

Auto Identification for Cobotic Welding & Cutting

Panel Project PP23-07

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SPC & PPPF Joint Panel Meeting NSWC Carderock – Bethesda, MD
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Auto Identification for Cobotic Welding & Cutting

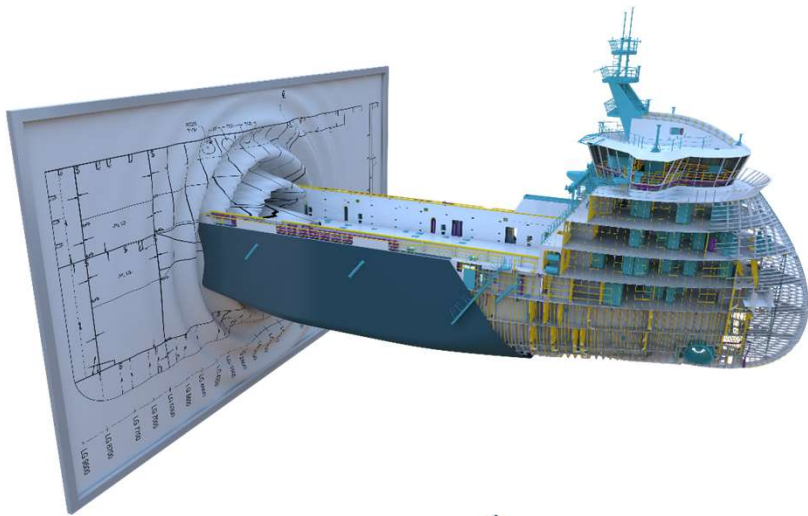
- 2022 Panel Project Team

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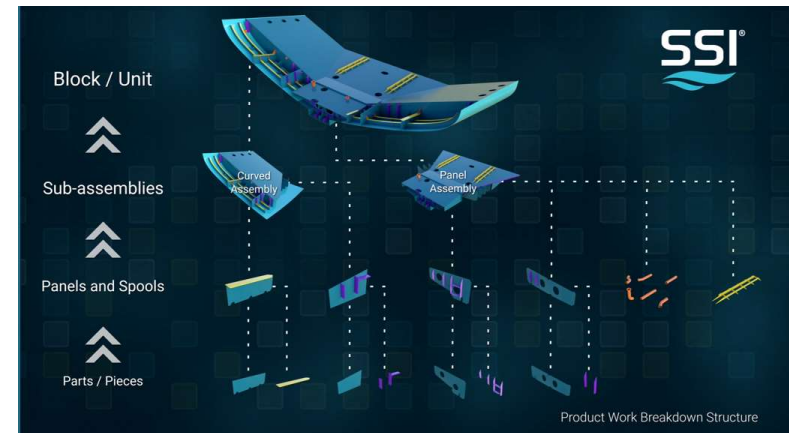
next level
consulting



Leveraging the digital model to assess Collaborative Robotic **Welding & Cutting** opportunities



- The project focused on outlining a development plan so that potential Cobot applications could be easily identified (at the design and production planning stages) from existing and potentially new information contained in and accessed directly from the 3D design and production models.
- The project identified general information “filtering” strategies to help identify Cobot applications that could be leveraged to help ship designers “design for Cobot applications” and production planners to “plan for Cobot applications”.
- The project also explored the relationships between information contained in the ERP System if necessary to close the identification loop.
- Potential Cobot Applications were then validated before deployment.

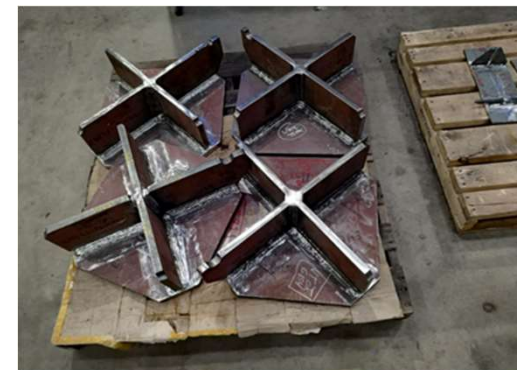


Project Kicked off March 2023 onsite at FMM

- **Cobot Application Areas Identified (During Team Tour of Facility):**
 - 1. Welding Cells for Smaller Assemblies**
 - Focused on smaller assembly tasks.
 - 2. Cutting Cell for Traditional Profile Endcut Processing**
 - Handles traditional profile endcut processing.
 - 3. Individual Part Cutting Beyond Traditional CNC Processes**
 - Explores cutting tasks outside of conventional CNC processes.

Welding Cells for Smaller Assemblies

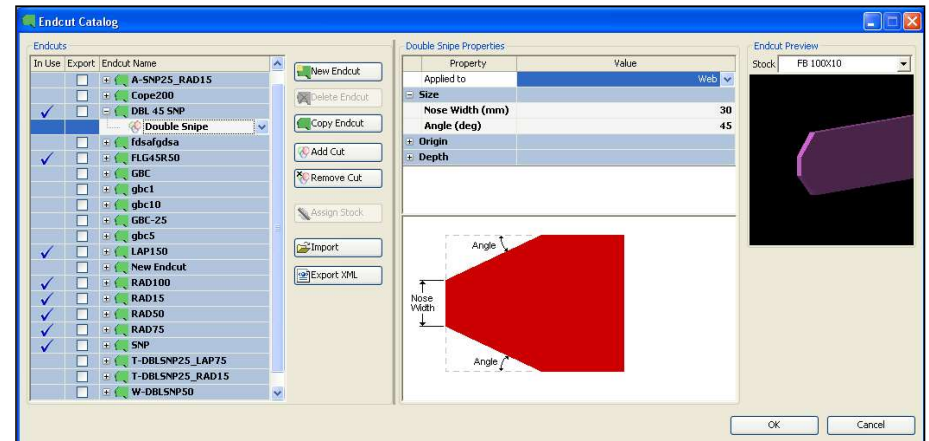
The project team identified assembly structures and micro panels that met size and weight restrictions that could adopt a Cobot welding cell or multiple Cobot welding cells and could be minimally manned



Cutting Cell Profile Endcut Processing



The project team identified profile endcut processing could benefit from a Cobot cutting cell



SSI Endcut digital library of parts.

Individual Part Cutting Beyond Traditional CNC Processes

The project team identified individual plate parts that with the use of a Cobot cutting cell, could be reproduced without impacting traditional workflows.
i.e., CNC table cutting



Various plate brackets & Clips that get lost or damaged

Move Shipyards from *Physical assessments* for Cobot Welding opportunities to **Digital**



Traditional Physical Assessments for applications are usually pocketed within the plant and limited to the knowledge of the assessor & a specific shop / need



Model the Digital Assessment Strategy after the Physical Assessment Strategy

Picture the ability to “see” these Cobot welding applications the same way digitally that you do physically as a **designer or production planner**



Down-selection criteria for applications are always related to weld types according to technical feasibility, ROI, and organizational labor considerations.

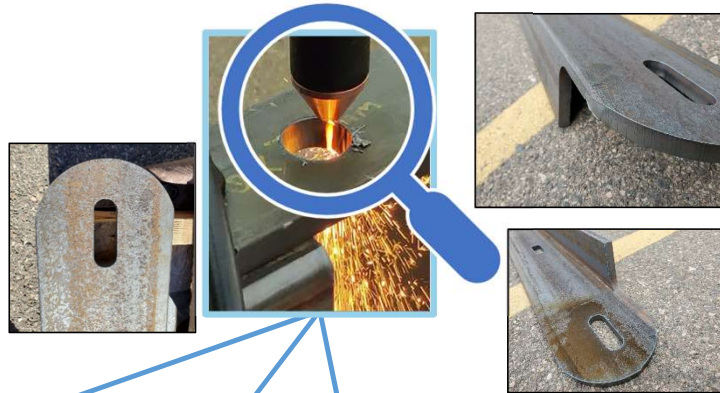
WELDING Specific
Digital Filters



REDUCED SHIP COST

Move Shipyards from *Physical assessments* for Cobot Cutting opportunities to **Digital**

Traditional Physical Assessments for applications are usually pocketed within the plant and limited to the knowledge of the assessor & a specific shop / need



Model the Digital Assessment Strategy after the Physical Assessment Strategy

Picture the ability to “see” these Cobot cutting applications the same way digitally that you do physically as a **designer or production planner**



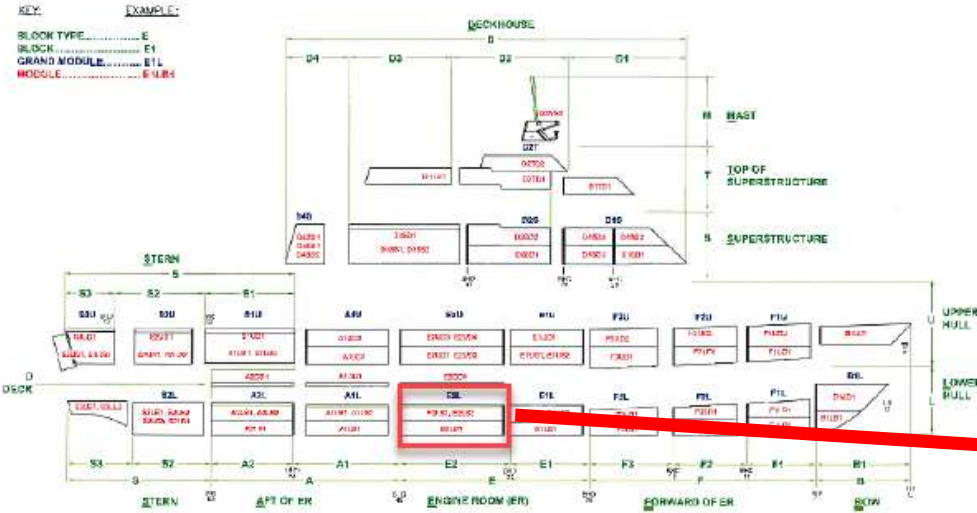
Down-selection criteria for applications involve technical feasibility, ROI, and organizational labor considerations.

PART CUTTING Specific Digital Filters

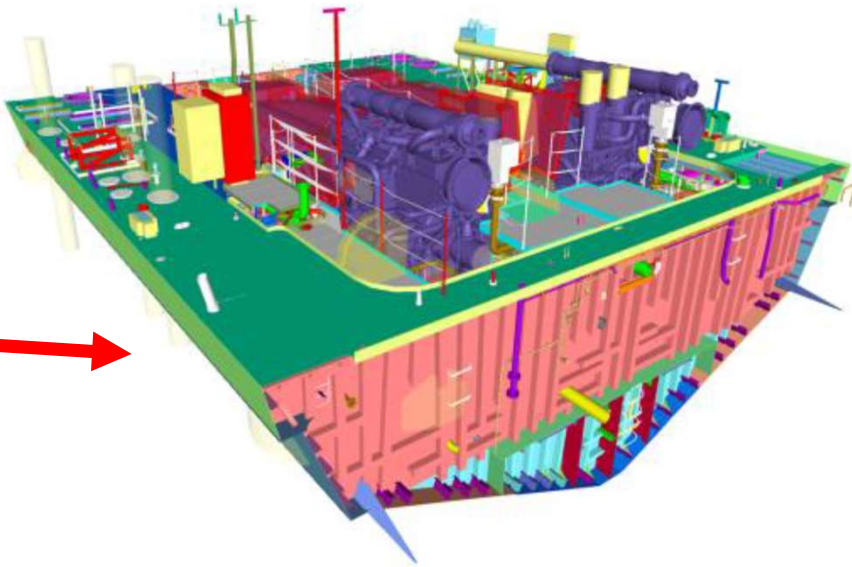


REDUCED SHIP COST

FMM Provided LCS Test Information



FMM LCS Block Map



E2L Block LCS

LCS provided information did not have weld information. SSI developed Generic weld Information and added it to the test environment to perform test operations to filter weld information.

Identify ShipConstructor Entities to filter

Three different types of ShipConstructor entities were targeted based on in person tour of FMM facilities.

- Profile Parts
- Micro panels/individual plate parts
- Welds/Weld information

WELDING
Specific
Digital Filters



CUTTING
Specific
Digital Filters



Point to data fields for collection

Each of the three types of data had filterable information

- Profile Parts

Fields					
Field name	Alias	Visible	Sort details	Merge	Field props
Unit	Module	Yes	None	No	String
Assembly	Assembly	Yes	None	No	String
Piece Type	Part Type	Yes	None	No	String
Plot Sheet	Plot Sheet	Yes	None	No	String
Rank	Assembly Level	Yes	None	No	String
Part Name	Part Name	Yes	None	No	String
Stock Name	Stock Name	Yes	None	No	String
Length	Profile Length (mm)	Yes	None	No	Length: mm; Decimal; Precision: 0; Round up to: 0mm
Weight	Profile Weight (kg)	Yes	None	No	Weight: kg; Decimal; Precision: 0
Endcut Start	Endcut Start	Yes	None	No	String
Endcut End	Endcut End	Yes	None	No	String
Stock Identifier	Stock Identifier	Yes	None	No	String
Stock Description	Stock Description	Yes	None	No	String
Purchased	Purchased	Yes	None	No	String
User Defined	User Defined	Yes	None	No	String

Point to data fields for collection

Each of the three types of data had filterable information

- Plate Parts

Fields					
Field name	Alias	Visible	Sort details	Merge	Field props
Unit	Module	Yes	None	No	String
Rank	Rank	Yes	None	No	String
Material	Material	Yes	None	No	String
Stock Name	Stock Name	Yes	None	No	String
Part Name	Part Name	Yes	None	No	String
Weight	Weight (kg)	Yes	None	No	Weight: kg; Decimal; Precision: 0.000
Outer Toolpath Length	Outer Edge Length (mr	Yes	None	No	Length: mm; Decimal; Precision: 0; Round up to: 0mm
Length	Length (mm)	Yes	None	No	Length: mm; Decimal; Precision: 0; Round up to: 0mm
Nest	Nest	Yes	None	No	String
Nest Drawing	Nest Drawing	Yes	None	No	String
User Defined	User Defined	Yes	None	No	String

Point to data fields for collection

Each of the three types of data had filterable information

- Weld Information

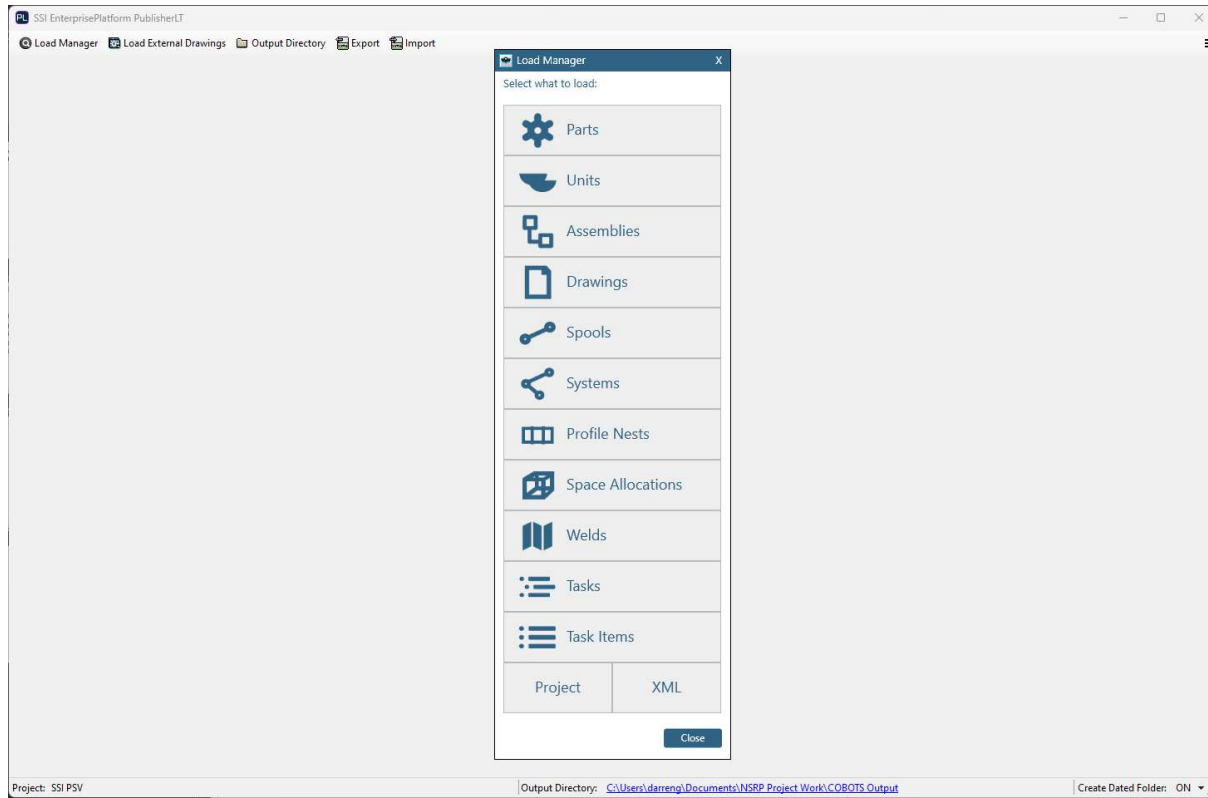
Field name	Alias	Visible	Sort details	Merge	Field props
Part Name	Weld Tag	Yes	None	No	String
Weld Length	Weld Length (mm)	Yes	None	No	Length: mm; Decimal; Precision: 0; Round up to: 0mm
Weld Standard	Weld Standard	Yes	None	No	String
Status	Status	Yes	None	No	String
First Part Name	First Part Name	Yes	None	No	String
First Stock Name	First Stock Name	Yes	None	No	String
First Thickness	First Thickness	Yes	None	No	String
First Material Name	First Material Name	Yes	None	No	String
First Welded Member	First Welded Member	Yes	None	No	String
Second Part Name	Second Part Name	Yes	None	No	String
Second Stock Name	Second Stock Name	Yes	None	No	String
Second Thickness	Second Thickness	Yes	None	No	String
Second Material Name	Second Material Name	Yes	None	No	String
Second Welded Member	Second Welded Member	Yes	None	No	String
Field Weld	Field Weld	Yes	None	No	String
All Around	All Around	Yes	None	No	String
Location	Location	Yes	None	No	String
User Defined	User Defined	Yes	None	No	String
Notes	Notes	Yes	None	No	String
Unit	Module	Yes	None	No	String
Rank	Rank	Yes	None	No	String
Weight	Weight	Yes	None	No	Weight: kg; Decimal; Precision: 0

Process for Model Data Filtering

1. Use PublisherLT to load targeted information
2. Run Custom Operations against targeted information
3. Use templated Excel Pivot Table for informational sorting



Load targeted info into PublisherLT

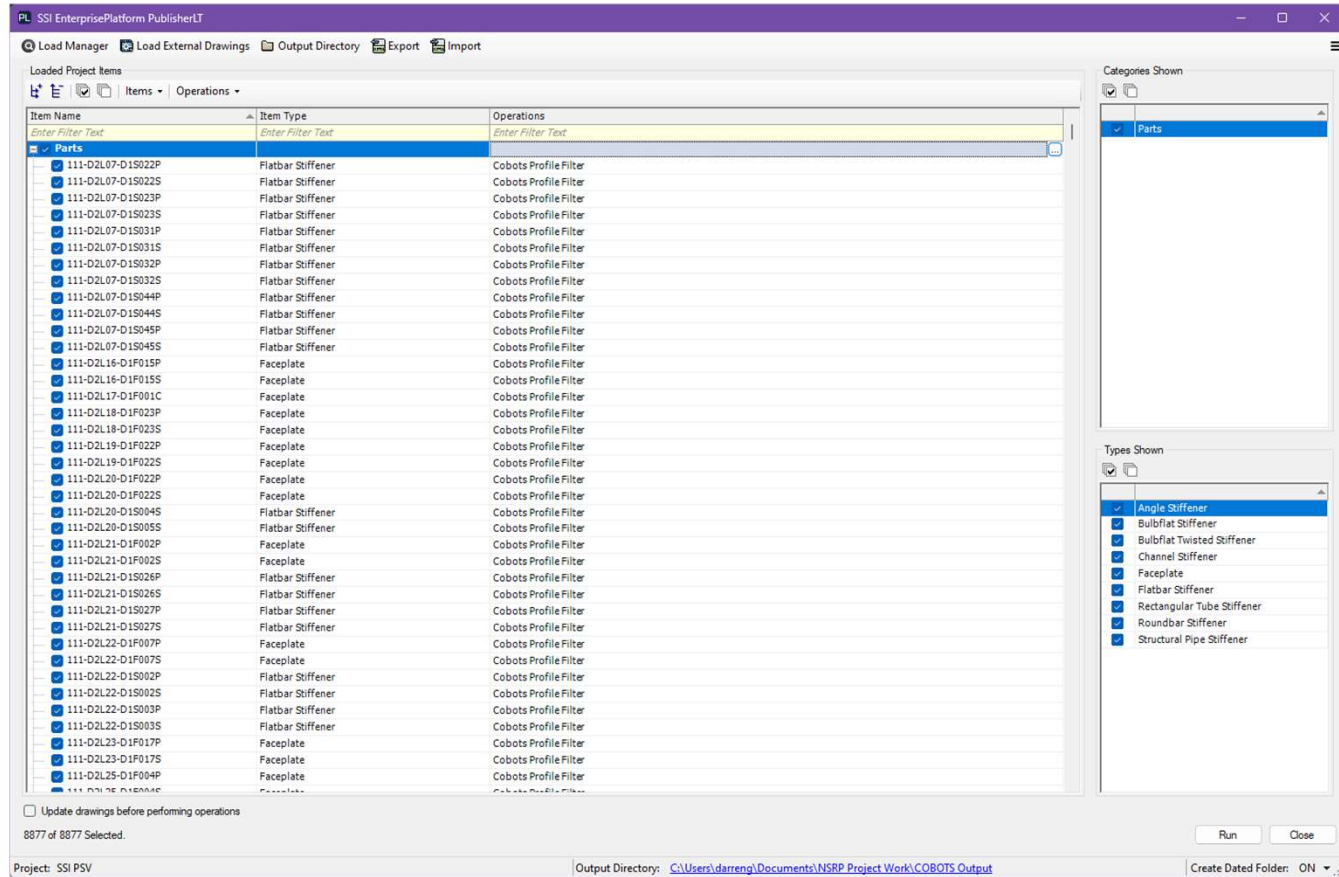


PublisherLT is used to load relevant Model information. Once information is loaded you can select out of the box or custom Operations to extract the targeted data for filtering.

Load targeted info into PublisherLT



Targeted Profile Parts
Loaded Into PublisherLT
with Operation selected



Operations applied to run in PublisherLT



Customized Operations to apply to targeted data

▲ XLSX (5)		
<input type="checkbox"/> Cobots Part Filter	Part	XLSX
<input type="checkbox"/> Cobots Profile Filter	Part	XLSX
<input type="checkbox"/> Excel Modified Part Report	Part	XLSX
<input type="checkbox"/> Excel Report for Parts	Part	XLSX
<input type="checkbox"/> NW Part Selection and Properties Excel	Part	XLSX

▲ XLSX (1)		
<input type="checkbox"/> Cobots Welds Filter Weld		XLSX

Raw Data is added to an Excel Template

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
	Part Guid	Module Assembly	Part Type	Plot Sheet	Assembly Level	Part Name	Stock Name	Profile Length (mm)	Profile Weight (kg)	Endcut Start	Endcut End	Stock Identifie	Stock Descriptor	Purchased	SpoolGUI	
1	00058f3f-91a3-4e5b-9808-06fb2cb1870a	321 C2L24-C1	Stiffener	321_FB 120x10-005	STAGE5	321-C2L24-C1S059S	FB 120X10	713	6	SNIFE 30	RAD35			FALSE	NULL	
2	000b1a8e-f8aa-4cde-8b84-9bf5ccad2fe9	411 D3L01-D1	Stiffener	411_FB 150x15-002	STAGE4	411-D3L01-D1S020S	FB 150X15	1147	19	SNIFE 30	None			FALSE	NULL	
3	001f517f-21e6-43e1-a072-0888256672ba	711 C2M02-C2	Stiffener	711_HP 120x08-001	STAGE3	711-C2M02-C2S004S	HP 120x08	5980	55	None	None	DIN 1019		FALSE	NULL	
4	00250c20-45d9-4a50-bead-9c399f8278fc	422 D2L14-D1	Stiffener	422_FB 100x10-001	STAGE4	422-D2L14-D1S092P	FB 100X10	1258	9	SNIFE 30	SNIFE 30			FALSE	NULL	
5	002ba4a1-8ab1-452a-8c77-74dfb98db7c4	122 C3M04-C2	Stiffener	122_FB 100x8-002	STAGE3	122-C3M04-C2S004S	FB 100X8	760	4	SNIFE 30	None			FALSE	NULL	
6	002c1c40-2395-448d-9c04-8f602db831b5	512 C3L06-C1	Stiffener	512_HP 200x09-003	STAGE4	512-C3L06-C1S037C	HP 200x09	2663	49	None	None	DIN 1019		FALSE	NULL	
7	003442d1-c914-4cd9-9755-a036408f31de	422 D2M02-D1	Stiffener	422_HP 180x08-009	STAGE3	422-D2M02-D1S029S	HP 180x08	688	10	RAD35	RAD35	DIN 1019		FALSE	NULL	
8	00356735-9025-44f6-a7dd-5c442eaa3f6f	423 D3M01-D2	Stiffener	423_FB 100x10-006	STAGE3	423-D3M01-D2S042S	FB 100X10	636	4	SNIFE 30	SNIFE 30			FALSE	NULL	
9	0040ba66-8ea5-4a46-9bc4-da9abafbeb2d	342 C3	Stiffener	342_L200x100x10-001	STAGE4	342-C3_S010C	L200X100X10	2638	60	None	None	JIS		FALSE	NULL	
10	00484c37-e860-45a8-92c6-5ca1ec7e693e	413 A	Stiffener	413_HP 180x08A-36-033	STAGE2	413-AS071P	HP 180X08A-36	2976	43	R100X50	RAD50	DIN 1019		FALSE	NULL	
11	004a136a-4a83-4d9c-868a-10a58e531792	843 D3L45-D1	Stiffener	843_RT 50x30x3-006	STAGE2	843-D3L45-D1S118P	50X30X3	1370	5	None	None	DIN		FALSE	NULL	
12	004bb10a-f0ca-44d7-9e50-a35bec08684e	112 E3M02-E2	Stiffener	112_FB 100x10-011	STAGE3	112-E3M02-E2S002P	FB 100X10	680	5	None	None			FALSE	NULL	
13	00614dda-ecd8-4e55-89b9-5c9a7c3b9ae9	811 D3M02-D2	Stiffener	811_FB 100x8-002	STAGE3	811-D3M02-D2S064P	FB 100X8	692	4	snipe15X15	snipe15X15			FALSE	NULL	
14	0064816e-6563-4654-b8c1-22d0035af3bd	342 C3N02-C2	Stiffener	342_HP240x12A-36-001	STAGE2	342-C3N02-C2S053P	HP240X12A-36	2051	59	None	None	DIN 1019		FALSE	NULL	
15	006ecfc2-ec8c-40e0-b33a-1195d203936a	342 C2L16_C1	Stiffener	342_FB 100x10-001	STAGE4	342-C2L16_C1S002C	FB 100X10	1298	9	SNIFE 30	SNIFE 30			FALSE	NULL	
16	00712401-33a0-4cf5-8ea6-91b6836e9aa4	843 D3L45-D1	Stiffener	843_RT 50x30x3-001	STAGE2	843-D3L45-D1S056P	50X30X3	4508	16	None	None	DIN		FALSE	NULL	
17	008511c1-0a47-43d3-83fc-39a2862399d9	322 C2L13_C1	Stiffener	322_FB 100x10-009	STAGE6	322-C2L13_C1S094S	FB 100X10	651	5	None	SNIFE 30			FALSE	NULL	
18	0086e144-4e4e-4803-8770-9090b85705e8	831 C3M02-C2	Stiffener	831_HP100x06-002	STAGE3	831-C3M02-C2S015P	HP100X06	1354	8	None	None	DIN 1019		FALSE	NULL	
19	00937776-45d4-4c68-91be-b0ddb0a1ce1a	422 Z	Stiffener	422_FB 150x15-001	STAGE2	422-ZS001P	FB 150X15	1090	16	SNIFE 30	SNIFE 30			FALSE	NULL	
20	009563ac-9af9-4b6b-965f-e2dec99d3bb6	812 C2L09-C1	Stiffener	812_FB 100x10-004	STAGE4	812-C2L09-C1S009P	FB 100X10	2358	18	SNIFE 30	SNIFE 30			FALSE	NULL	
21	009607a5-68af-41d8-bfdf-2399c4171a8c	712 C3M02-C2	Faceplate	712_FB 200x15-003	STAGE3	712-C3M02-C2F015P	FB 200X15	3976	94	None	None			FALSE	NULL	
22	009fe2d4-96e1-4120-944b-40264ca2e1e7	422 D2L25-D1	Stiffener	422_HP80x06-008	STAGE4	422-D2L25-D1S096S	HP80X06	1439	7	None	None	DIN 1019		FALSE	NULL	
23	00a78046-4979-465b-a26a-0f4024e20bc9	321 C2L05-C1	Stiffener	321_FB 120x10-001	STAGE4	321-C2L05-C1S030P	FB 120X10	713	6	RAD35	SNIFE 30			FALSE	NULL	
24	00ab3de0-e777-4539-9649-ee5942c71d09	352 C3M02-C2	Faceplate	352_FB 100x10-001	STAGE3	352-C3M02-C2F001S	FB 100X10	1118	8	DBL 30 SNP	DBL 30 SNP			FALSE	NULL	
25	00ba3765-cd65-4a09-a8dd-0638c3b117ad	332 D3M17-D2	Faceplate	332_FB 100x10-001	STAGE3	332-D3M17-D2F007S	FB 100X10	2075	16	DBL 30 SNP	DBL 30 SNP			FALSE	NULL	
26	00c4ec88-d5a0-4d29-a10d-88965fec0a5	331 C2L12-C1	Stiffener	331_FB 120x10-002	STAGE4	331-C2L12-C1S012P	FB 120X10	732	6	snipe10X10	SNIFE 30			FALSE	NULL	
27	00cf4b4d-6124-4c19-856e-6924804531a1	352 C3M06-C2	Stiffener	352_FB 100x10-003	STAGE3	352-C3M06-C2S098P	FB 100X10	611	4	SNIFE 30	SNIFE 30			FALSE	NULL	
28	00d37fdd-269c-42f4-89d7-be0104775cf9	413 D3M01-D2	Stiffener	413_FB 100x10-006	STAGE3	413-D3M01-D2S026P	FB 100X10	615	4	SNIFE 30	SNIFE 30			FALSE	NULL	
29	00d8ad1c-b49c-4383-b990-9aa89e526daf	421 D3	Stiffener	421_FB 100x10-006	STAGE5	421-D3S005P	FB 100X10	700	5	snipe10X10	snipe10X10			FALSE	NULL	
30	00e3ff8c-2f88-47a1-acc5-591aa87073b8	423 D3M01-D2	Stiffener	423_HP140x7-016	STAGE3	423-D3M01-D2S067S	HP140X7	879	8	None	None	DIN 1019		FALSE	NULL	
31	00e57a8e-9b2d-4dd9-b706-27c4d5d6bc72	513 C2M03-C2	Stiffener	513_HP 160x08-001	STAGE3	513-C2M03-C2S012P	HP 160x08	652	8	None	None	DIN 1019		FALSE	NULL	
32	00f4fd1a-5aa4-4f60-9745-ad7eebd667a6	321 C2L01-C1	Stiffener	321_FB 120x10-002	STAGE4	321-C2L01-C1S003S	FB 120X10	707	6	SNIFE 30	RAD35			FALSE	NULL	
33	00f7100a-de60-4ec5-b9ae-7cf8901e224f	332 D2L31-D1	Stiffener	332_FB 150x15-004	STAGE4	332-D2L31-D1S003S	FB 150X15	1787	31	F-545E75	None			FALSE	NULL	
34	00fda07-bc3b-415c-b2bd-2520c2931437	711 C2L07-C1	Faceplate	711_FB 200x15-005	STAGE4	711-C2L07-C1F005S	FB 200X15	5615	131	DBL 45 SNP	None			FALSE	NULL	
35	011127b0-c9ef-4ed1-b640-cb4ad7c9e770	111 D3M09-D2	Stiffener	111_HP 180x08-010	STAGE3	111-D3M09-D2S067P	HP 180x08	2195	32	None	None	DIN 1019		FALSE	NULL	
36	01197e47-d7c0-49e0-a1e9-7c511a0eeda4	421 D2L20-D1	Stiffener	421_FB 150x15-001	STAGE4	421-D2L20-D1S028S	FB 150X15	185	3	None	None			FALSE	NULL	
37	0122e280-399c-4638-a468-6d52f79ae772	722 C3M03-C2	Stiffener	722_HP 180x08-002	STAGE3	722-C3M03-C2S047P	HP 180x08	5420	80	None	RAD35	DIN 1019		FALSE	NULL	
38	0129f1f6-dcc1-487c-ac6a-bb664504db4c	423 D3L06-D1	Stiffener	423_HP 220x10-001	STAGE4	423-D3L06-D1S017S	HP 220x10	1390	32	None	None	DIN 1019		FALSE	NULL	
39	012e46b6-d5c1-436a-b0d5-467a042d0e4	322 C2L16-C1	Stiffener	322_HP 140x08-001	STAGE4	322-C2L16-C1S076P	HP 140x08	1025	11	None	None	DIN 1019		FALSE	NULL	
40	013d8bd4-33bb-4a9c-8cd0-9c54321c5341	332 D2M08-D2	Stiffener	332_HP240x12A-36-001	STAGE3	332-D2M08-D2S007P	HP240X12A-36	7711	222	None	None	DIN 1019		FALSE	NULL	
41	01471b41-e039-45b8-8fa8-94c8155cfc36	322 C2M09-C2	Stiffener	322_HP 220x10-001	STAGE4	322-C2M09-C2S024P	HP 220x10	2400	55	None	None	DIN 1019		FALSE	NULL	

Pivot table provides categories to filter parts

Example

Profile Part Data placed in categories and unfiltered

1	Module	(All)				
2	Assembly	(All)				
3	Part Type	(All)				
4	Plot Sheet	(All)				
5	Assembly Level	(All)				
6						
7	Part Name	Stock Name	Profile Length (mm)	Profile Weight (kg)	Endcut Start	Endcut End
8	321-C2L24-C1S059S	FB 120X10	713	6	SNIFE 30	RAD35
9	411-D3L01-D1S020S	FB 150X15	1147	19	SNIFE 30	None
10	711-C2M02-C2S004S	HP 120x08	5980	55	None	None
11	422-D2L14-D1S092P	FB 100X10	1258	9	SNIFE 30	SNIFE 30
12	122-C3M04-C2S004S	FB 100X8	760	4	SNIFE 30	None
13	512-C3L06-C1S037C	HP 200x09	2663	49	None	None
14	422-D2M02-D1S029S	HP 180x08	688	10	RAD35	RAD35
15	423-D3M01-D2S042S	FB 100X10	636	4	SNIFE 30	SNIFE 30
16	342-C3_S010C	L200X100X10	2638	60	None	None
17	413-AS071P	HP 180X08A-36	2976	43	R100X50	RAD50
18	843-D3L45-D1S118P	50X30X3	1370	5	None	None
19	112-E3M02-E2S002P	FB 100X10	680	5	None	None
20	811-D3M02-D2S064P	FB 100X8	692	4	snipe15X15	snipe15X15
21	342-C3N02-C2S053P	HP240X12A-36	2051	59	None	None
22	342-C2L16_-C1S002C	FB 100X10	1298	9	SNIFE 30	SNIFE 30
23	843-D3L45-D1S056P	50X30X3	4508	16	None	None
24	322-C2L13_-C1S094S	FB 100X10	651	5	None	SNIFE 30
25	831-C3M02-C2S015P	HP100X06	1354	8	None	None
26	422-ZS001P	FB 150X15	1090	16	SNIFE 30	SNIFE 30
27	812-C2L09-C1S009P	FB 100X10	2358	18	SNIFE 30	SNIFE 30
28	712-C3M02-C2F015P	FB 200X15	3976	94	None	None
29	422-D2L25-D1S096S	HP80X06	1439	7	None	None
30	321-C2L05-C1S030P	FB 120X10	713	6	RAD35	SNIFE 30
31	352-C3M02-C2F001S	FB 100X10	1118	8	DBL 30 SNP	DBL 30 SNP
32	332-D3M17-D2F007S	FB 100X10	2075	16	DBL 30 SNP	DBL 30 SNP
33	331-C2L12-C1S012P	FB 120X10	732	6	snipe10X10	SNIFE 30
34	352-C3M06-C2S098P	FB 100X10	611	4	SNIFE 30	SNIFE 30
35	413-D3M01-D2S026P	FB 100X10	615	4	SNIFE 30	SNIFE 30
36	421-D3S005P	FB 100X10	700	5	snipe10X10	snipe10X10
37	423-D3M01-D2S067S	HP140X7	879	8	None	None
38	513-C2M03-C2S012P	HP 160x08	652	8	None	None
39	321-C2L01-C1S003S	FB 120X10	707	6	SNIFE 30	RAD35
40	332-D2L31-D1S003S	FB 150X15	1787	31	F-S45E75	None
41	711-C2L07-C1F005S	FB 200X15	5615	131	DBL 45 SNP	None
42	111-D3M09-D2S067P	HP 180x08	2195	32	None	None
43	421-D2L20-D1S028S	FB 150X15	185	3	None	None

Profile Part data filtered

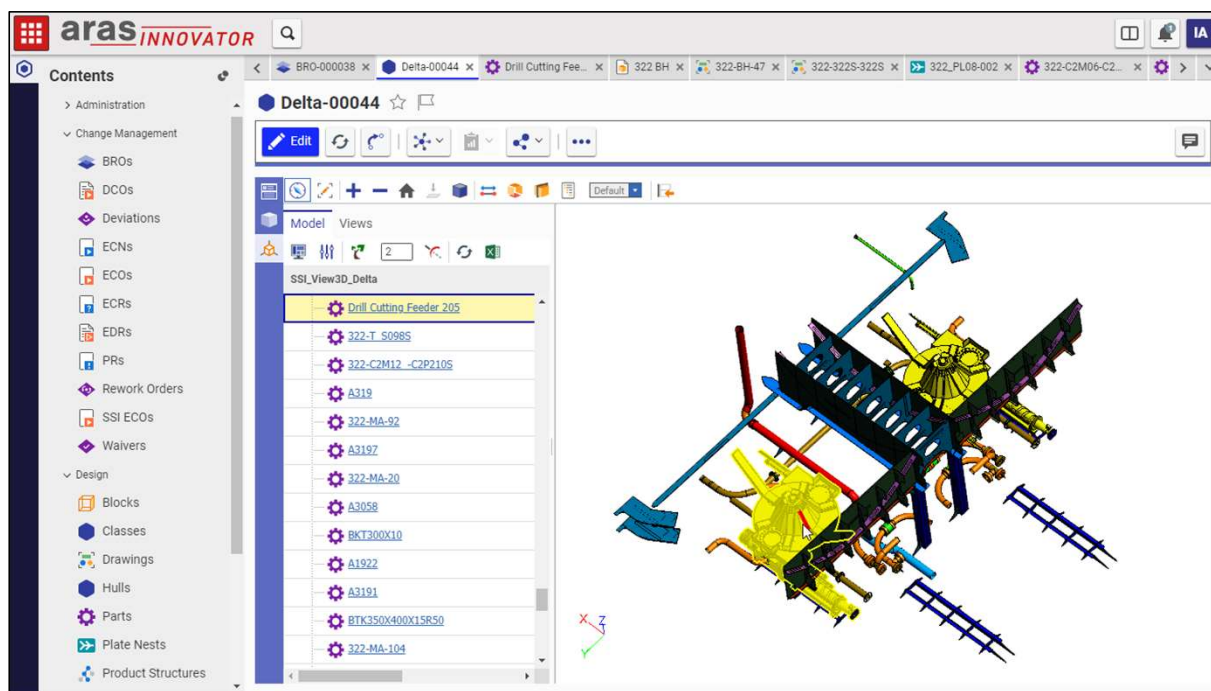
Example:

Profile Part Data filtered by
Module (Unit), Endcuts, &
Stock Name

	A	B	C	D	E	F
1	Module	422				
2	Assembly	(All)				
3	Part Type	(All)				
4	Plot Sheet	(All)				
5	Assembly Level	STAGE4				
6						
7	Part Name	Stock Name	Profile Length (mm)	Profile Weight (kg)	Endcut Start	Endcut End
8	422-D2L14-D1S092P	FB 100X10	1258		9 SNIPE 30	SNIPE 30
9	422-D2L17-D1S097S	FB 100X10	1020		7 SNIPE 30	SNIPE 30
10	422-D2L15-D1S091S	FB 100X10	1258		9 SNIPE 30	SNIPE 30
11	422-D2L18-D1S031S	FB 100X10	645		4 SNIPE 30	SNIPE 30
12	422-D2L03-D1S033P	FB 100X10	649		4 SNIPE 30	SNIPE 30
13	422-D2L25-D1S040S	FB 100X10	651		4 SNIPE 30	SNIPE 30
14	422-D2L15-D1S086S	FB 100X10	1506		11 SNIPE 30	SNIPE 30
15	422-D2L05-D1S039P	FB 100X10	651		4 SNIPE 30	SNIPE 30
16	422-D2L25-D1S042S	FB 100X10	652		4 SNIPE 30	SNIPE 30
17	422-D2L17-D1S098S	FB 100X10	1020		7 SNIPE 30	SNIPE 30
18	422-D2L17-D1S098P	FB 100X10	1020		7 SNIPE 30	SNIPE 30
19	422-D2L15-D1S080S	FB 100X10	1753		13 SNIPE 30	SNIPE 30
20	422-D2L05-D1S042P	FB 100X10	672		4 SNIPE 30	SNIPE 30
21	422-D2L15-D1S087S	FB 100X10	1506		11 SNIPE 30	SNIPE 30
22	422-D2L03-D1S032P	FB 100X10	649		4 SNIPE 30	SNIPE 30
23	422-D2L01-D1S031P	FB 100X10	645		4 SNIPE 30	SNIPE 30
24	422-D2L15-D1S092S	FB 100X10	1258		9 SNIPE 30	SNIPE 30
25	422-D2L14-D1S087P	FB 100X10	1506		11 SNIPE 30	SNIPE 30
26	422-D2L05-D1S041P	FB 100X10	652		4 SNIPE 30	SNIPE 30
27	422-D2L14-D1S081P	FB 100X10	1753		13 SNIPE 30	SNIPE 30
28	422-D2L20-D1S034S	FB 100X10	649		4 SNIPE 30	SNIPE 30
29	422-D2L20-D1S033S	FB 100X10	649		4 SNIPE 30	SNIPE 30
30	422-D2L05-D1S038P	FB 100X10	651		4 SNIPE 30	SNIPE 30
31	422-D2L25-D1S043S	FB 100X10	672		4 SNIPE 30	SNIPE 30
32	422-D2L14-D1S080P	FB 100X10	1753		13 SNIPE 30	SNIPE 30
33	422-D2L01-D1S022P	FB 100X10	645		4 SNIPE 30	SNIPE 30
34	422-D2L14-D1S086P	FB 100X10	1506		11 SNIPE 30	SNIPE 30
35	422-D2L15-D1S081S	FB 100X10	1753		13 SNIPE 30	SNIPE 30
36	422-D2L25-D1S039S	FB 100X10	651		4 SNIPE 30	SNIPE 30
37	422-D2L20-D1S035S	FB 100X10	650		4 SNIPE 30	SNIPE 30
38	422-D2L05-D1S040P	FB 100X10	652		4 SNIPE 30	SNIPE 30
39	422-D2L03-D1S034P	FB 100X10	650		4 SNIPE 30	SNIPE 30
40	422-D2L17-D1S097P	FB 100X10	1020		7 SNIPE 30	SNIPE 30
41	422-D2L25-D1S041S	FB 100X10	652		4 SNIPE 30	SNIPE 30
42	422-D2L18-D1S032S	FB 100X10	645		4 SNIPE 30	SNIPE 30
43	422-D2L14-D1S091P	FB 100X10	1258		9 SNIPE 30	SNIPE 30

Potential Future Cobot Filtering Capabilities

- Using ShipbuildingPLM



SHIPBUILDING
PLM™

**WELDING
Specific
Digital Filters**



**CUTTING
Specific
Digital Filters**



Questions?

