

Design and
production of Pumps
and Equipment



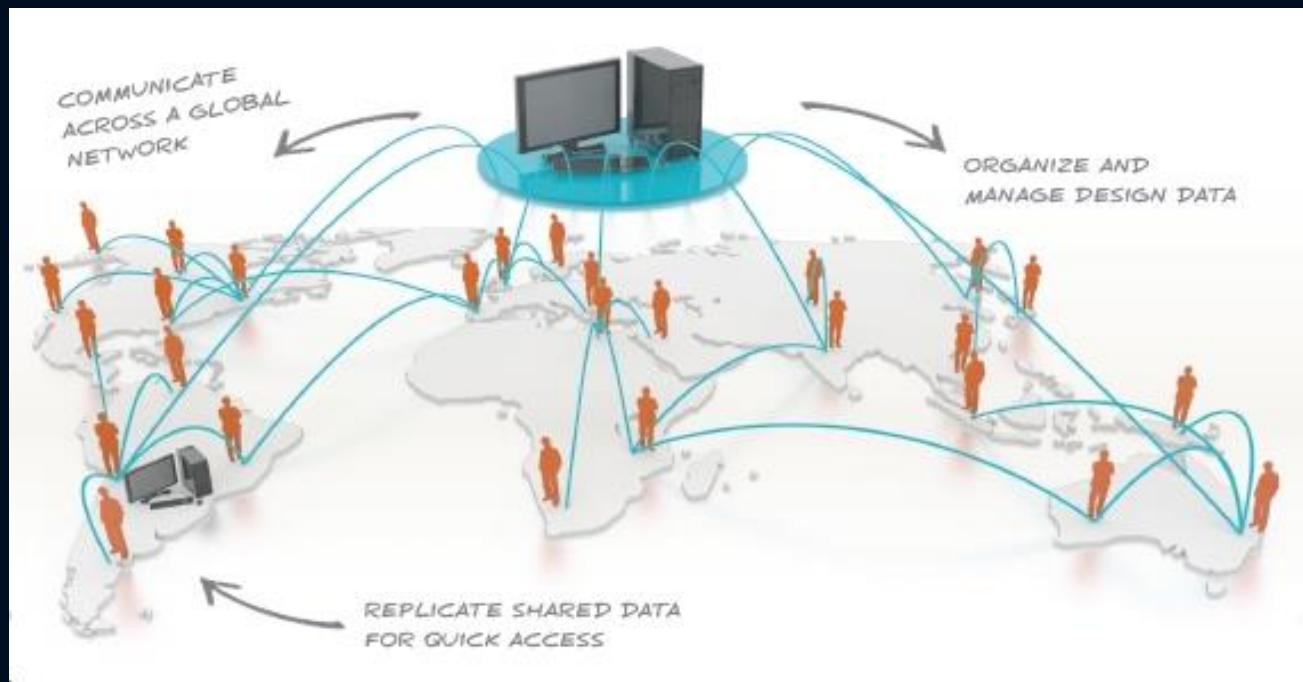
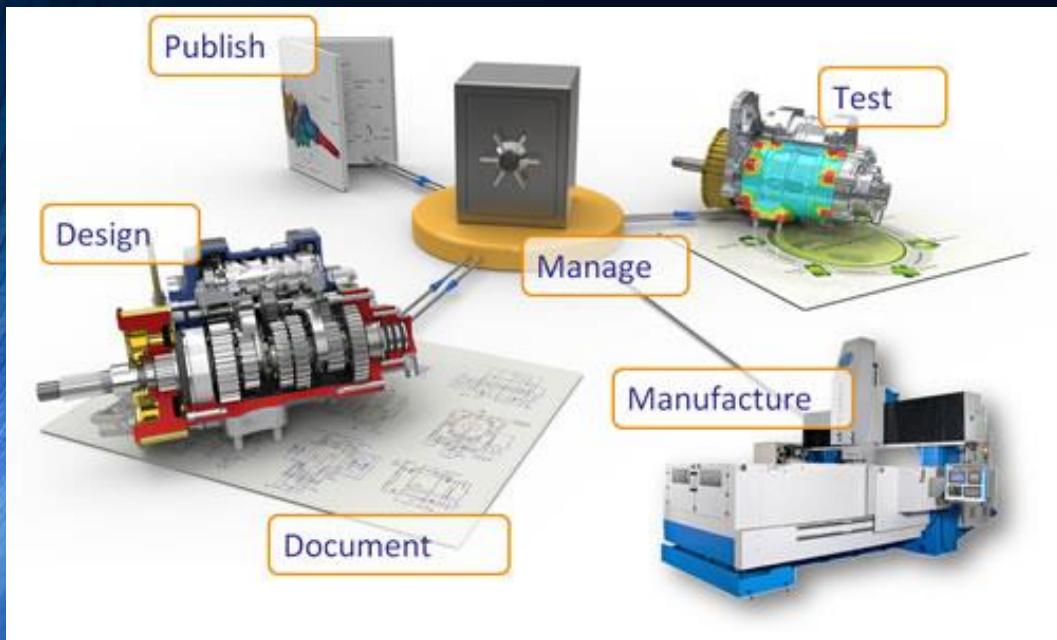
Using the best CAD/CAM/CAE solution for engineering design, validation and manufacturing of products

- Hydraulic and mechanical design of pumps and equipment
- Generating technical and after sales documentation
- Simulation and Validation of products
- Manufacturing of model, prototype pumps and other parts or serial production
- Controlling and Inspection
- After sale services

Product Data Management (PDM) products manage and synchronize our design data across our entire enterprise

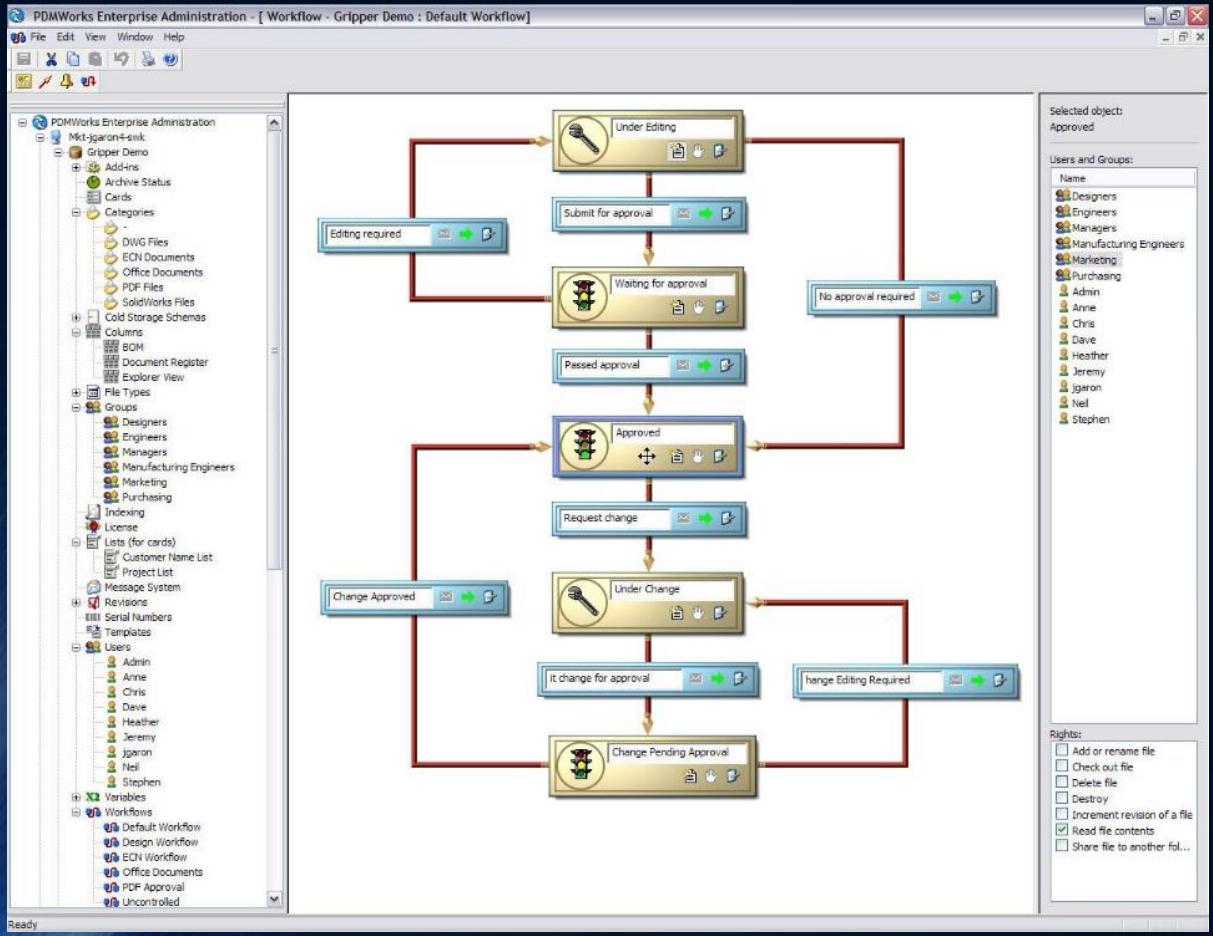
All data are securely stored and indexed in one database – Vault:

- Design data
- Sketches and documentation
- Manufacturing data, NC programs ...
- Supplier data
- Materials
- Cost calculations, etc



Everyone involved in the process share information and collaborate on designs - inside and outside the organization in multiple locations

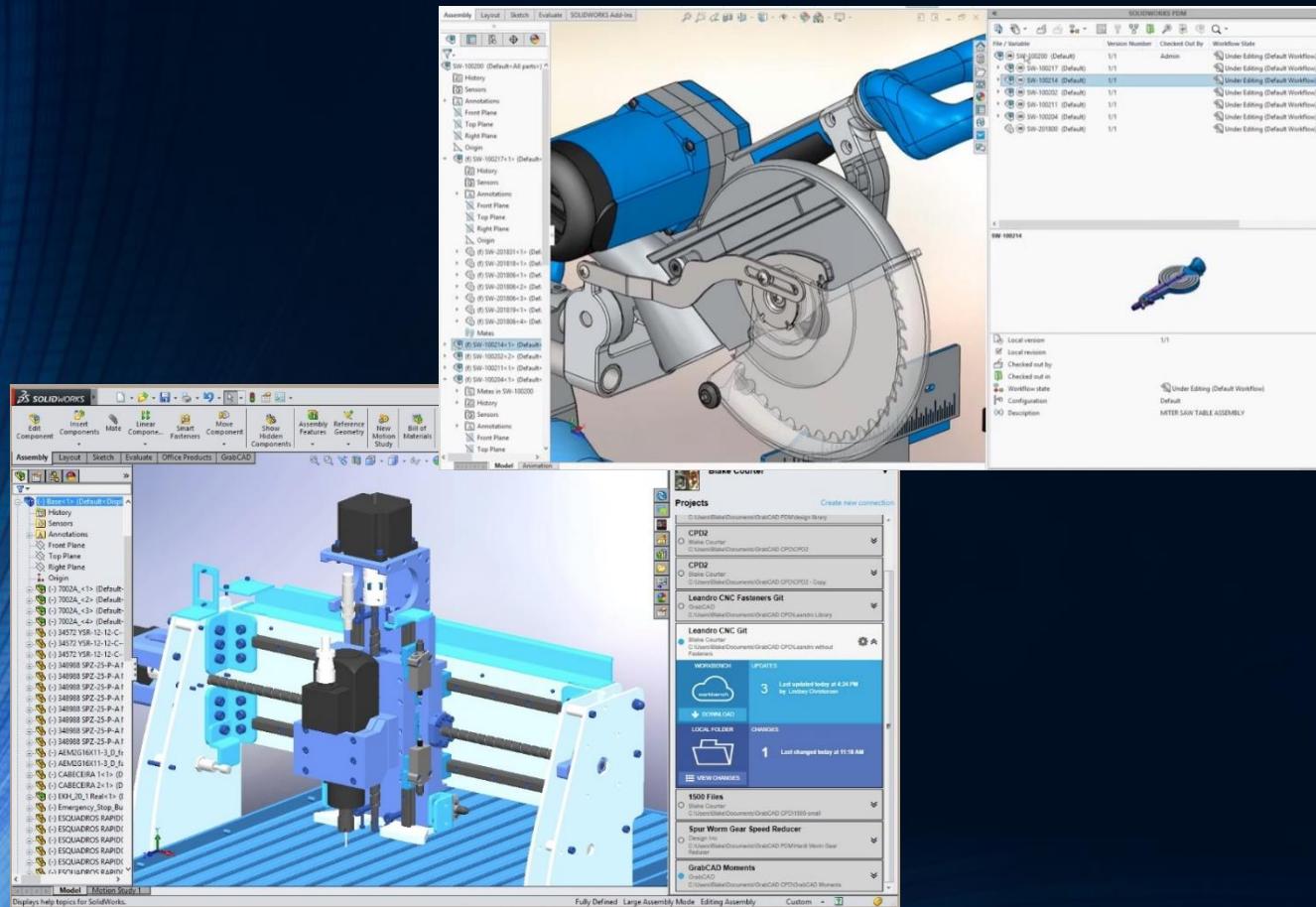
Product Data Management (PDM) products manage and synchronize your design data across our entire enterprise



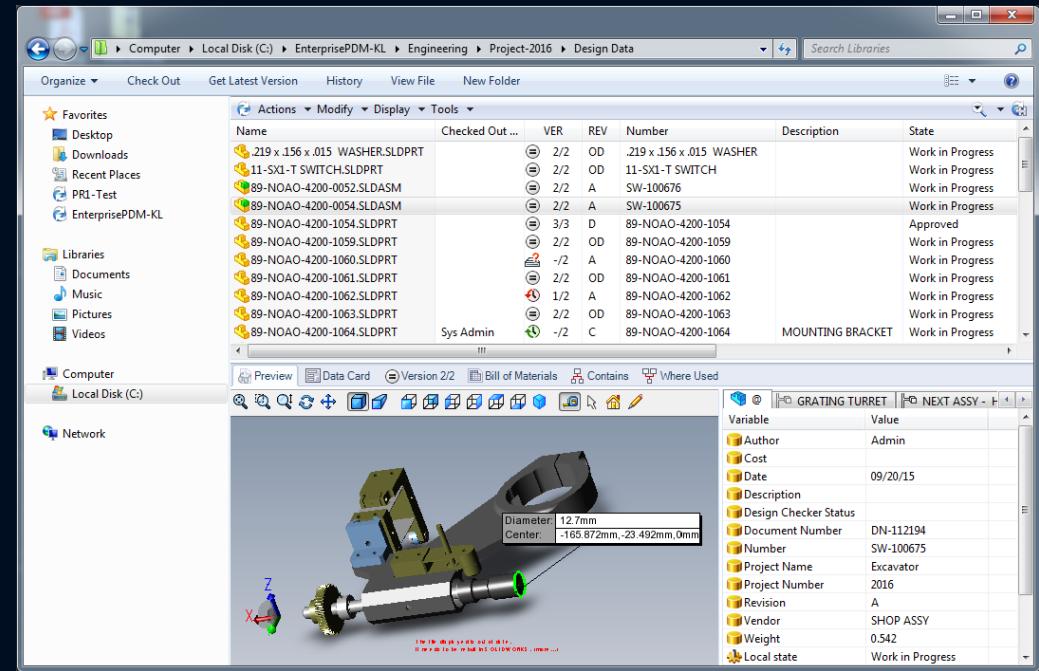
Creating an electronic workflow to formalize, manage, and optimize development, document approval and engineering change processes

Product Data Management (PDM) products manage and synchronize your design data across our entire enterprise

Revision Control



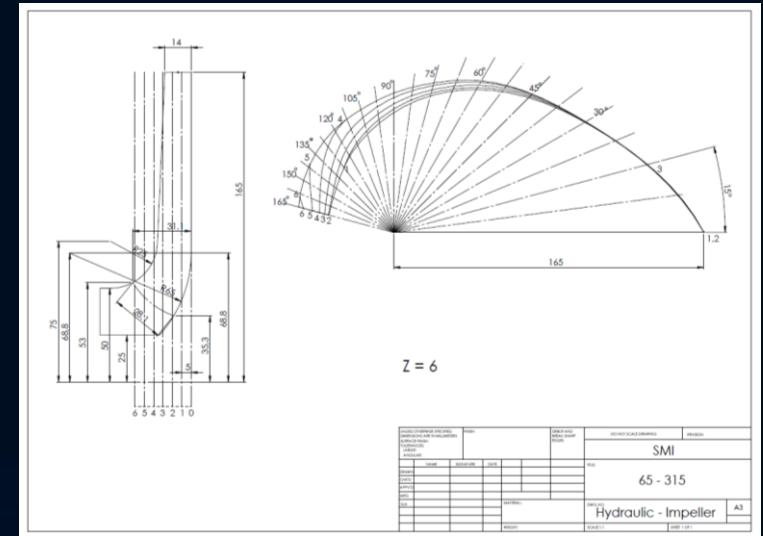
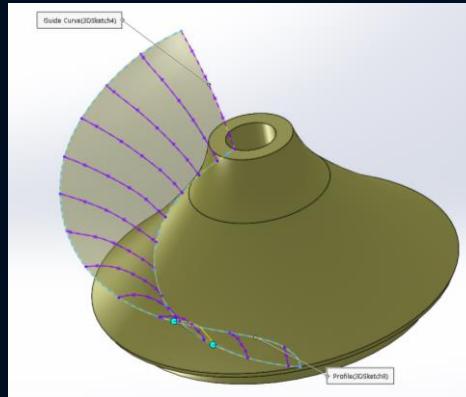
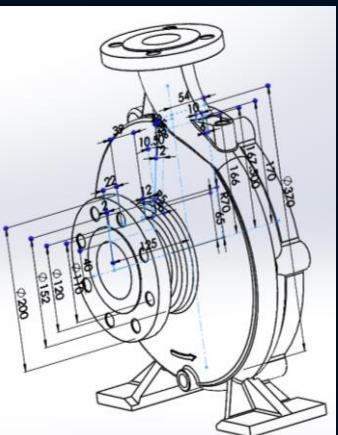
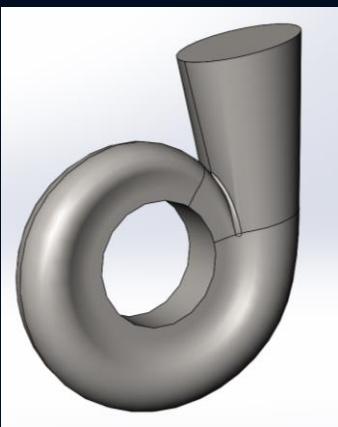
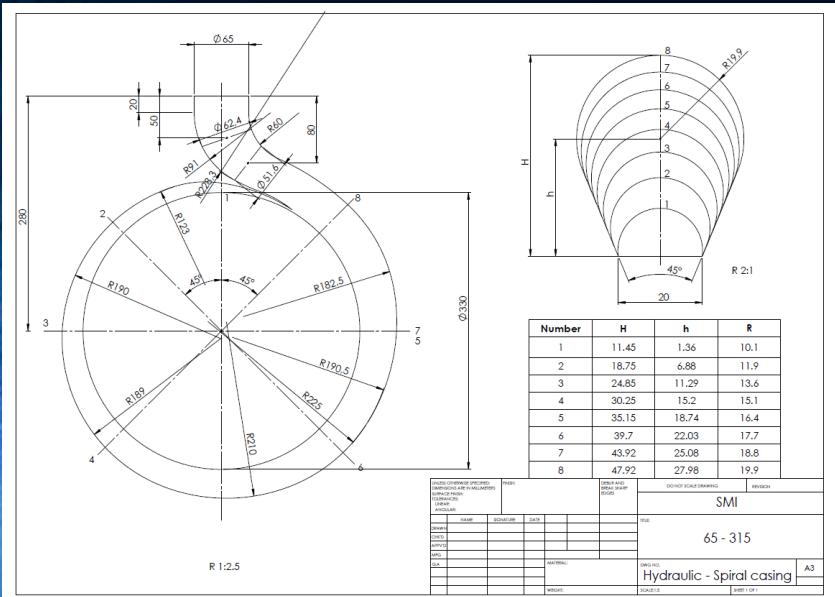
Find and Reuse Design Data



Search and integrated preview In user friendly environment – Windows explorer

Hydraulic and mechanical design of pumps and equipment

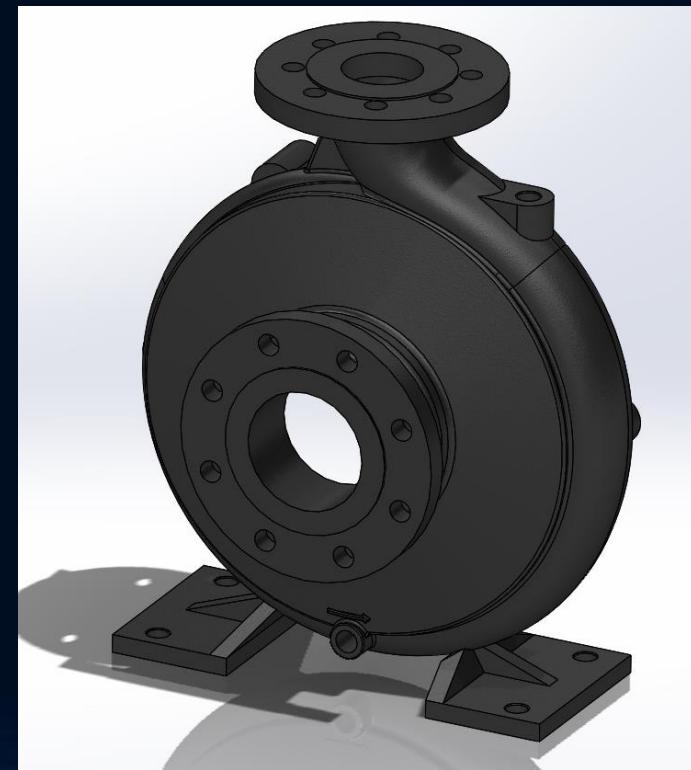
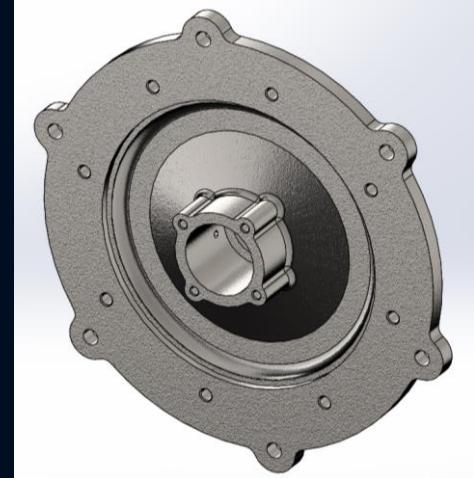
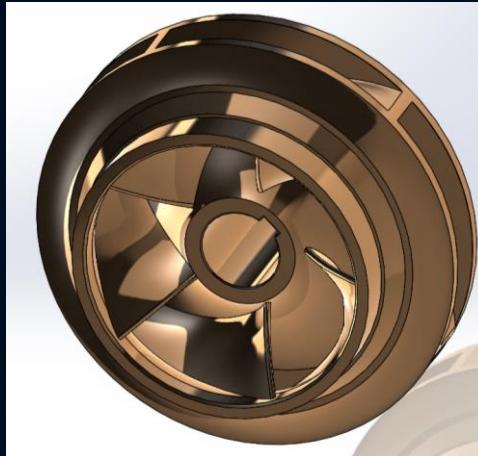
Hydraulic and mechanical design of Volute



Hydraulic and mechanical design of Impeller

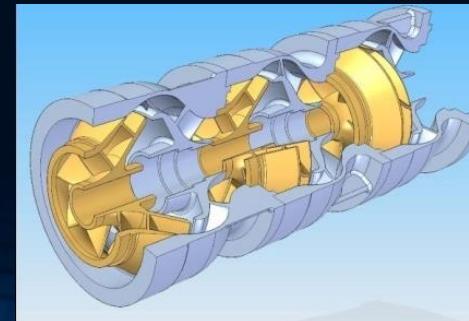
Hydraulic and mechanical design of pumps and equipment

- Mechanical design of other components



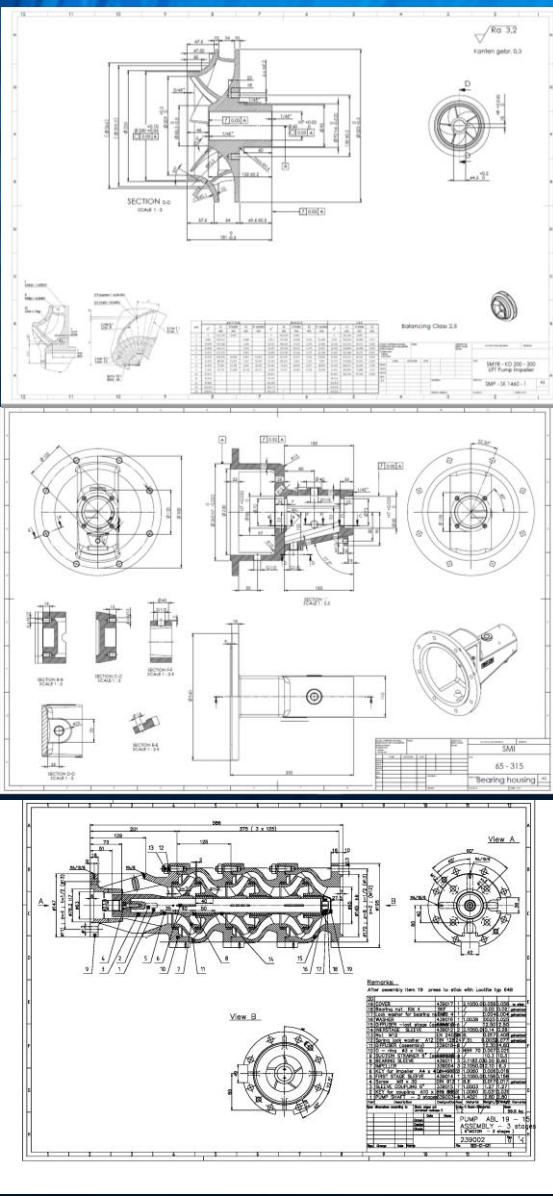
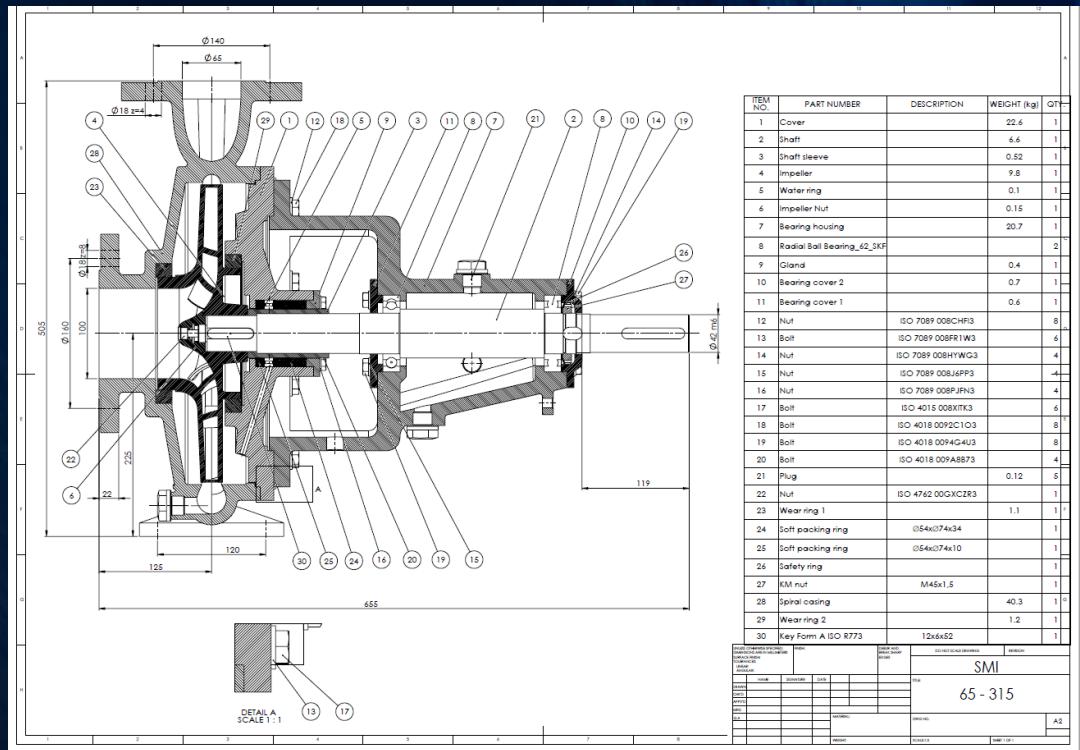
Hydraulic and mechanical design of pumps and equipment

- Creating and checking functionality (motion study) of assemblies and subassemblies



Generating technical documentation and specifications

- Assembly drawings
 - Work shop drawings
 - Drawings for control and inspection
 - Technical specifications
 - Templates

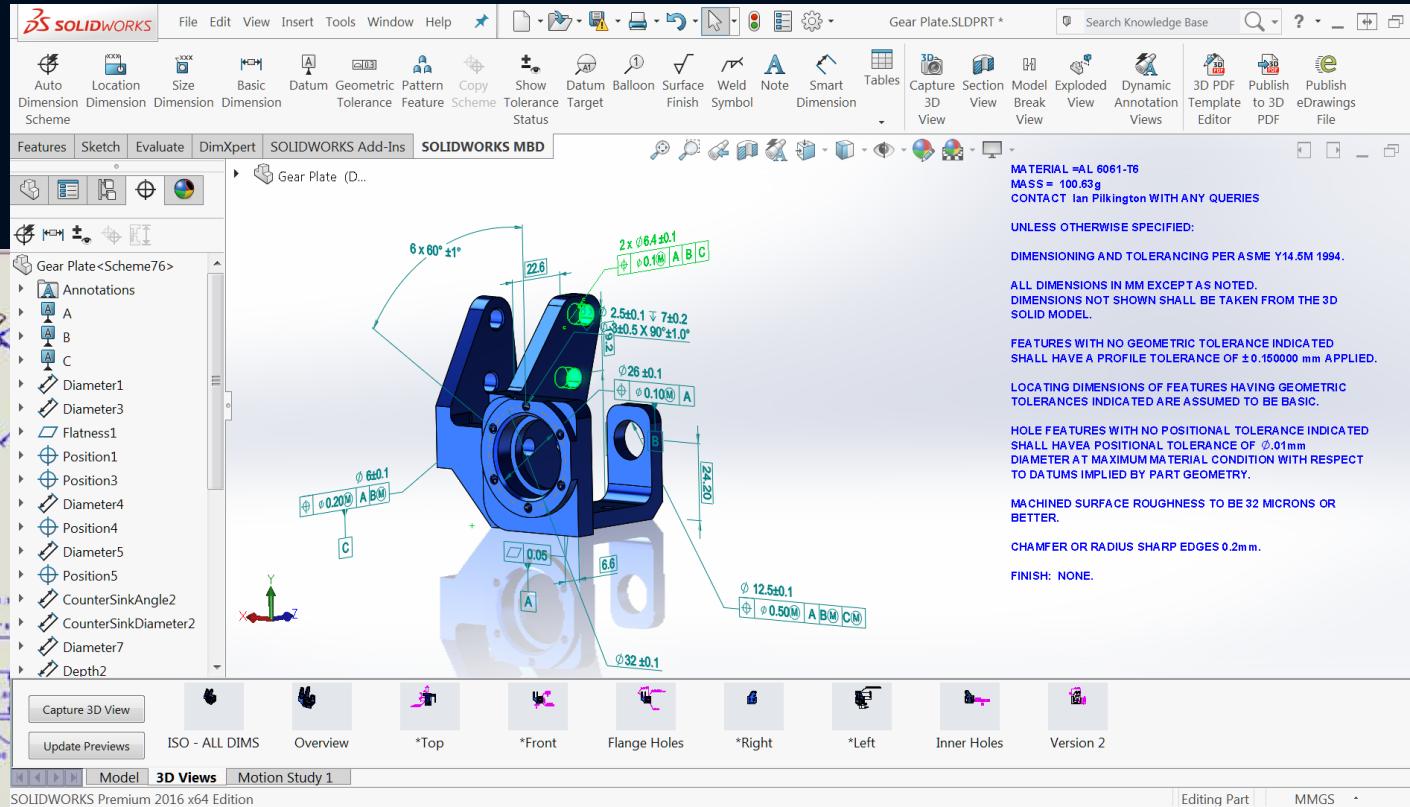
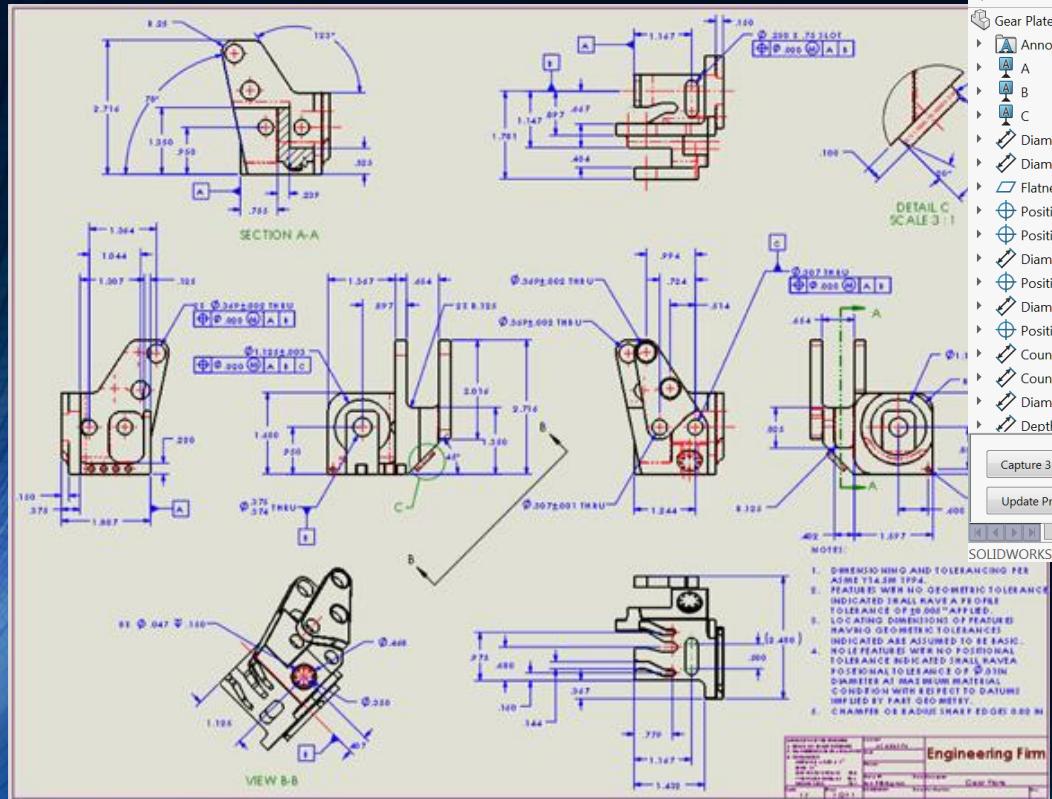


ITEM NO.	PART NUMBER	DESCRIPTION	WEIGHT (kg)	QTY
1	Cover		22.6	1
2	Shaft		6.6	1
3	Shaft sleeve		0.52	1
4	Impeller		9.8	1
5	Water ring		0.1	1
6	Impeller Nut		0.15	1
7	Bearing housing		20.7	1
8	Radial Ball Bearing_62_SKF			2
9	Gland		0.4	1
10	Bearing cover 2		0.7	1
11	Bearing cover 1		0.6	1
12	Nut	ISO 7089 008CHR3		8
13	Bolt	ISO 7089 008FR1W3		6
14	Nut	ISO 7089 008HYWG3		4
15	Nut	ISO 7089 008J6PP3		4
16	Nut	ISO 7089 008PJFN3		4
17	Bolt	ISO 4015 008XITK3		6
18	Bolt	ISO 4018 0092C1O3		8
19	Bolt	ISO 4018 0094G4U3		8
20	Bolt	ISO 4018 009A8B73		4
21	Plug		0.12	5
22	Nut	ISO 4762 00GXCZR3		1
23	Wear ring 1		1.1	1
24	Soft packing ring	Ø54xØ74x34		1
25	Soft packing ring	Ø54xØ74x10		1
26	Safety ring			1
27	KM nut	M45x1,5		1
28	Spiral casing		40.3	1
29	Wear ring 2		1.2	1
30	Key Form A ISO R773	12x6x52		1

Generating technical documentation and specifications

Integrated drawingless manufacturing solution

Classic documentation



Model Based Definition - Documentation



Generating after sales and marketing documentation

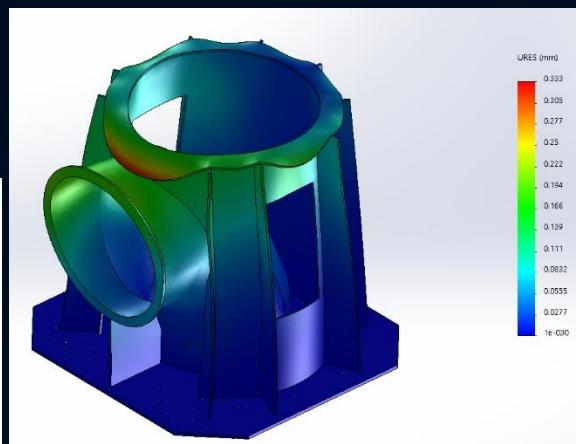
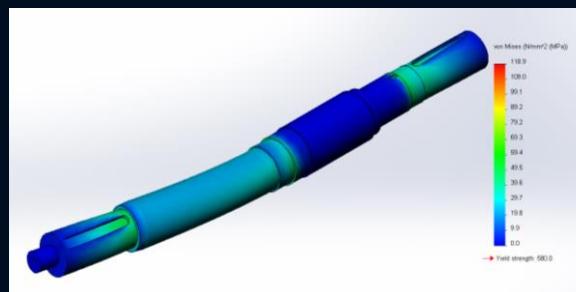
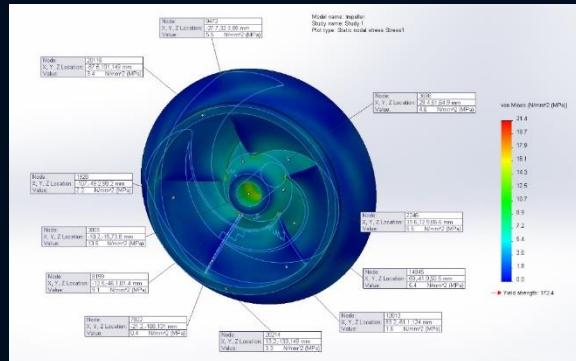
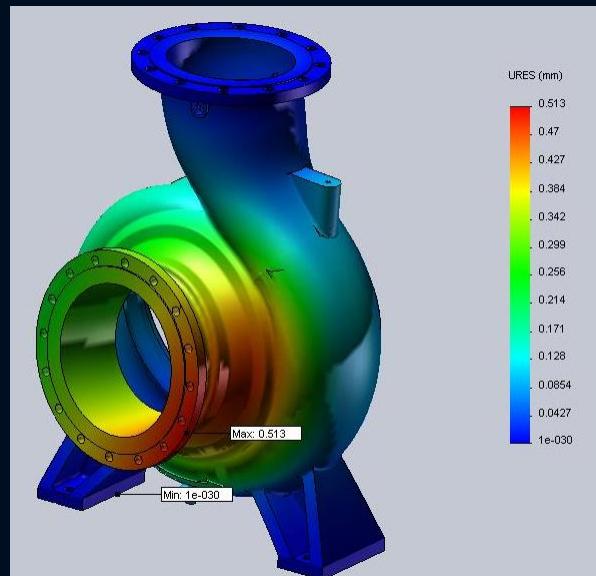
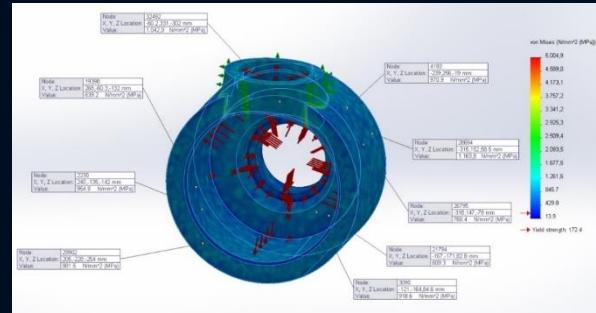
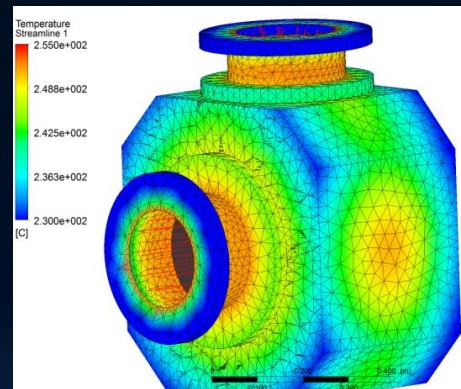
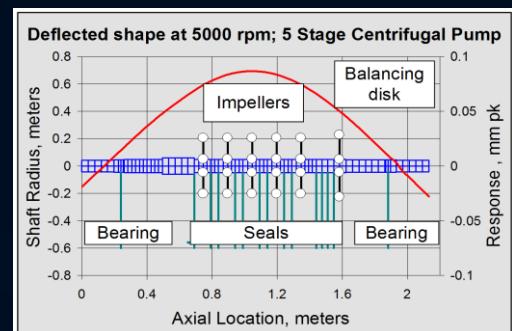
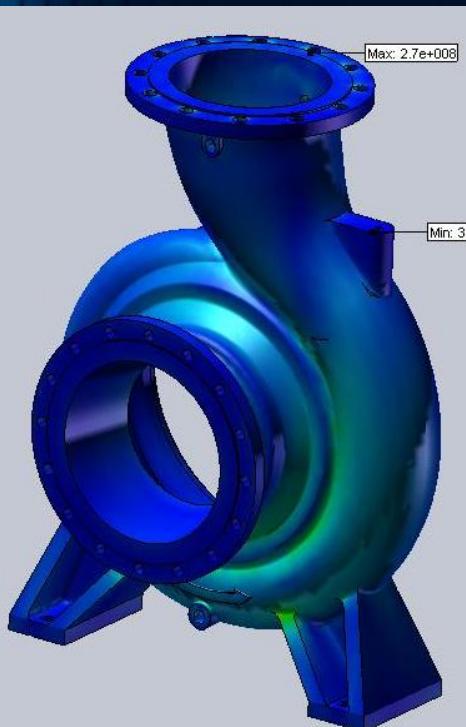
- Spare parts
- Manuals
- Technical specifications
- High quality images, etc...



Simulation and Validation

In design process – during the designer are looking for the best solution

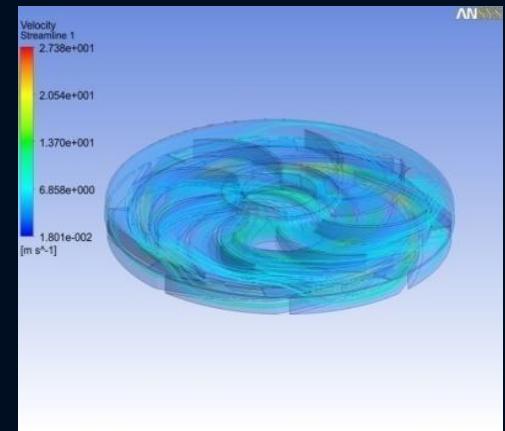
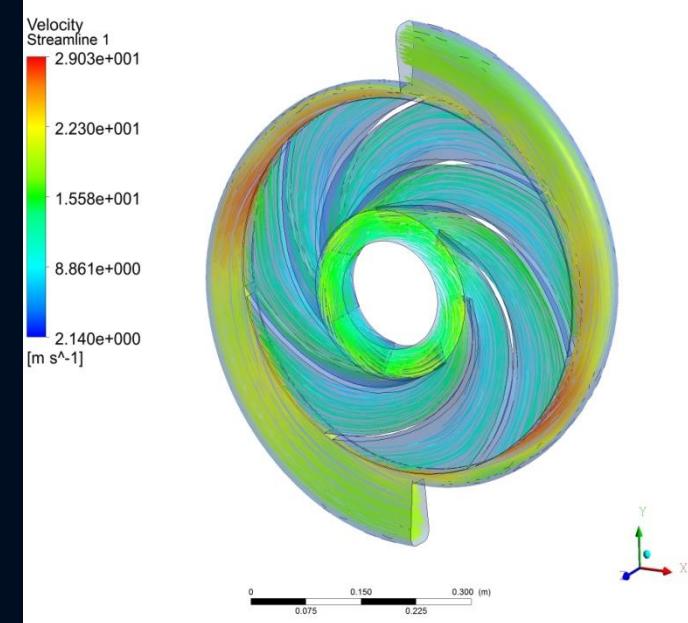
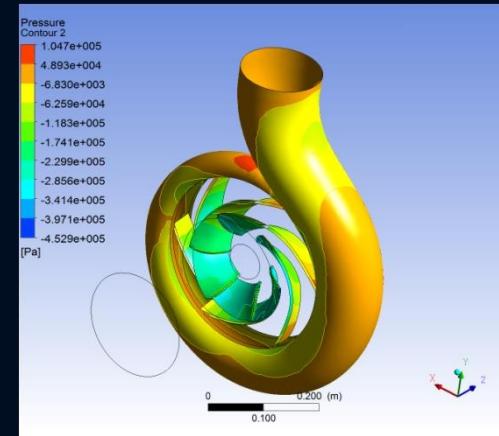
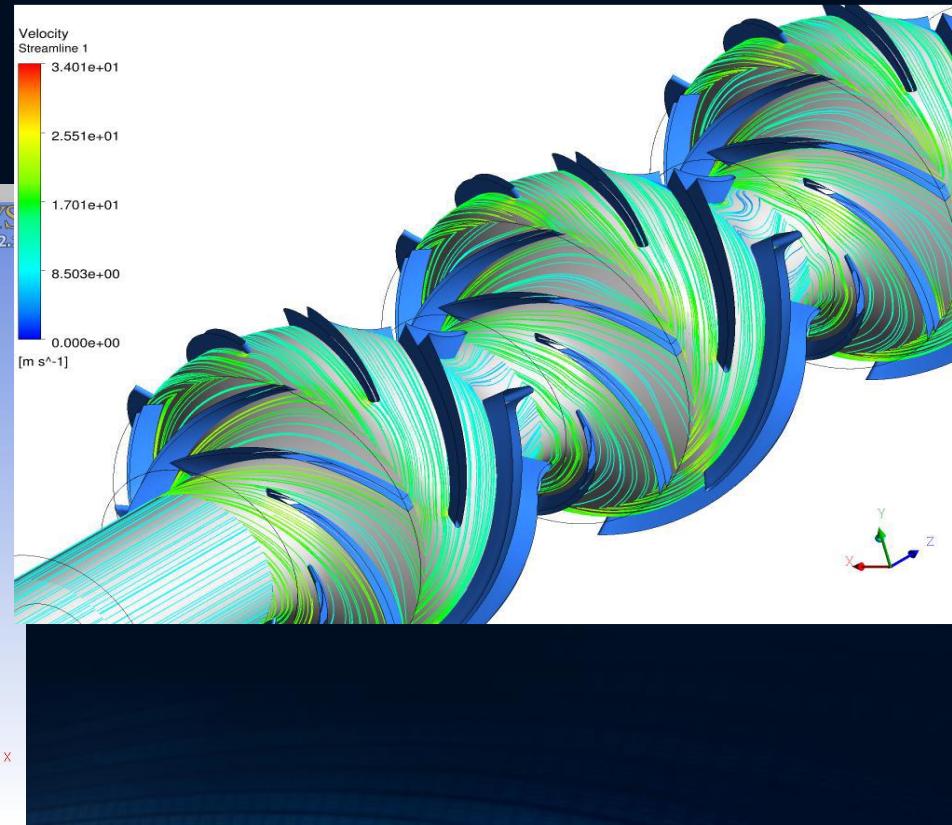
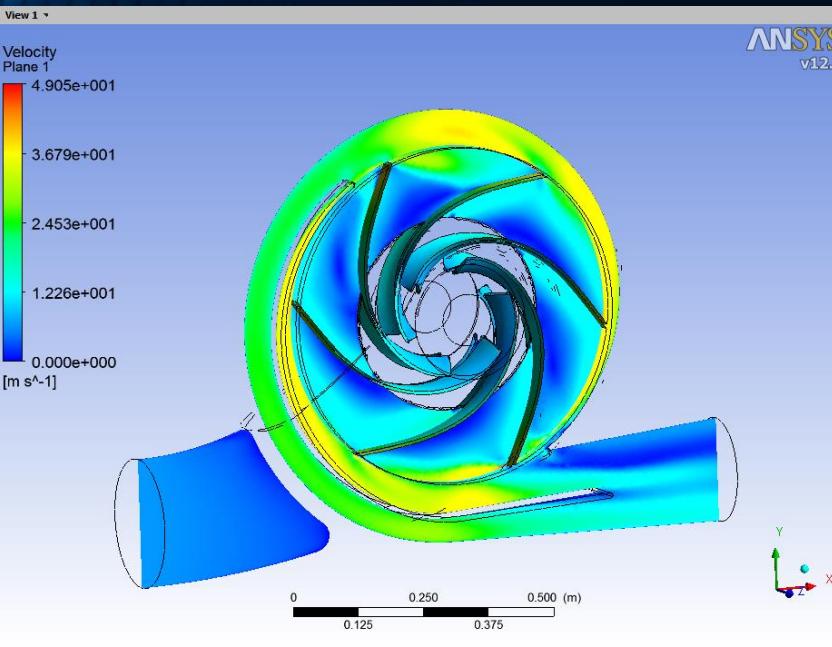
- Structural analysis with static and dynamic load
 - Thermal analysis
 - Deformation with large displacement
 - Structural Optimization analysis



Simulation and Validation

External Validation

- CFD Analysis - Flow Simulation
- Fluid flow
- Heat transfer
- Displacement distribution from a coupled thermal-stress

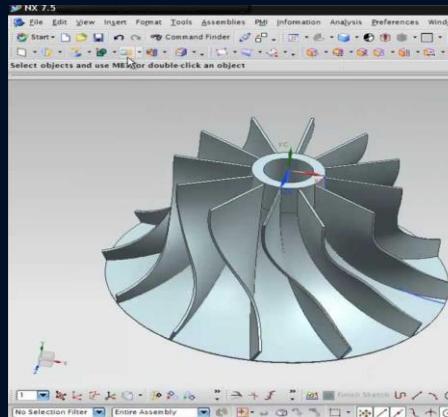


Preparing for production and Manufacturing

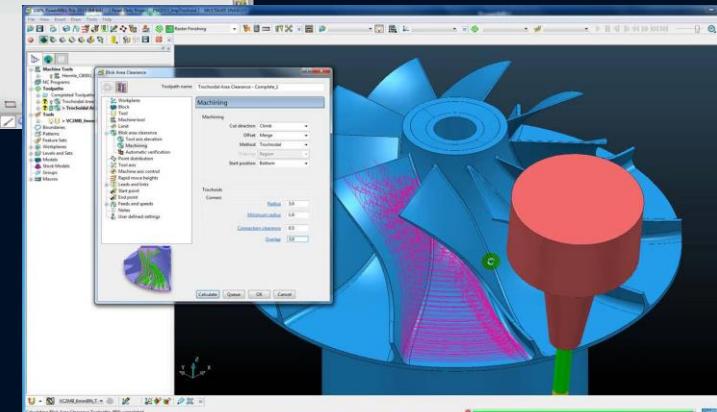


SAMPLE:

- Manufacturing of Impeller for prototype pump (with 5 axis machine) using special CAM strategies



3D CAD MODEL



CAM PREPARATION

NC CODE

```
N00 G21  
N01 G00 Z1  
N02 G50 S2000  
N03 G96 S60 F0.5  
N04 G00 X0 Y0 Z1  
N05 G00 Z1  
N06 G00 Z1  
N07 G00 X6,.49243466299862 Y0..302  
N08 G00 X6,.49243466299862 Z1  
N09 G01 X6,.49243466299862 Y17.68  
N10 G01 X0 Y17.6891334250344  
N11 G01 X0 Y20  
N12 G01 X-.5983493810179 Y20  
N13 G01 X15.5983493810179 Y17.68  
N14 G01 X9.10591471801926 Y17.68  
N15 G01 X9.10591471801926 Y0..302  
N16 G00 X6,.49243466299862 Y0..302  
N17 G00 Z1  
N18 G00 X27.7028885832187 Y4.924  
N19 G01 Z-1  
N20 G01 X0.-2063273727648 Y4.984  
N21 G01 X29.453502565337 Y2.6409  
N22 G02 X28.0055020632737 Y1.182  
N23 G02 X26.1898211829436 Y0.295  
N24 G02 X23.9339752407153 Y0.427  
N25 G02 X21.1416781292985 Y0.427
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MANUFACTURING

Preparing for production and Manufacturing



SAMPLE:

- Manufacturing of Impeller for prototype pump (with 3 axis machine)

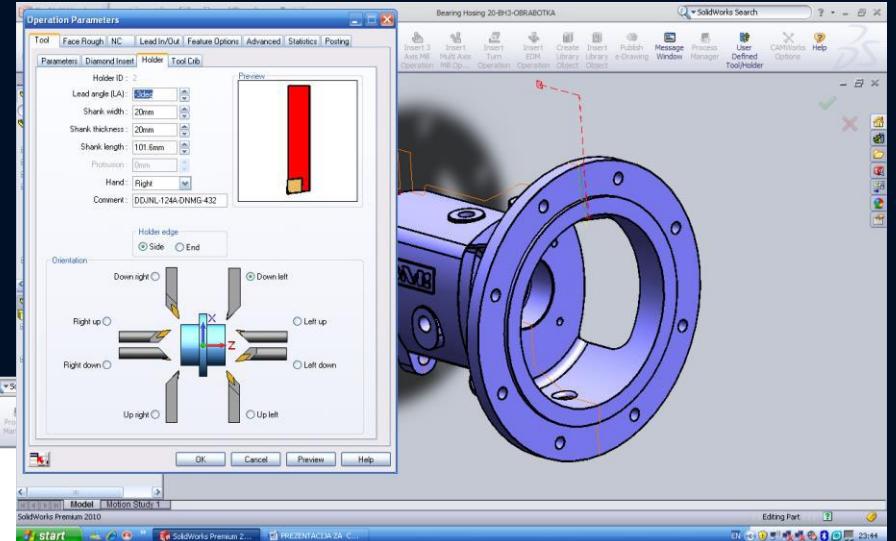
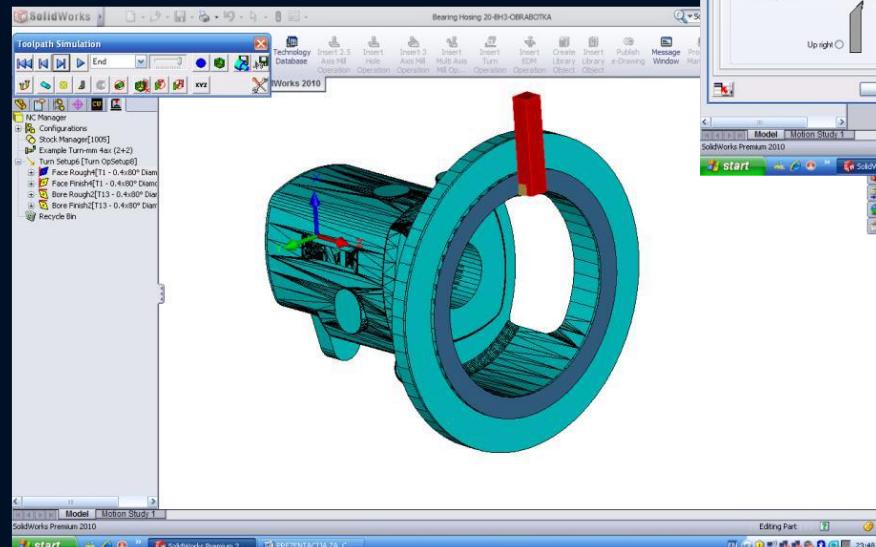
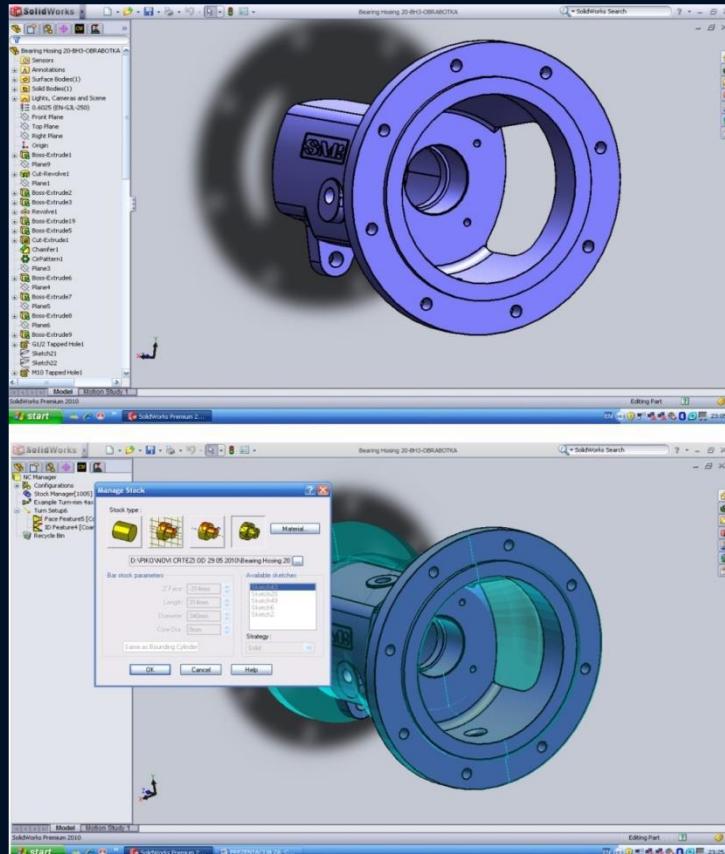


- Manufacturing of difusor

Preparing for production and Manufacturing

Preparing for serial production with implementation of CAM software

- Some 3D models of parts are used as a input in CAM software
- Any change in the drawings is automatically changed in the CNC program for machining



Preparing for production and Manufacturing



Preparing for serial production with implementation of CAM software

- Technological data: Feed, Speed, Tools ...
- NC code for: Milling – 2 to 5 axis, Turning, Turn-Mill machines

My Company Name
SETUP SHEET

Company	KG
Date/Time	06/07/10 23:31
Material	1005
Setup Name	Turn OpSetup8
Part File	Bearing Hosing 20-BH

CNC Mach	Example Turn-mm 4a
Setup#	1 of 1
Programmer	
Units	MM
Mach Time(min)	10,15

Tool St.	1
Operation	Face Rough4
Insert	CNMG-431
Holder	DDJNL-124A-DNMG-432
Speed	106 RPM
Feed	24,397 FPM
Time(min)	5,66
Tip Len	1.017,86

Tool St.	1
Operation	Face Finish4
Insert	CNMG-431
Holder	DDJNL-124A-DNMG-432
Speed	106 RPM
Feed	0,229 FPR
Time(min)	2,79
Tip Len	796,17

Tool St.	13
Operation	Bore Rough2
Insert	CNMG-431
Holder	DDJNL-124A-DNMG-432
Speed	442 RPM
Feed	101,158 FPM
Time(min)	1,12
Tip Len	1.329,15

07-pw-10 23:33:00 Page 1 of 2

My Company Name
SETUP SHEET

Company	KG
Date/Time	06/08/10 20:35
Material	1005
Stock Size	340,00, 340,00, 320,0
Setup Origin	.00,.00,.00
Setup Name	Group1

CNC Mach	Bearing Hosing 20-BH
Setup#	1 of 2
Programmer	
Units	MM
Mach Time(mi)	1,06

Tool#	42
Operation	Tap1
Tool Description	10.0X1.5 TAP
Holder Description	Add Comment
Holder Number	Default
Speed	213,445877279403
Feed	320,168815919104
Mach Depth	14,90
Min. Tool Prot. Len.	N.A.
Tip Len	577,62
Time	0,71

Minimum	Maximum
X: -45,96194078	45,961940777
Y: -45,96194078	45,961940777
Z: -14,9	28,000000000

Endmill	Oversize	Holder	Feed/Speed																																
<input checked="" type="checkbox"/> Show all holders <input type="radio"/> Only show holders that match the current spindle Current Spindle: CAT 50, Spindle																																			
Tool Holders: <table border="1"> <tr> <td>Name</td> <td>Type</td> <td>Tool dia.</td> <td>Spindle</td> </tr> <tr> <td>CAT 30, EndMill</td> <td>Endmill</td> <td>dynamic</td> <td>CAT 30, Spindle</td> </tr> <tr> <td>CAT 30, Collet</td> <td>Collet</td> <td>dynamic</td> <td>CAT 30, Spindle</td> </tr> <tr> <td>CAT 40, EndMill</td> <td>Endmill</td> <td>dynamic</td> <td>CAT 40, Spindle</td> </tr> <tr> <td>CAT 40, Collet</td> <td>Collet</td> <td>dynamic</td> <td>CAT 40, Spindle</td> </tr> <tr> <td>CAT 50, EndMill</td> <td>Endmill</td> <td>dynamic</td> <td>CAT 50, Spindle</td> </tr> <tr> <td>CAT 50, Collet</td> <td>Collet</td> <td>dynamic</td> <td>CAT 50, Spindle</td> </tr> <tr> <td>Mittum</td> <td>Collet</td> <td>dynamic</td> <td>Mittum</td> </tr> </table>				Name	Type	Tool dia.	Spindle	CAT 30, EndMill	Endmill	dynamic	CAT 30, Spindle	CAT 30, Collet	Collet	dynamic	CAT 30, Spindle	CAT 40, EndMill	Endmill	dynamic	CAT 40, Spindle	CAT 40, Collet	Collet	dynamic	CAT 40, Spindle	CAT 50, EndMill	Endmill	dynamic	CAT 50, Spindle	CAT 50, Collet	Collet	dynamic	CAT 50, Spindle	Mittum	Collet	dynamic	Mittum
Name	Type	Tool dia.	Spindle																																
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CAT 50, Collet	Collet	dynamic	CAT 50, Spindle																																
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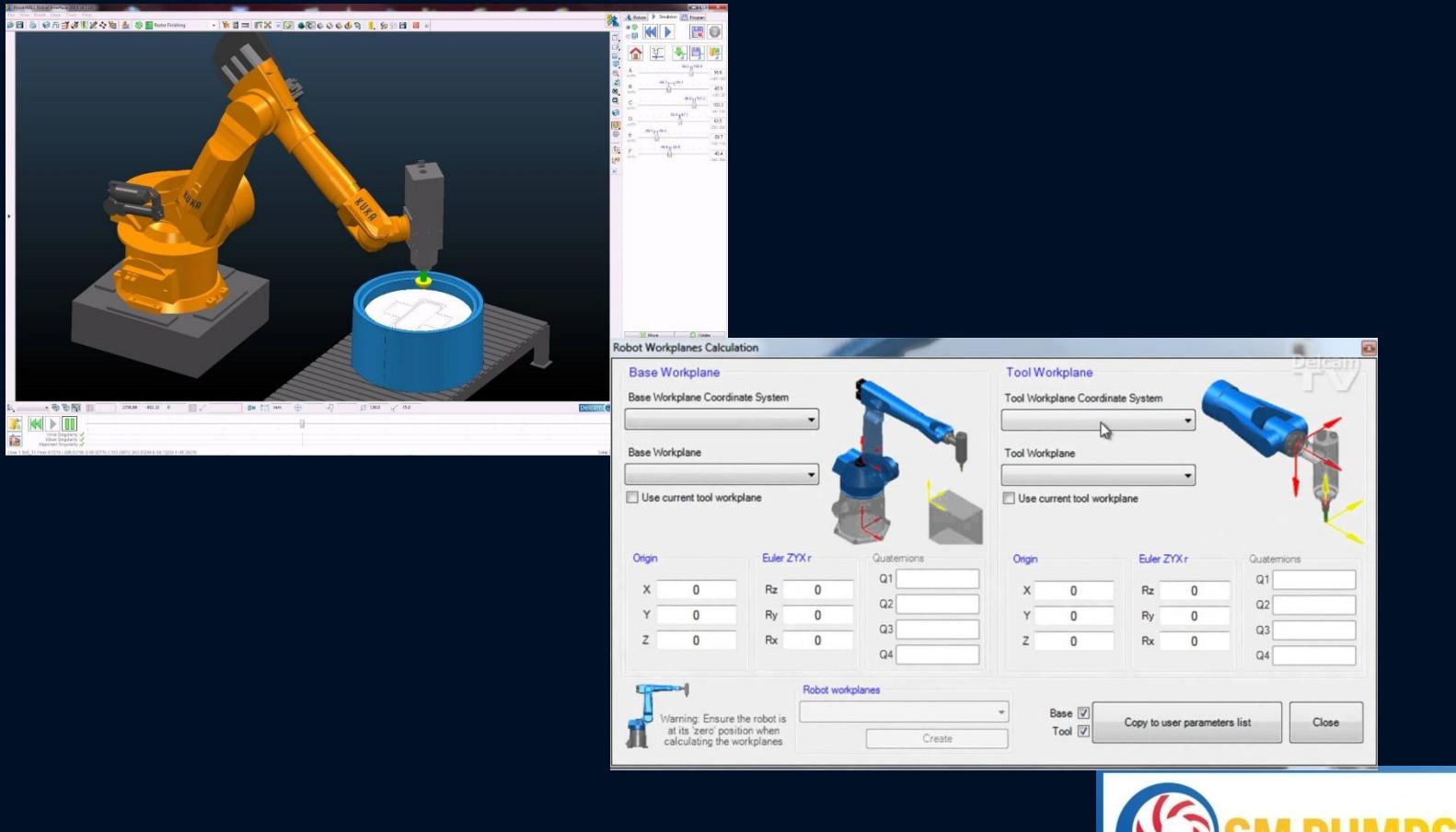
OK Cancel Apply Help

06-pw-10 20:37:32 Page 2 of 3

Manufacturing Details									
RES		ULTS							
<input type="checkbox"/> Operation List		<input checked="" type="checkbox"/> Tool List							
MANUFACTURING TOOL DETAIL SHEET									
Part: Q36SM Chamfer Setup: Setup1 (1 of 1) Date: Tuesday, March 17, 2015 09:42:28									
Crib: basicmetric Summary:									
Slot 1: facemillM3200 D 32,000 mm L 30,000 mm Slot 2: center_M1250-0500 D 5,000 mm L 5,000 mm Slot 3: TD_M0600.J D 6,000 mm L 70,000 mm Slot 4: endmillM0800:reg D 8,000 mm L 40,000 mm F2 T 0,000 mm Slot 5: endmillM2000:reg D 20,000 mm L 38,100 mm F2 T 0,000 mm Slot 6: endmillM1200:4reg D 12,000 mm L 31,750 mm F4 T 0,000 mm Slot 7: endmillM1400:reg-ground D 14,000 mm L 28,580 mm F2 T 2,000 mm Slot 8: endmillBM1200:4reg D 12,000 mm L 25,000 mm F4 T 6,000 mm Slot 9: endmillM1200:reg D 12,000 mm L 25,400 mm F2 T 0,000 mm Slot 10: endmillM0600:reg D 6,000 mm L 35,000 mm F2 T 0,000 mm Slot 11: endmillM0600:4reg D 6,000 mm L 15,880 mm F4 T 0,000 mm									
R E S E S E S T S T S									
(FINISH FACE1) N25 G0 G40 G49 G80 G90 N30 T1 M6 N35 G54 X326.47 Y5.556 N40 G03 S10000 N45 G43 H1 Z26.0 M8 N50 Z4.0 N55 G1 Z0, F5000.0 N60 X-21.0 N65 Y32.112 N70 X326.47 N75 Y58.668 N80 X-21.0 N85 Y85.223 N90 X326.47 N95 Y111.779 N100 X-21.0 N105 Y138.335 N110 X326.47 N115 Y164.891 N120 X-21.0 N125 Y191.147 N130 X326.47 N135 Y218.003 N140 X-21.0 N145 Y244.558 N150 X326.47 N155 Y271.114 N160 X-21.0 N165 Y297.67 N170 X326.47 N175 G0 Z26.0 N180 M5 N185 M0 N190 G91 G28 Z0. N195 G90 G49									

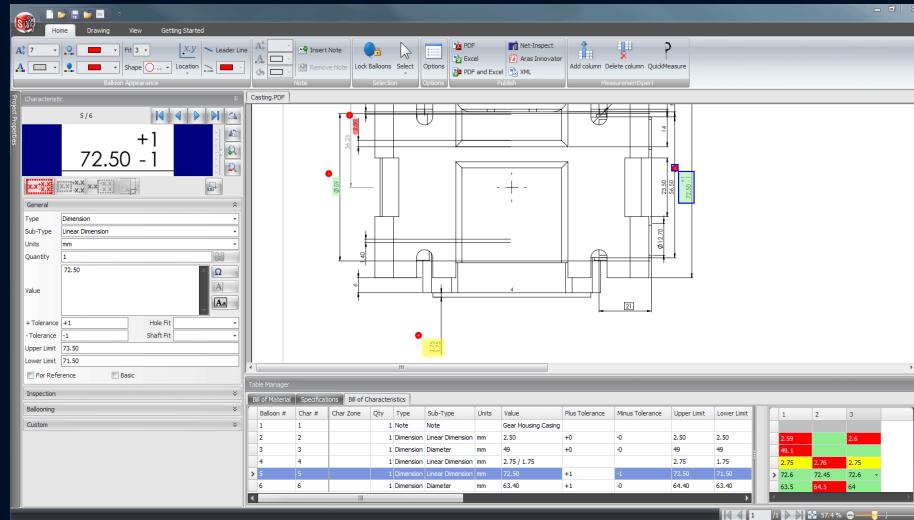
Preparing for production and Manufacturing

Specific industry machining solution
-Robot programming



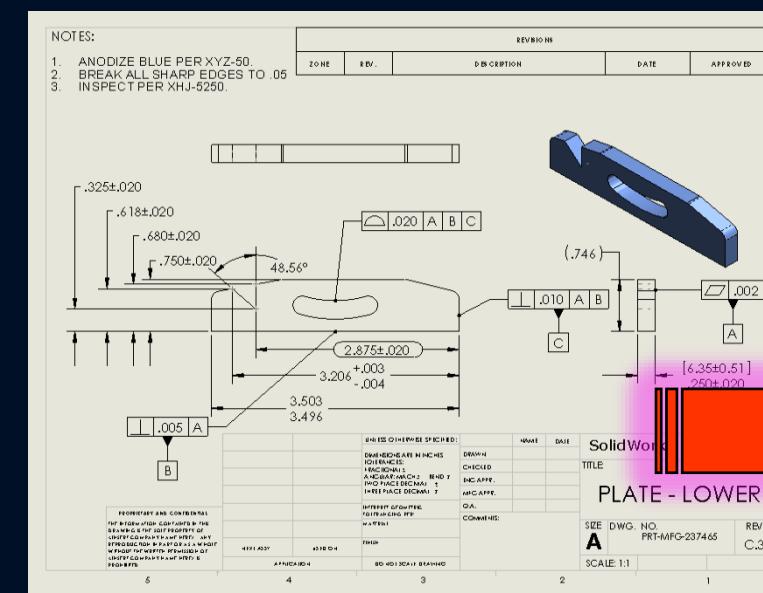
Controlling and inspection

- Automatically Excel table creation (Measuring List) from 2D Drawings in CAD, PDF or JPG format
- Save time and eliminate possibility of mistakes



System recognize:

- Dimension
- Tolerances
- Geometrical tolerances
- Notes



First Article Inspection Report								
Form 3: Characteristic Accountability, Verification and Compatibility Evaluation			Inspection / Test Results			Other Fields		
1. Part Number	2. Part Name	3. Serial/Ref	4. FAI	5. Part - Lower Drawing	6. Part - Higher Drawing	7. Part - Lower Drawing	8. Part - Higher Drawing	9. Notes
Lower Plate-001	PLATE - LOWER	PRT-MFG-237465	C.3					
1	Characteristic	Requirement	Us.	Bl. Upper Limit	Bl. Lower Limit	N. Results	Bl. Designed Tolerance	Bl. Min Conformance Number
1	NA	NOTES	n	0.00	0.00			
2	NA	1. ANODIZE BLUE PER XYZ-50.	n	0.27	0.23			
3	NA	2. BREAK ALL SHARP EDGES TO .05	n	0.02	0.00			
4	NA	3. IN SPECT PER XHJ-5250.	n	0.00	0.00			
5	Flatness	[.030]	n	0.00	0.00			
6	Length	.250	n	0.27	0.23			
7	Length	.744	n	REF	REF			
8	Profile	[.030] A [B]	n	0.02	0.00			
9	Perpendicularity	[.030] A [B]	n	0.01	0.00			
10	Length	2.875	n	2.875	2.875			
11	Length	3.206	n	3.21	3.20			
12	Length	3.503	n	3.50	3.50			
13	Length	3.496	n	3.496	3.496			
14	Perpendicularity	[.030] A [B]	n	0.01	0.00			
15	Radius	.750	n	0.77	0.73			
16	Radius	.680	n	0.70	0.64			
17	Radius	.618	n	0.64	0.60			
18	Radius	.680	n	0.25	0.21			
19	Radius	.325	n	0.29	0.28			
20	Radius	.325 THRU	n	0.29	0.28			
21	Radius	.325 A [B]	n	0.02	0.00			
22	Radius	.406	n	0.41	0.40			
23	Radius	.156	n	0.00	0.05			
24	Radius	.030 A [B]	n	0.02	0.00			
25	Diameter	.135 THRU	n	0.135	0.132			
26	Diameter	.135 THRU	n	0.135	0.132			
27	Diameter	.135 THRU	n	0.135	0.132			
28	Position	[.030] A [B]	n	0.02	0.00			
29	Length	.750	n	Basic	Basic			

The signature indicates that all characteristics are accounted for, meet drawing requirements or are properly documented for disposition.

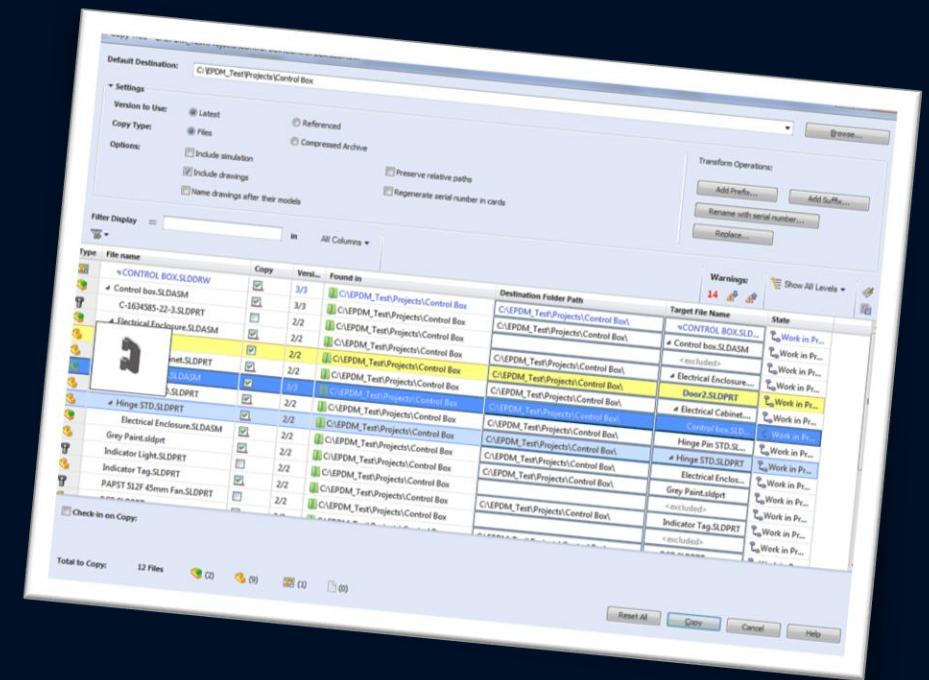
Product Data Management System



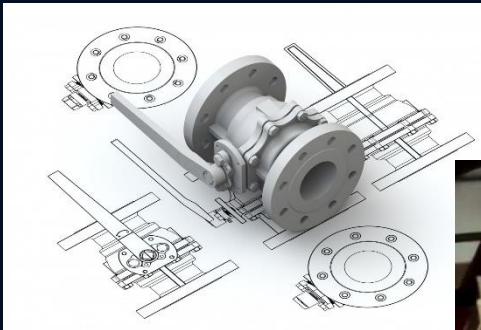
BASIC RULE – EVERUBODY MUST USE SAME DATABASE

- The Data are Securely stored and indexed and concerns about version control and data loss are eliminated
- Sharing and collaborating designs with people inside and outside the organization in multiple locations.
- Create an electronic workflow to formalize, manage, and optimize development, document approval, and engineering change processes.

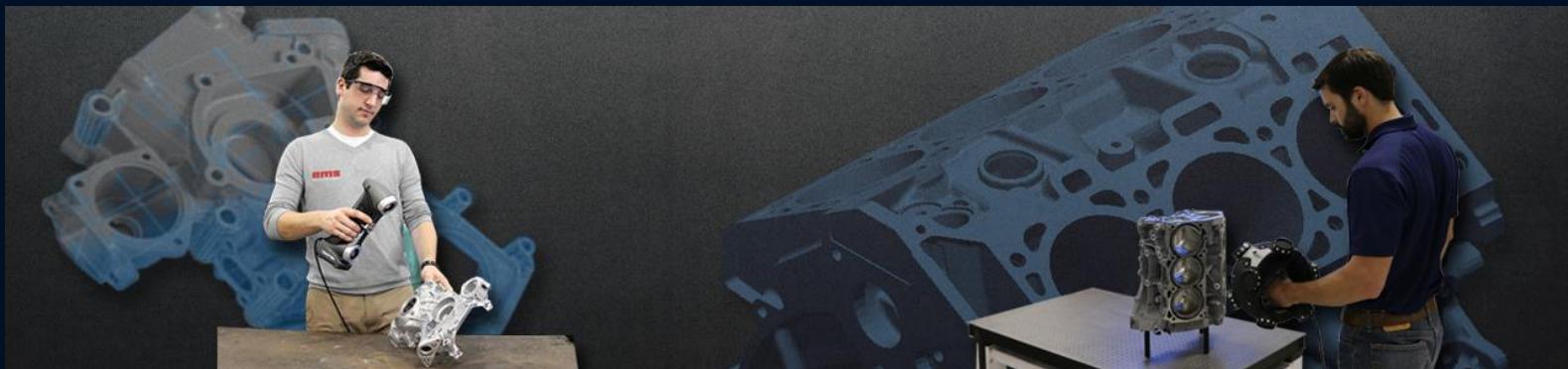
- Secure Access
- Revision Control
- Find and Reuse Design Data
- Audit Trail
- Integrated Search
- Advanced Search and Favorites
- Integrated eDrawings Preview
- Multi-Document Preview
- Scalability
- Automated Neutral File Creation
- Custom Configuration
- Automated Data Import and Export
- Serial Number Generators
- Distributed Design Teams
- Remote Access
- Automated Approval Process
- Email Notifications



Rapid Prototyping and Reverse Engineering



3D printing



Reverse Engineering - From physical to CAD model