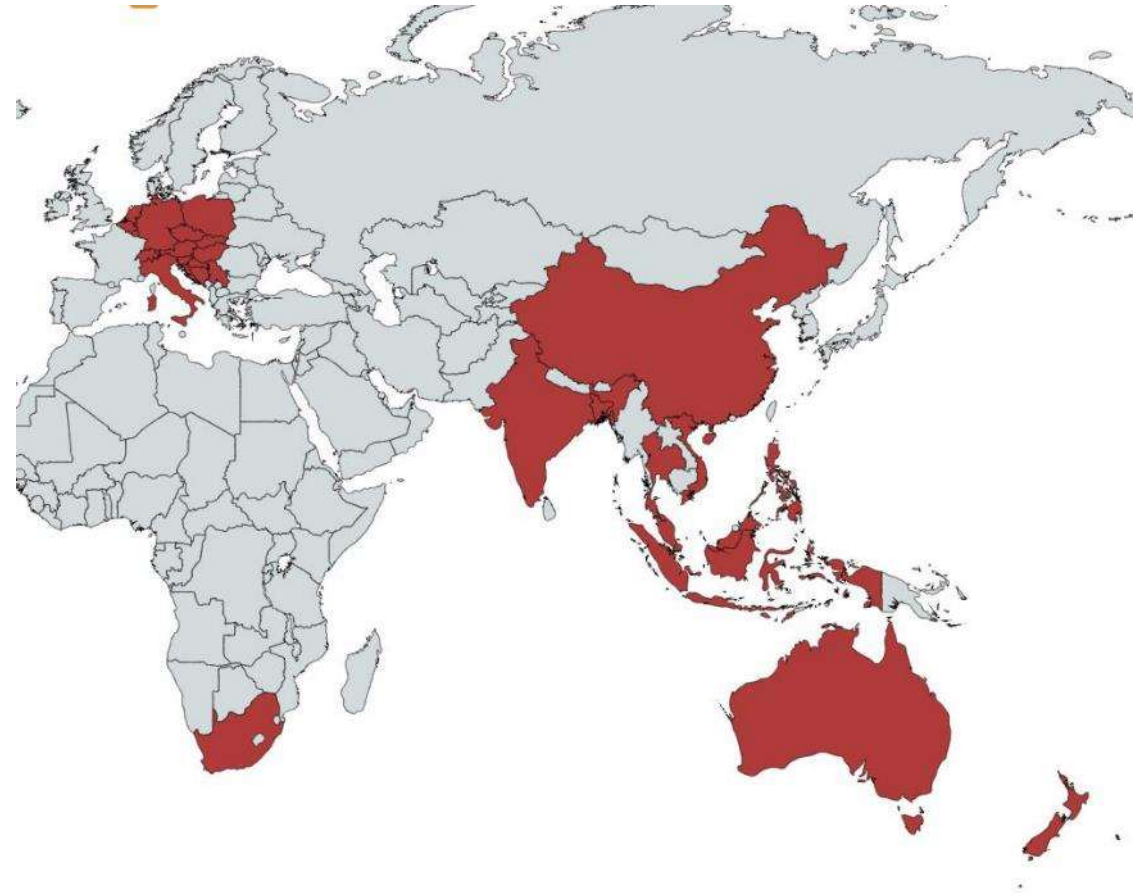




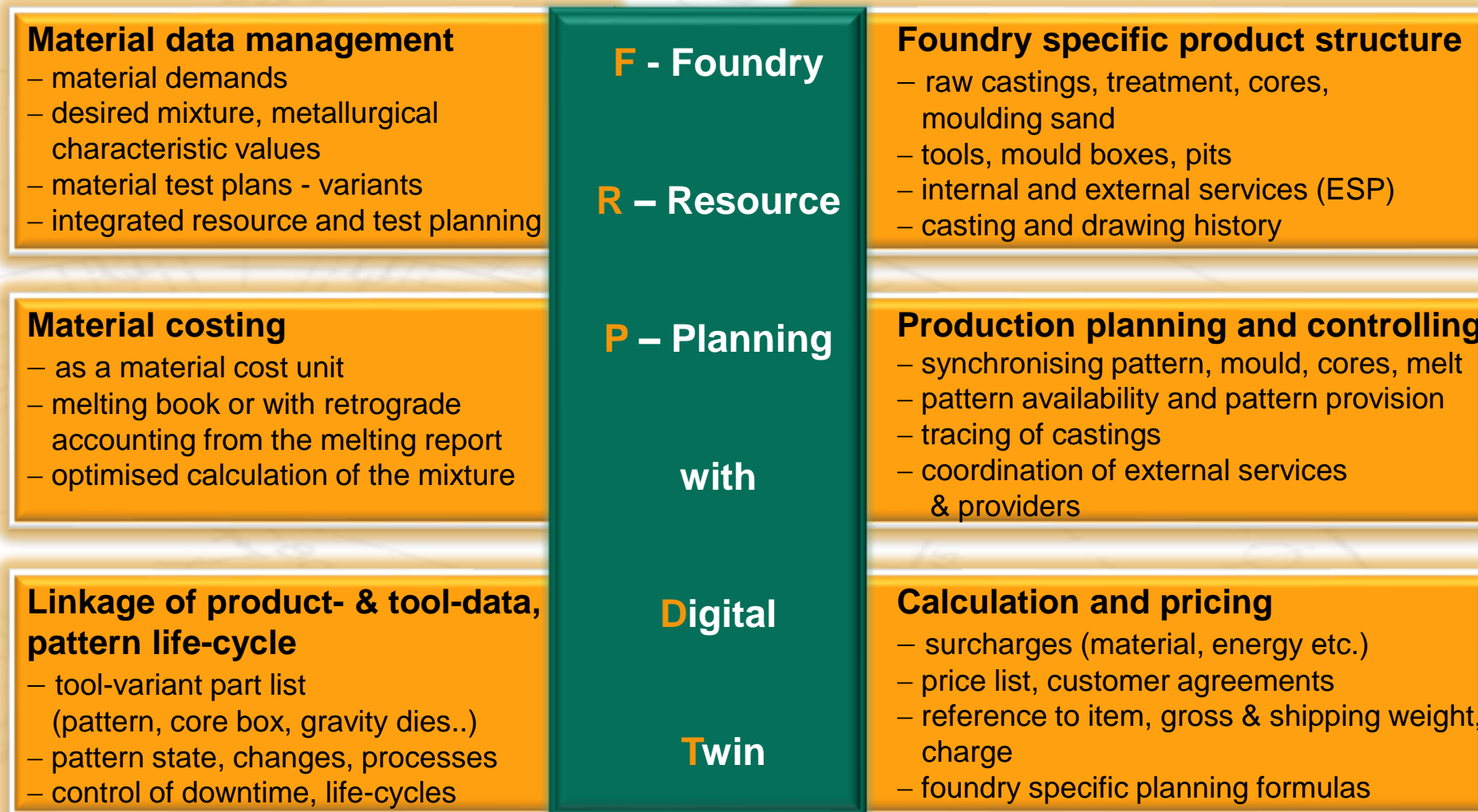
FRP<sup>®</sup> - Foundry Resource Planning  
driving the digital transformation of metal  
casting operations using DIGITAL TWIN  
technology approaches

- **About Us – Introduction**
- **FRP<sup>®</sup> - digital twin technology, what does it mean ?**
- **FRP<sup>®</sup>.base – your starting package**
- **FRP<sup>®</sup>.kompakt – your standard package**
- **FRP<sup>®</sup>.melt – melt-shop management going digital**
- **The difference between integrated and non-integrated systems**
- **Workflow – Resource Plans – Digital Twin application**
- **How casting is made in FRP?**
- **Advantage of digitalization & Industry 4.0 via Foundry KPI**
- **Summary**

- Foundry Resource Planning & Consulting Pvt. Ltd., Vadodara- India
- Headquarter: RGU Asia Pte Ltd, Singapore
- Distinguished partners in **ASEAN / ANZ / China / SA**
- ONLY solutions for FOUNDRY and working exclusively on foundry digital platforms for resource planning
- Products
  - **FRP®.base** → digital entry level
  - **FRP®.kompakt** → digital standard level
  - **FRP®.melt** → digital melt shop
- Interface with SAP, Oracle, Tally, & others possible



## RGU. FRP<sup>®</sup> takes care of all Foundry specific requirements





A digital twin is a virtual representation that serves as the real-time digital counterpart of a physical object or process.

**In metal casting this is the process from:**



**and ALL its variations completely digitally replicated = resource plan inside FRP® - software**



## FRP®.base – software

- Starting solution
- For (M)SME foundries
- SeW - inventory transparency for the shop-floor
- Limited user and WIP
- Automatic disposition
- Digital twin included



## FRP®.kompakt – software

- Standard solution
- For SME foundries and larger operations
- SeW - inventory transparency for the shop-floor plus full FIS and dashboard capability
- (Un-)limited user and WIP (tba)
- Automatic disposition
- Enhanced digital twin
- Full corporate functions

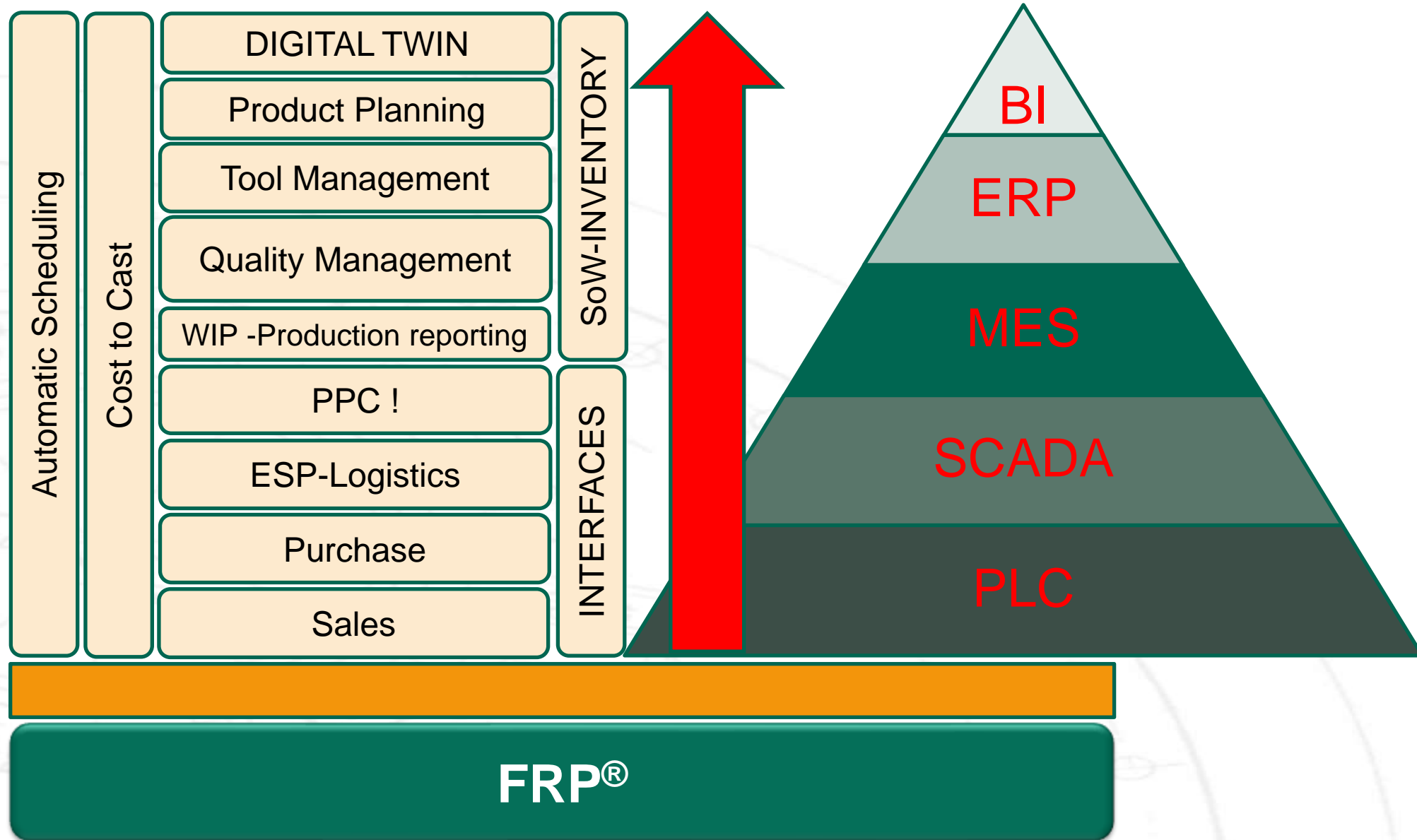


## FRP<sup>®</sup>.melt – software

- Charge calculation
- For any foundry regardless of size
- Post-charge calculations
- Melt shop management
- Database know-how
- Material management
- Alloying recipe
- Iron / Steel / Alu applications



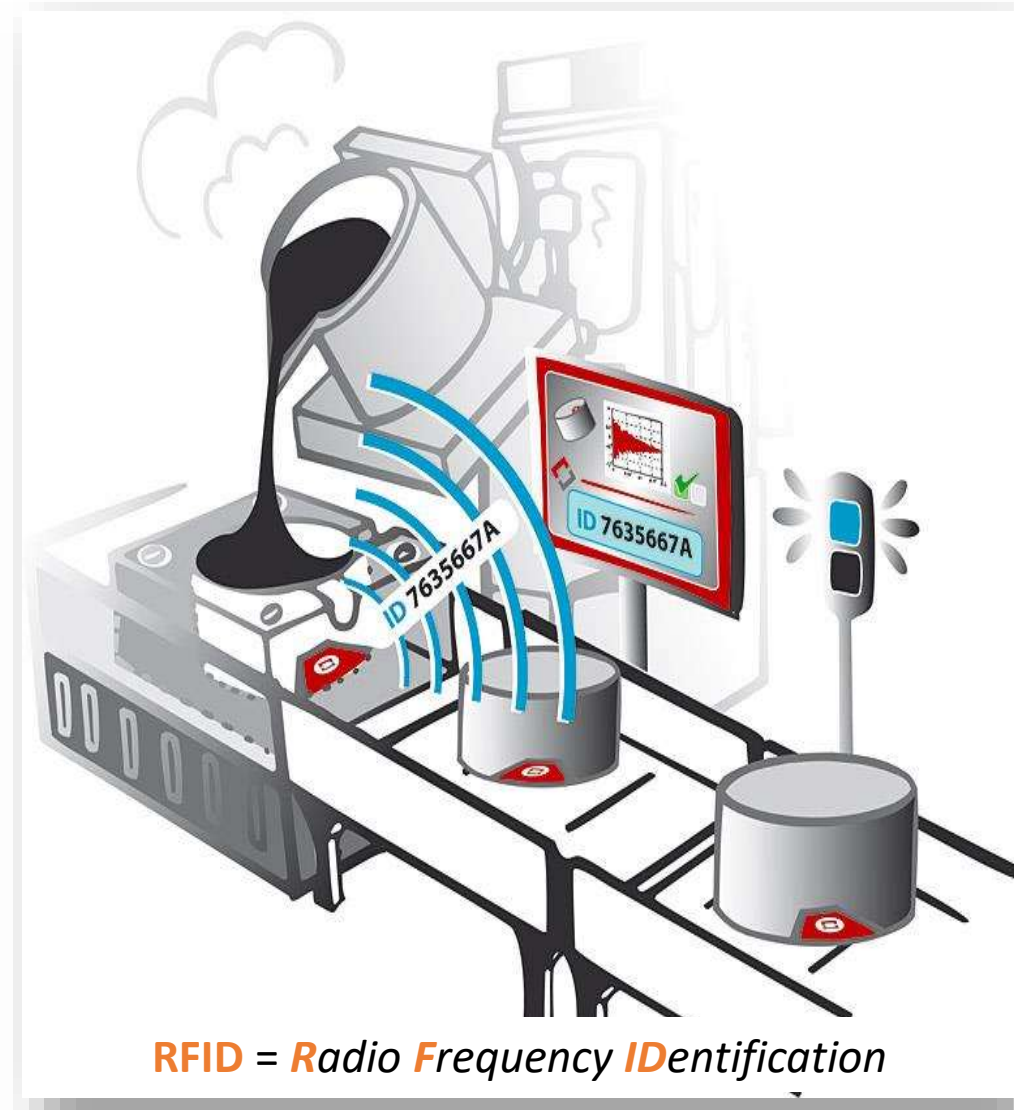
# Why “FRP®” – Not just ERP?





- Short term goal

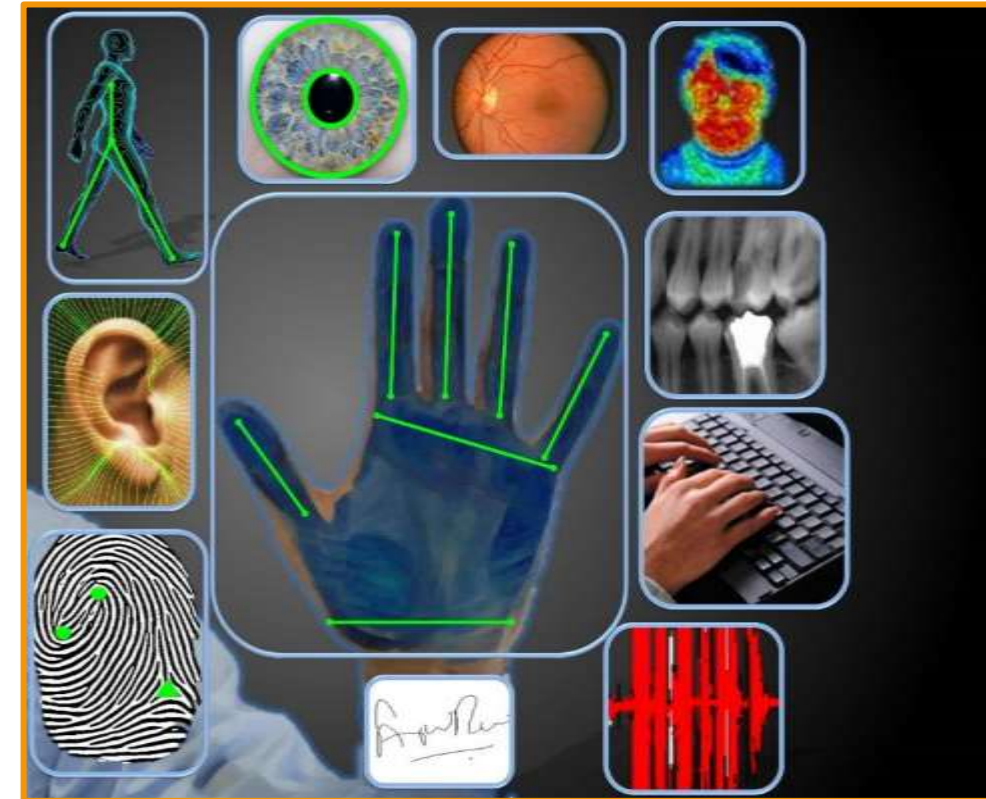
- Overcome paper & log sheets in Sales-Purchase-Material/store -
- Think beyond just BOM
- What are the resources required to make one casting? Man-Machine-Operation- Workflow
- Real inventory of all the casting laying anywhere in foundry at any stage
- Status of per order and its progress known anytime 24X7
- Traceability heat code wise, No missing castings
- Overview of capacities – bottlenecks
- Status of Tool/Patterns e.g. available, maintenance , Tool/Pattern life



- **Mid term goal**
  - System based Planning and scheduling to get realistic delivery date
  - Per order heat code, Hardness, Spectrometer data linkage – full traceability !
  - Able to print “Quality Certificate” from system without looking up past data
  - Work with an integrated system for Sales-Purchase-Materials – Tool/Pattern Management - PPC- Quality Management - Dispatch

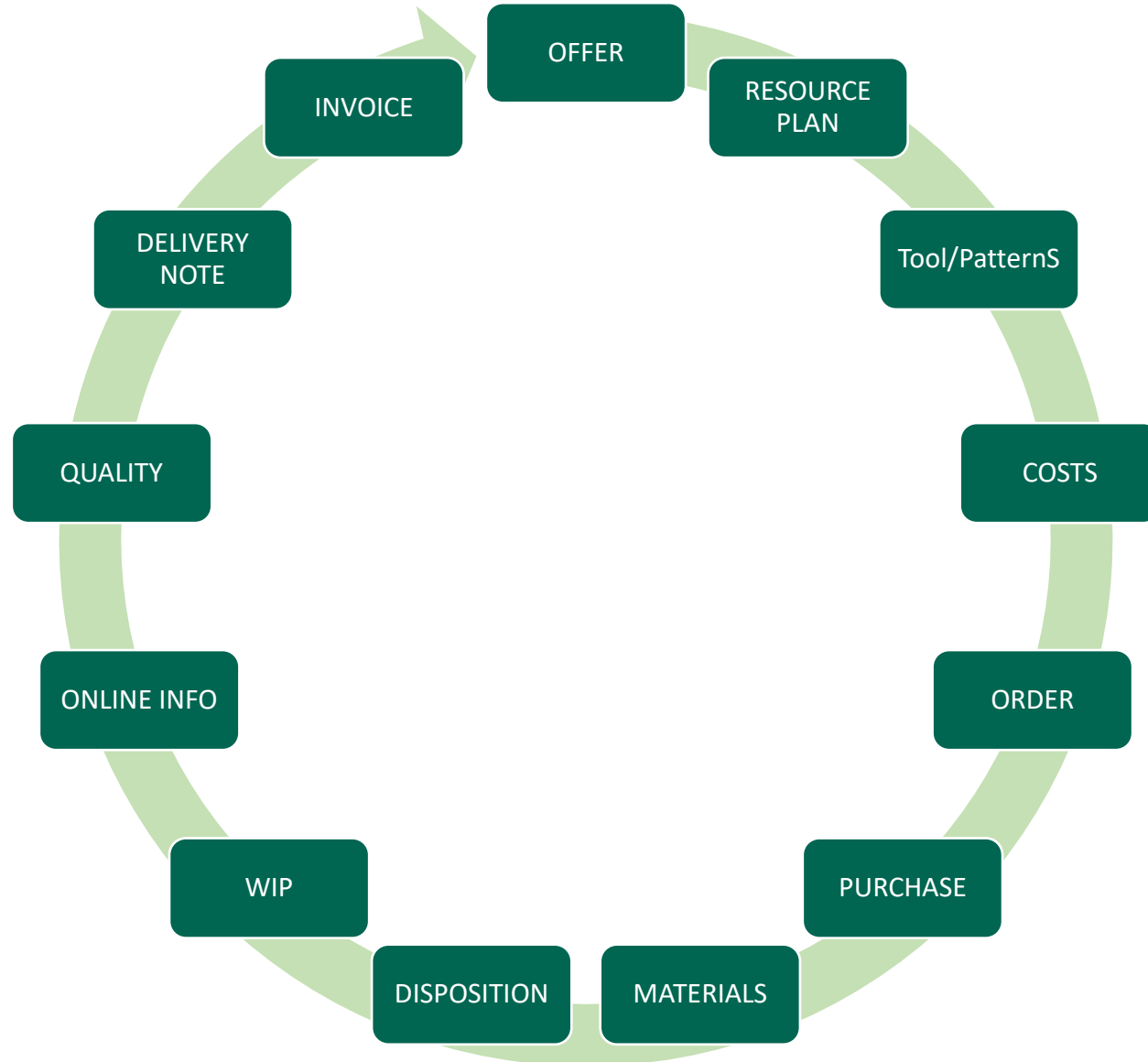


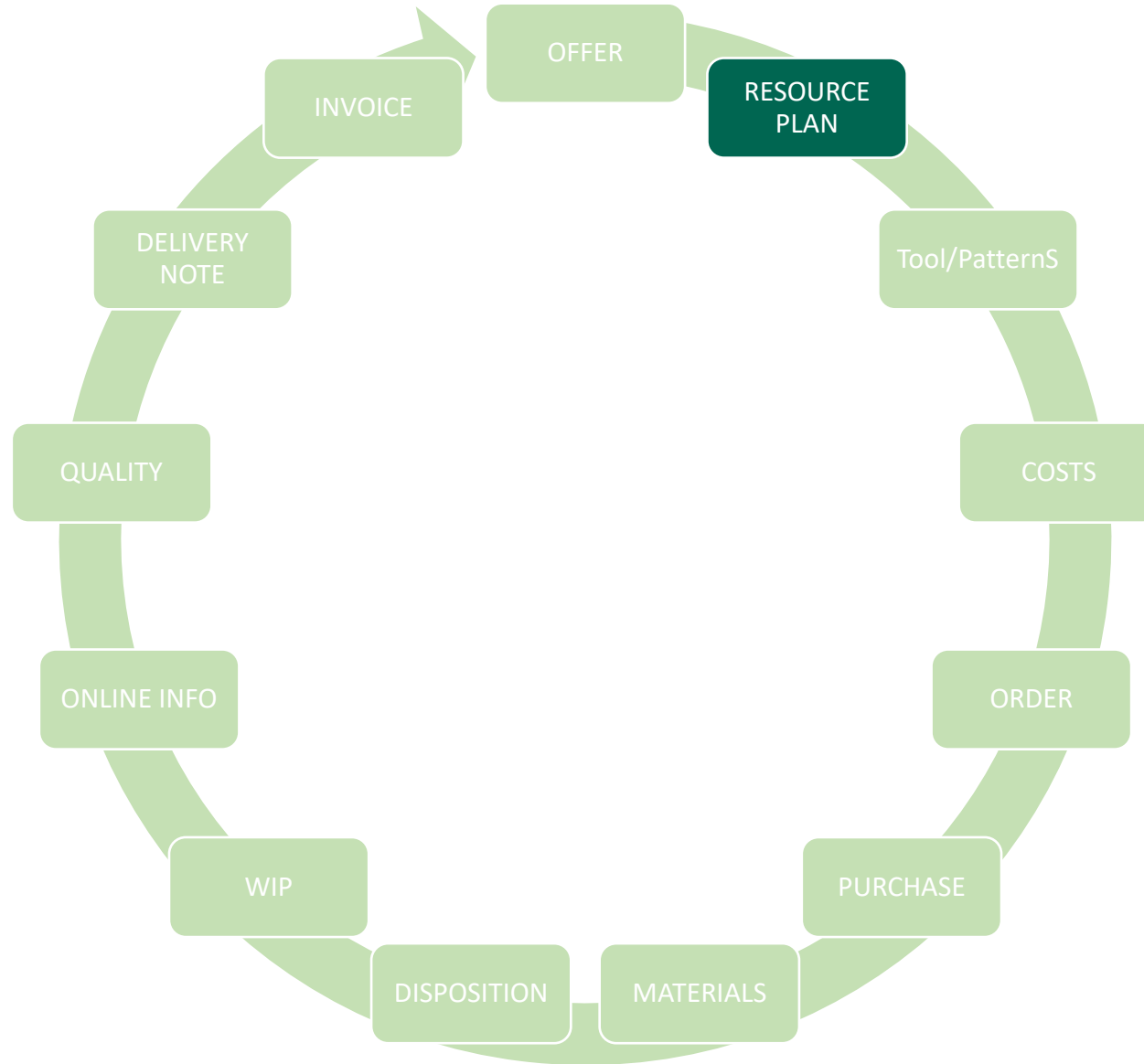
- Long term goal
  - Define critical process /areas where system can directly collect data from machine
  - Less dependency on human data entry for critical to quality processes
  - Interface with advance sensors, automation, RFID, Cameras etc. to reduce manual entries and get real time data
  - Preventive approach to reduce scrap and rejections
  - Across all departments online info/Dashboard monitoring
  - SMS – Email – alarm notifications



# Difference between Integrated – Non Integrated system

<b>Non Integrated System</b>	<b>Integrated system</b>
Works only for admin area Sales – Purchase – Store - Dispatch	For Foundry Tool/Pattern Management– PPC must be part of integration with sales – Purchase - Store – Dispatch
Limited to BOM & Routing	Multiple BOM – Man- Machine – Operation – Tool/Pattern – Cycle time – Quality criteria are linked with each other
Will need multiple island solutions to connect them	Single system will work across all the departments
Interface will be nearly impossible	Easy to interface with other software / hardware solutions incl. IoT / other machines
After few years may reach to limitations	Allows you to expand as you grow

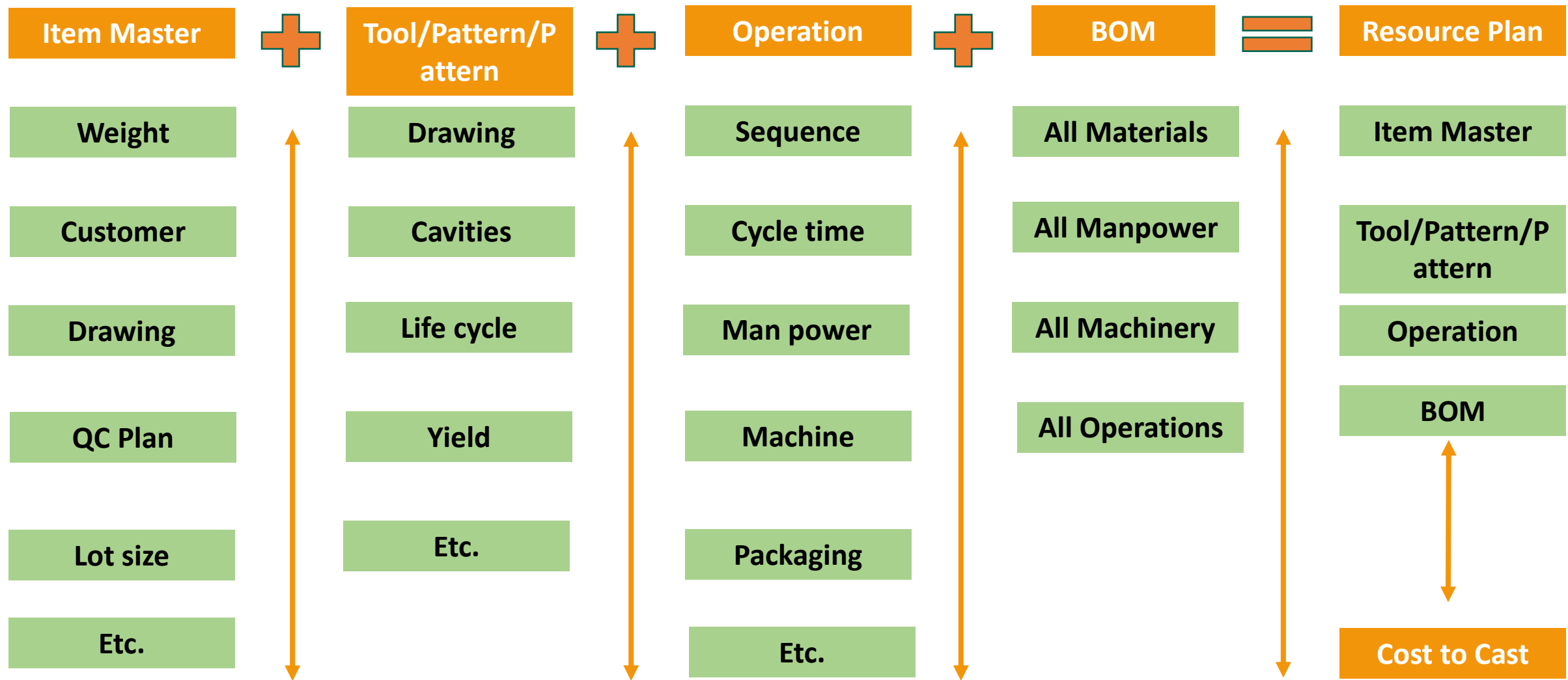




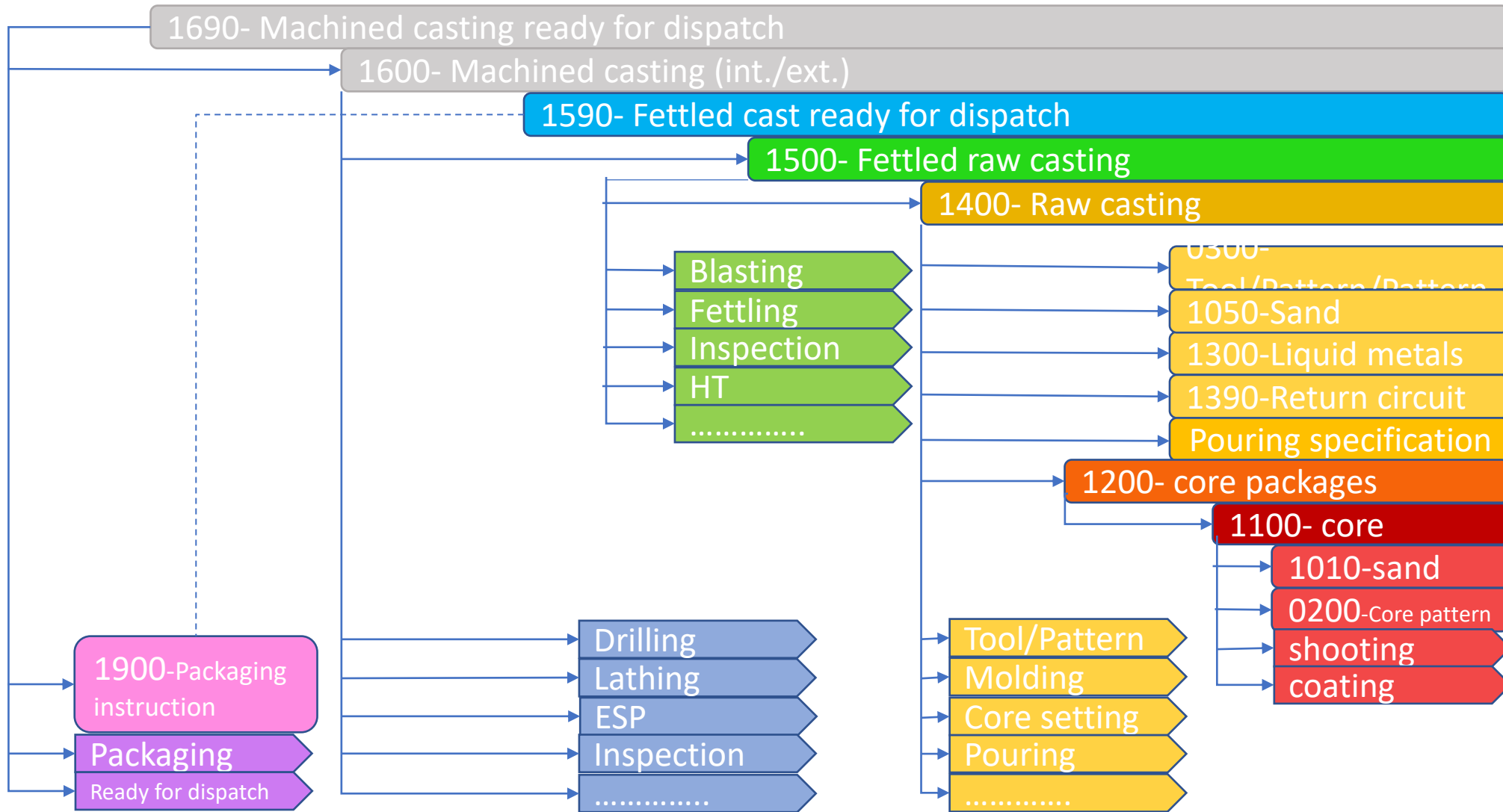


- The Resource Plan is simplified expressed a “Digital Twin” of the manufacturing process of how to make a casting.
- Resource Plan goes beyond BOM and integrates Material – Machine – Cycle time (Man power) – Formula – Costing – Setting time for all the stages of the foundry.
- Resource Plan is the “Backbone” of the FRP® software for all the further activities related to Order – Materials – Quality – PPC – Tool/Patterns etc.
- Different levels of resource plan represent different stages of foundry industry.

# What is Resource Plan = DIGITAL TWIN ?



# What is Resource Plan? (Schematic Display)



# How RAW CASTING is made in FRP?



1400- Raw casting

1200- core packages

1100- core

0300-Too/Pattern

1050-Moulding sand

1300-Liquid metals

1390-Return circuit

Pouring

# How CASTING – Melt is made in FRP?

MOULDING SHOP							
Raw material	Qty	UOM	Resources	Setup time in min	Cycle time in min	Working time in min	Mould cavity
Return sand	225	Kgs	MLM-30	30	2	1200	1
Wash sand	2	Kgs					
Bentonite	2.25	Kgs					
Cold dust	0.8	Kgs					
Pig iron	6.6	Kgs					
MS scrap	4.2	Kgs					
Cl scrap	10	Kgs					
Cl boring	10.5	Kgs					
Cl raiser	10.5	Kgs					

And more...

- Mold Tool/Pattern status
- Mold Tool/Pattern cavities
- Consumables sand, sleeve, filters
- Charge material – alloying
- Costs
- Cycle time & Holding time
- Default machine or next possible alternative

Code-No.	Var	PTe	Description	Statl	Activ	Remark	Remark	Machir	FID	Form	Fact	Num	Targe	Uni	Setti	Wori	HT(a)	ESP	cWage	cprop.	cfix
1	A1010	01	Pattern/Tool Ready Positioni	●	0			0	1	0	1	1	180	min	0	0	0		0.3	0.3	0
2	0300-00039	01	FAC RP - M-00039-1	●	0			0	0	1	1	1	1	Pcs	0	0	0		0	0	0
3	1200-00003	01	FRPCON core packets	●	0			0	1	0	1	1	0	Pcs	0	0	0		0	0	0
4	1050-00002	01	Quartz sand clay bonded -					0	3.828	1	1	1	49.828	kg					0	0.082	0
5	1300-00003	01	G-Al Si 10 Mg	●	0			0	0	2.283	1	1.001	0.283	t	0	0	0		0	2063.5	80
6	1390-00003	01	RM-239	●	0			0	0	2.113	1	1	-0.113	kg	0	0	0		0	1.65	0
7	A3100	01	Hand Pouring	●	0		LPDC-02	0	1	0	1	1	1.67	min	0	0	0		0.3	0.1	0.1

# How RAW CASTING is made in FRP?

Software interface showing the configuration for Raw Casting in FRP. The interface includes a toolbar with various icons (Input, Update, Search, etc.), a Treeview on the left, and a main data area with multiple tables.

**Item Details:**

- Item-Ident.-No.: 1590-00021
- Equipm. Id.-No.: 0800-00023
- ItemIdNo(Foc): 1400-00019
- FRPCPL

**Structure Table:**

Level	Ident.-No.	Va	Ml	mU	RS	uC	Group	Description	Calc. per	valid from	Material	Qual.Co.	Draw.-Id-Nc	Info
1	1590-00021	01	✓	1	●	☐	Fettled Cast ready	Sample Part	Piece	---	239	8005-00		Packing Instruction: intern 1xEuro pallet 1200x800 mm returnable
2	1400-00019	01	✓	1	●	☐	Raw Casting	Sample Part	Piece	---	239	8005-00		
3	1200-00003	01	✓	1	●	☐	Core Packets	FRPCON core packets	Piece	---				
4	1100-00015	01	✓	1	●	☐	Cores	C2-FRPCON core pack	Piece	---	CS-COLDI			
5	1100-00016	01	✓	1	●	☐	Cores	C3-FRPCON core pack	Piece	---	CS-COLDI			
6	1900-00016	01	✓	1	●	☐	Packing Instruction	Packing Instruction: int	Piece	---				

**Resource Plan Table:**

Code-No.	Var	PTe	Description	Statl	Actin	Remark	Remark
1	A1010	01	Pattern/Tool Ready Positioni	●	0		
2	0300-00039	01	FAC RP - M-00039-1	●	0		
3	1200-00003	01	FRPCON core packets	●	0		
4	1050-00002	01	Quartz sand clay bonded -	●	0		
5	1300-00003	01	G-Al Si 10 Mg	●	0		
6	1390-00003	01	RM-239	●	0		
7	A3100	01	Hand Pouring	●	0		LPDC-02

**Machine - Unit - Setup time - Holding time Table:**

Machir	FID	Form	Fact	Num	Target	Uni	Setti	Wori	HT(a)	ESP	cWage	cprop.	cfix
0	1	0	1	1	180	min	0	0	0		0.3	0.3	0
0	0	1	1	1	1	Pcs	0	0	0		0	0	0
0	1	0	1	1	0	Pcs	0	0	0		0	0	0
0	0	3.828	1	1	49.828	kg					0	0.082	0
0	0	2.283	1	3.001	0.283	t					0	2063.5	80
0	0	2.113	1	1	-0.113	kg					0	1.65	0
0	1	0	1	1	1.67	min	0	0	0		0.3	0.1	0.1






**Annotations:**

- Orange boxes highlight the 'Raw Casting' row in the Structure table and the 'Hand Pouring' row in the Resource Plan table.
- Green boxes highlight the 'Status' and 'Machine - Unit - Setup time - Holding time' columns in the Resource Plan table.

## Integrated Dashboard for Foundry KPI

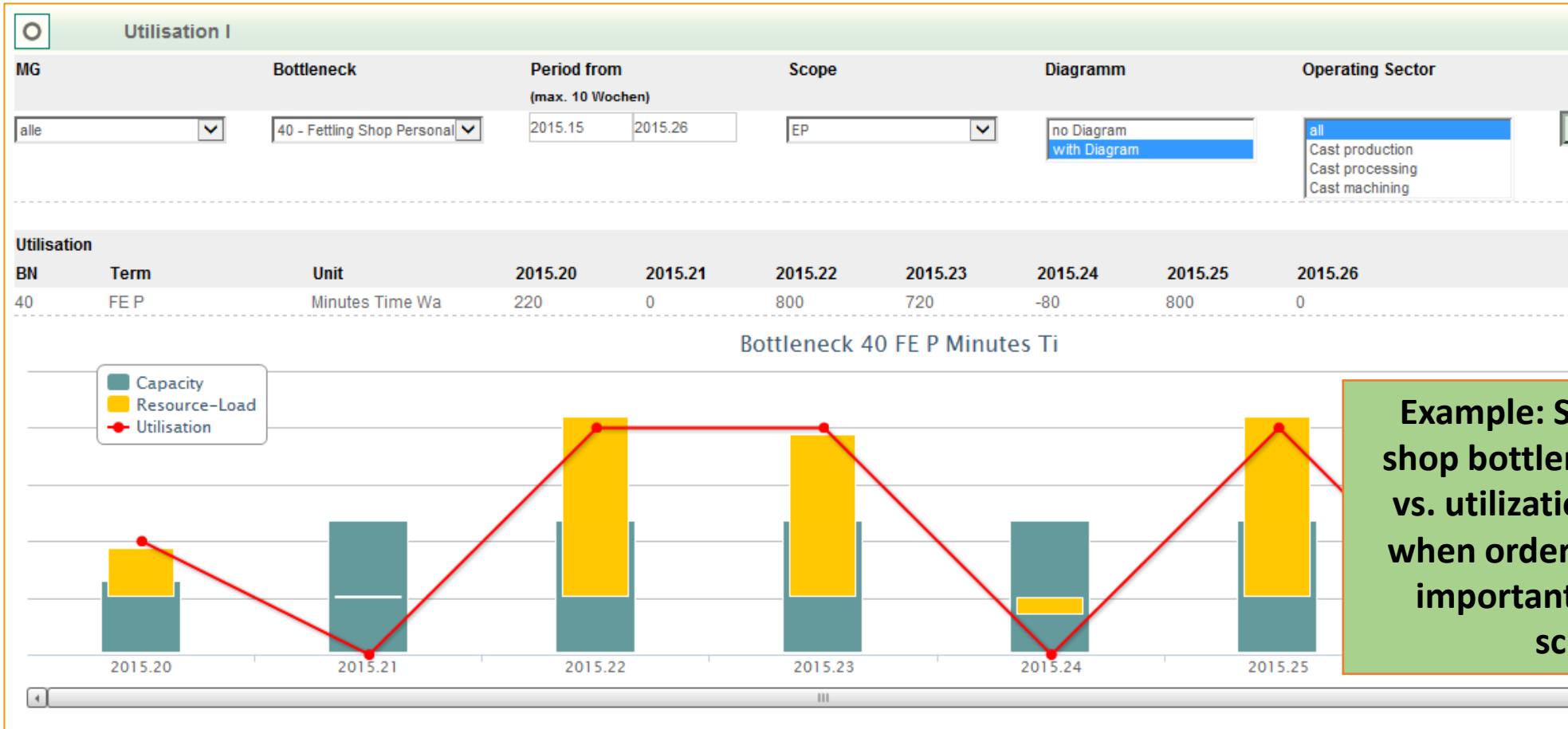
- All Data Visualisation for all Foundry Sections
- All Department or Staff KPI (individual)
- Inventory Improvement
- Melt shop status
- Raw Material Scenario Manager

**DATA visualization in real time for any possible KPI in foundry operations**

BN	BN/Year	Description	Unit	Week	% Level of efficiency	Capacity/Unit	Capacity/Hour	Load Actual	Load in word %	Load Arrear	Load Arrear %	Workload	%
39	Year/BN	Shake out / Knock off	Minutes Ti	2020.15	100	28200	360	0	0	92124	326.7	100	
39	Year/BN	Shake out / Knock off	Minutes Ti	2020.16	100	28200	300	0	0	63924	226.7	100	
39	Year/BN	Shake out / Knock off	Minutes Ti	2020.17	100	28200	300	0	0	35724	126.7	100	
39	Year/BN	Shake out / Knock off	Minutes Ti	2020.18	100	28200	300	0	0	7524	26.7	100	
39	Year/BN	Shake out / Knock off	Minutes Ti	2020.19	100	28200	300	0	0	0	0	26.7	



**DATA visualization in real time for any possible KPI in foundry operations**



**Example: Showing fettling shop bottleneck vs. capacity vs. utilization weeks ahead when orders are booked → important for PPC to re-schedule**

## Minimum stock requirement info

Stock material prediction

Material ID: 1390%

Type: 1-30 day period

Inventory check: 0 without check

Start search

Material ID	Description	Article-No.	Pattern number	Replacement Time in days	Unit	Stock	Material requirement	Material input	Expected stock	Minimum stock	Demand quantity (already registered)
1590-0001	Motor housing	4711-0001	P004711-0001	0	Piece	0,00	300,00	0,00	- 300,00	0,00	0,00
1590-0002	Pump housing ACP200-350	4500595578	701619998	0	Piece	0,00	0,00	0,00	0,00	0,00	0,00
1590-0003	Bezeichnung1	Artikelnr. intern	Modelnr.	0	Piece	0,00	3.599,00	0,00	- 3.599,00	0,00	0,00
1590-0004	>Bezeichnung1	>Artikelnr. intern	Modelnr.	0	Piece	0,00	1.500,00	0,00	- 1.500,00	0,00	0,00
1590-0005	Forging Test		4712	0	Piece	35,00	1.595,00	0,00	- 1.560,00	0,00	0,00
1590-0012	WS-5C-L-A5H	4711	558-012-1235-01	0	Piece	0,00	0,00	0,00	0,00	0,00	0,00
1590-0013				0	Piece	0,00	0,00	0,00	0,00	0,00	0,00
1590-0014	Shell mould Test 1	12345	22334455	0	Piece	0,00	0,00	0,00	0,00	0,00	0,00
1590-0015	>Bezeichnung1		Modelnr.	0	Piece	0,00	0,00	0,00	0,00	0,00	0,00
1590-0016	Part No. 224444		224444	0	Piece	30,00	200,00	368,00	198,00	0,00	0,00
1590-0017	S.Ring		166028	0	Piece	110,00	1.460,00	1.350,00	0,00	0,00	0,00
1590-0018	Part No. 191532			0	Piece	750,00	15,00	0,00	735,00	0,00	0,00
1590-0019	Part No. 212980		Damping	0	Piece	0,00	0,00	0,00	0,00	0,00	0,00
1590-0020	XYZ		ABC	0	Piece	0,00	100,00	100,00	0,00	0,00	0,00
1590-0021	Sample Part			0	Piece	100,00	1.200,00	1.300,00	200,00	0,00	0,00
1590-0022	Sample Part		Sample Pattern No	0	Piece	10,00	120,00	110,00	0,00	0,00	0,00
1590-0023	Sample Part		Sample Pattern No	0	Piece	10,00	310,00	1.200,00	900,00	0,00	0,00

Stock material prediction

Material ID: 8006%

Type: 1-30 day period

Inventory check: 0 without check

Start search

Material ID	Description	Article-No.	Replacement Time in days	Unit	Stock	Material requirement	Material input	Expected stock	Minimum stock	Demand quantity (already registered)
6006-00001	Anticorrosive bag PVC-VCI		0	Piece	1.830,00	1.300,00	650,00	1.100,00	0,00	0,00
6006-00002	Cardboard box 1200x800x750 mm		0	Piece	0,00	0,00	0,00	0,00	0,00	0,00
6006-00003	Cardboard box 530x350x150 mm		0	Piece	0,00	0,00	0,00	0,00	0,00	0,00
6006-00004	Chip board 1100x750x8 mm		0	Piece	0,00	0,00	0,00	0,00	0,00	0,00
6006-00005	Customer Container / Gitterbox		0	Piece	0,00	0,00	0,00	0,00	0,00	0,00
6006-00006	Euro pallet 1200x800 mm returnab		0	Piece	3.000,00	0,00	0,00	3.000,00	0,00	0,00
6006-00007	Gitterbox (Ordnbox)		0	Piece	0,00	0,00	0,00	0,00	0,00	0,00
6006-00008	Joining ribbon metal 19x0.5mm		0	m	0,00	0,00	0,00	0,00	0,00	0,00
6006-00009	Paperboard insert		0	Piece	0,00	0,00	0,00	0,00	0,00	0,00
6006-00010	PVC Stretch fol		0	m²	0,00	0,00	0,00	0,00	0,00	0,00
6006-00011	Wooden box 1200x800x900 mm		0	Piece	0,00	0,00	0,00	0,00	0,00	0,00
6006-00012	Wooden box 1200x950x750 mm		0	Piece	0,00	0,00	0,00	0,00	0,00	0,00
6006-00013	Wooden cover 1200x900 mm		0	Piece	0,00	0,00	0,00	0,00	0,00	0,00
6006-00014	Wooden Euro pallet 1200x800 mm		0	Piece	0,00	0,00	0,00	0,00	0,00	0,00
6006-00015	Wooden pallet from T4 1200x800x2		0	Piece	900,00	1.300,00	2.100,00	1.700,00	0,00	0,00

## Sequence of Work Inventory → Knowing precisely what is where and can we reduce / ship / improve

Dashboard SeW Status

SeW Status

Column visibility: Caterpillar All

ProcOrder	ProcOrderStatus	ProcOrderSerial	AssemblyCustomer	CurNo	CurName	ItemStatus	Pending	BaseQtyRe-rolling	Knocking off	Penultima grinding/pol	Fitting	Welding slaw Cast	Heat Treatment	Machining	Fin-Machining	Surface	Welding	Welding Machined Cast	Inspection Raw Cast	Final inspection Raw Cast	Inspection Machined Cast	Final inspection Machined Cast	ESP - Rolling	ESP - Machining	HEW - Fitting	HEW - Machining	Packaging before Dispatch	Quarantine stock	Stock MRO	Stock opp	Stock zero	Stock	AvailabilStock	ConsumedStock		
1700001.01	100	1590-00001	09201	120000	CATERPILLAR	🟢	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1700001.01	100	1590-00001	09203	120000	CATERPILLAR	🟢	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1800002.01	100	1590-00016	09247	120000	CATERPILLAR	🟢	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1800003.03	100	1690-00004		120000	CATERPILLAR	🔴	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1800005.01	100	1690-00006		120000	CATERPILLAR	🟡	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1800005.02	100	1690-00006	09268	120000	CATERPILLAR	🟡	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1900019.14	100	1590-00015		120000	CATERPILLAR	🟡	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B180005.01	100	1690-00004		120000	CATERPILLAR	🔴	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B180009.01	100	1690-00004	09276	120000	CATERPILLAR	🔴	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B190001.01	100	1590-00001	09331	120000	CATERPILLAR	🟢	0	0	0	0	75	0	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B190001.01	100	1590-00001	09333	120000	CATERPILLAR	🟢	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B190001.01	100	1590-00001	09335	120000	CATERPILLAR	🟢	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B190005.01	100	1590-00001		120000	CATERPILLAR	🟢	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B190006.01	100	1590-00001	09354	120000	CATERPILLAR	🟢	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B190008.01	100	1590-00015		120000	CATERPILLAR	🟡	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B190009.01	100	1590-00015		120000	CATERPILLAR	🟡	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

## Order – Revenue - Customers

### Angebotsübersicht

Kunde	Angebotsübersicht
Westmer Maschinenbau GmbH	5
Wagner Pressen GmbH	8
Test-Kunde1	2
Test-Kunde	1
Test-Firma	6
Rück & Kötter	2
RGU GmbH	2
Mayer & Cie GmbH & Co.	16
III Charging Systems	12
Hierichiel	10
Herrmanneder GmbH	19
Hansbecht GmbH	1
Geschäftsstell 5	2
DiL Laserlog GmbH	5
Dalmer AG	10
Conti Tecnic microelectronics GmbH	24
Busch Manufacturing LLC	24
ALBERT MEYER GmbH	2

### Bereichsfilter

Q1 2012 Q3 2012 Q1 2013 Q3 2013 Q1 2014 Q3 2014 Q1 2015 Q3 2015 Q1 2016 Q3 2016 Q1 2017

### Angebotsdetails

Angebots-Nr.	Projekt	Anfrage	Kunde	Betrag
160047	TEST-BBO-BG	123456	Busch Manufacturing LLC	0 €
160052	DLT20160627	123456	Busch Manufacturing LLC	0 €
160054	DL-TEST-ENT-20160704	123456	Busch Manufacturing LLC	0 €
160057	<ADCASDPQF AWEF AWEFER4		Busch Manufacturing LLC	0 €
160058	DLT2	123456	Busch Manufacturing LLC	0 €
160063	PRJ_20160712_4	ANF_20160712_4	Busch Manufacturing LLC	0 €
160066	DL_TEST_DEV_PET_BBO_BG	123456	Busch Manufacturing LLC	0 €

### Produkte nach Fertigungstermin

Produkt	Anteil
Pumpengehäuse ACP400-700	43,33 %
Gehäuse d12345	16,67 %
Brennergehäuse	16,67 %
Deckel	15,56 %
Lebwinntbdeckel	7,78 %

### Bereichsfilter

Q2 2013 Q4 2013 Q2 2014 Q4 2014 Q2 2015 Q4 2015 Q2 2016 Q4 2016 Q2 2017

## Supplier – Materials – Quarter Overview

STANDARD

package view | system info | keyboard commands | service status | Help | 1666 | F302

ADMINISTRATION | STA... | HELP | PREVIOUS | G

FAVORITES

Bookmarks

CONTAINER

- Container Entry: Forwarder
- Container Entry: Customer
- Container Entry: ESP
- Monitor AutoDispo
- Zeugnisdaten

OPTI GIS - Foundry Information-System

S:\v800-TDPC\dashboard\RGUDashboard-01.xml

Filter August 2014 - März 2017

Angebotsübersicht

Produkte nach Fertigungstermin

Angebotsdetails

Angebots-Nr.	Projekt	Anfrage	Kunde	Betrag
140005	MTR_19022014	MTR_19022014	Wagner Pressen GmbH	0 €
140067		12356984	Hanerbach GmbH	0 €
140068		fsedadsaddod	Hanerbach GmbH	0 €
140069		456456	Hanerbach GmbH	0 €
140071		Gasfasfisa	Hanerbach GmbH	0 €
140073	YESTCL20140922	20140922001	Heuschkel	0 €

- Systematic approach from sales to dispatch – less paper work-less meeting- follow-up
- Better efficiency – Data confidentiality – less human errors
- Action based on fact data – not just assumptions
- Easy to trace root cause – historical data
- Capture foundry know-how to meet manpower & skill shortage
- Better realistic costing considering not just purchase cost, manpower, machine , electricity etc.
- Easy to attract young talent /engineers
- Improvise OEE, downtime through better planning
- Visualise capacity –bottlenecks → better planning and reliability

- Digitalization is a prerequisite to achieve Industry/Foundry 4.0
- Integrated digitalization allows to interface with man-machine-material for real time data capturing
- Tracking of process data with order /customer is must in today's time
- Digitalized system can feed machine action – using IoT
- Allows you to become preventive measurement – reduce scrap, time wastage, material wastage – ultimately lots of cost savings
- Better real time monitoring – better process control
- Email-SMS notification unwanted events /occurrence

- Foundry has a non-linear structure, Sand-Mould-Melting can work only in FRP®, as it's beyond BOM & routing
- Foundry profitability depends on better planning & utilisation of shop floor infrastructure – if it's not part of generic s/w !
- Integrated system – FRP®, will require to manage the growth and scale of business, which will not reach to the saturation as you grow.
- FRP® ensures minimum island solutions as most of the areas are included and possible to even interface.
- FRP® ensures ROI by increasing productivity, efficiency of both machine and manpower.
- FRP® is the foundation for digitalization and Industry/Foundry 4.0.
- FRP® is a must ! The Question is when? ➔ Today or Tomorrow?





Thank you!

## Q&A

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