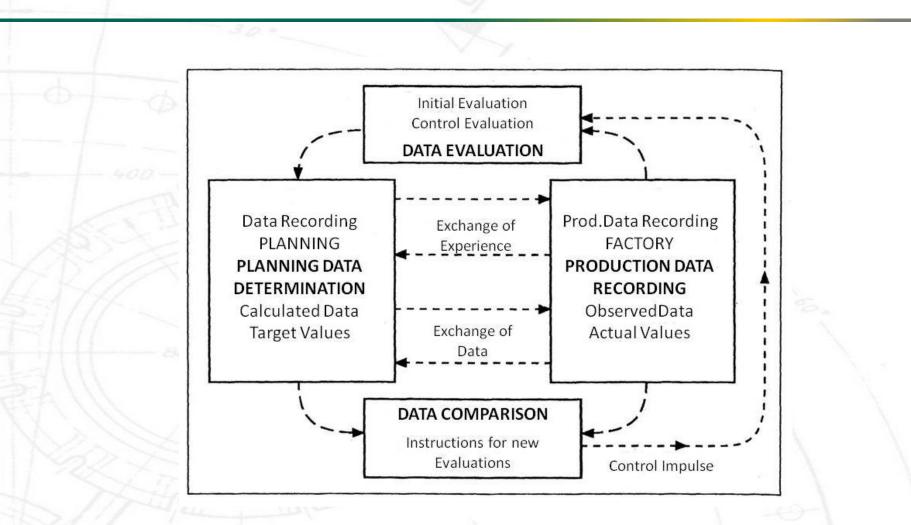
Online-Information

Durchlaufzeiten in der Putzerei in Kalendertagen

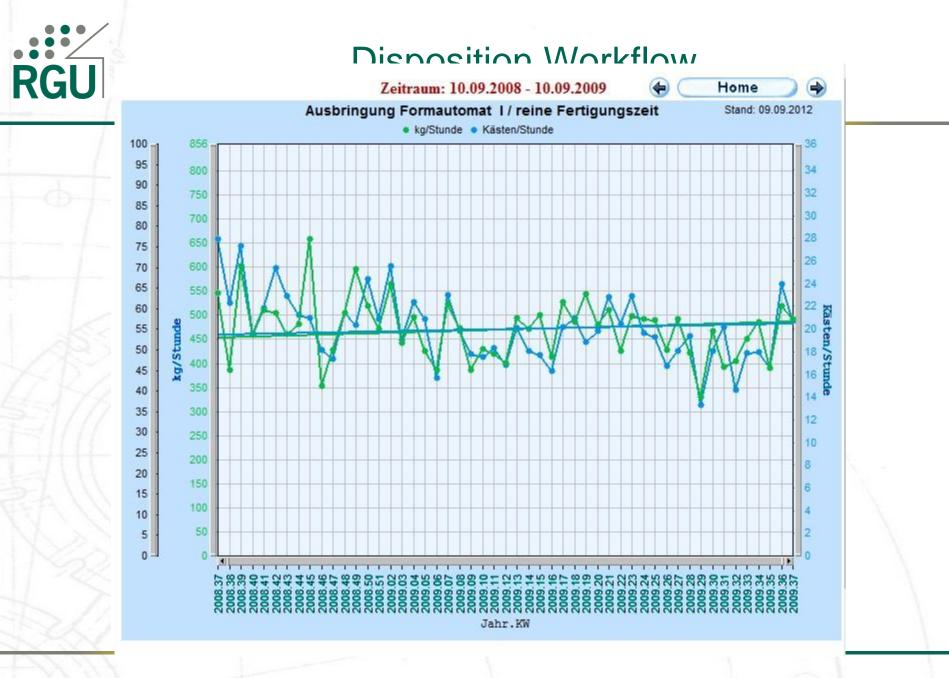




Set up the Control Loop



RGU



The company RGU in Dortmund, Germany, serves foundry companies for more than 25 years. The product planning was and is the heart module where all other modules are connected to. The ensured knowledge about own costs, processes and the possibilities to improve them is the key to success.

you for yor

Thank

Attention

RGU

You like more information? Hall 3, Stand E126