

Zander Snow

Industrial/Manufacturing Engineering Internship
Overview @ XNRGY



Agenda

- **Completed Projects**
- Lessons Learned
- Moving Forward



Completed Projects

- **Time Study of Main Line and Subassemblies**
- MBOM and EBOM Validation and Alignment
- MBOM Reordering and Instance Splitting



Time Study of Main Line and Subassemblies

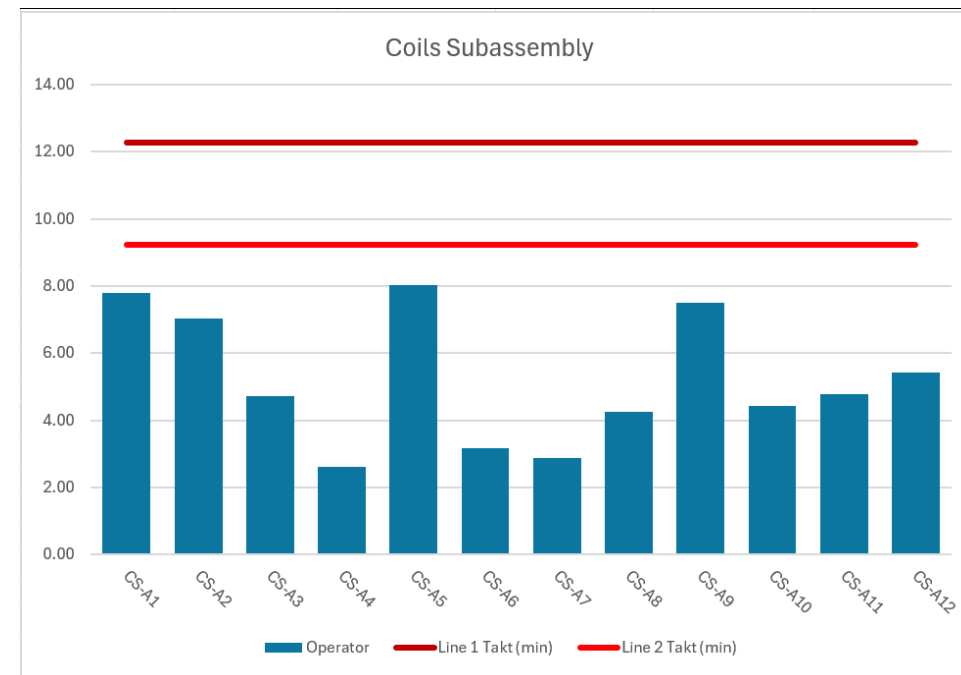
- Conducted time studies on more than 460 operations across the main production line and supporting subassemblies to better understand process timing and the steps involved in the manufacturing of the XNChiller.
- Analyzed a variety of manufacturing processes, including assembly, brazing, welding, wiring, and testing operations.
- Identified and documented discrepancies between shop floor practices and existing work instructions.



Time Study of Main Line and Subassemblies

- Evaluated current cycle times against takt-time requirements to confirm whether the existing operator count could support production targets.

Line Balancing					
Operator	Cycle Time (min)	Line 1 Takt (min)	Line 2 Takt (min)	Line 1 Efficiency	Line 2 Efficiency
CS-A1	7.78	12.27	9.23	63.4%	84.3%
CS-A2	7.03	12.27	9.23	57.3%	76.2%
CS-A3	4.73	12.27	9.23	38.6%	51.3%
CS-A4	2.60	12.27	9.23	21.2%	28.2%
CS-A5	8.03	12.27	9.23	65.5%	87.0%
CS-A6	3.18	12.27	9.23	25.9%	34.5%
CS-A7	2.87	12.27	9.23	23.4%	31.1%
CS-A8	4.27	12.27	9.23	34.8%	46.2%
CS-A9	7.50	12.27	9.23	61.1%	81.3%
CS-A10	4.42	12.27	9.23	36.0%	47.8%
CS-A11	4.77	12.27	9.23	38.8%	51.6%
CS-A12	5.43	12.27	9.23	44.3%	58.9%



Completed Projects

- Time Study of Main Line and Subassemblies
- **MBOM and EBOM Validation and Alignment**
- MBOM Reordering and Instance Splitting



MBOM and EBOM Validation and Alignment

- Validated more than 100 assemblies, components, and hardware instances across engineering and manufacturing documentation.
- Reconciled discrepancies between the Engineering Bill of Materials (EBOM), Manufacturing Bill of Materials (MBOM), and physical production line configurations.
- Improved EBOM and MBOM alignment to ensure the correct inventory is consumed and the appropriate costs are assigned.



MBOM and EBOM Validation and Alignment

Common Discrepancy #1

Merged Part Instances

Solution:

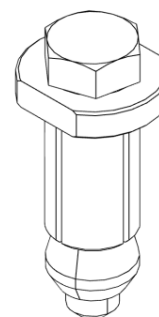
Verify part

Verify QTY on the line



Repeat for other instances

Verify in EBOM



H06039
HOLLO-BOLT 3/8", 2" LONG

Common Discrepancy #2

Incorrect EBOM Parent Assignment

Solution: Updated parent from A06102 to A06364

A07438	AA	LARGE ELECTRICAL PANEL	1	EA	FL-101	A06364
H06345	AA	FLAT WASHER FOR HOLLO-BOLT 3/8"	12	EA	FL-101	Not in E-BOM
H06039	AA	HOLLO-BOLT 3/8", 2" LONG	12	EA	FL-101	A06364
P06255	AC	WATER PUMP BASE PLATE	1	EA	AS-101	A06195
H06039	AA	HOLLO-BOLT 3/8", 2" LONG	5	EA	AS-101	A06102
P08319	AA	FILTER LOOP - RIGHT SECTION 3	1	EA	EC-101	
H06039	AA	HOLLO-BOLT 3/8", 2" LONG	4	EA	AS-101	
H06345	AA	FLAT WASHER FOR HOLLO-BOLT 3/8"	4	EA	AS-101	
H07786	AA	1/4"-20 UNC, HEX NUT, GR5, ZP	4	EA	CR-101	
H06039	AA	HOLLO-BOLT 3/8", 2" LONG	4	EA	AS-101	
H06345	AA	FLAT WASHER FOR HOLLO-BOLT 3/8"	4	EA	AS-101	
H07786	AA	1/4"-20 UNC, HEX NUT, GR5, ZP	4	EA	CR-101	
H06039	AA	HOLLO-BOLT 3/8", 2" LONG	4	EA	AS-101	
H06345	AA	FLAT WASHER FOR HOLLO-BOLT 3/8"	4	EA	AS-101	

QTY 17 in one instance

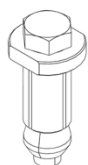
5x

8x

4x

4x

Split instances in MBOM



Completed Projects

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- **MBOM Reordering and Instance Splitting**



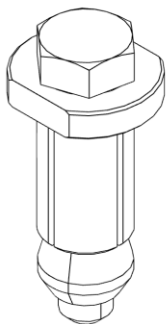
MBOM Reordering and Instance Splitting

- Reorganized MBOM structures into a logical sequence that mirrors manufacturing and assembly workflows.
- Split component instances and reassigned fasteners to their specific points of use, improving traceability and assembly clarity.
- Enhanced BOM readability and maintainability for manufacturing, engineering, and production support teams.
- Improved documentation consistency, enabling more efficient execution of assembly processes and future engineering changes.



MBOM Reordering and Instance Splitting

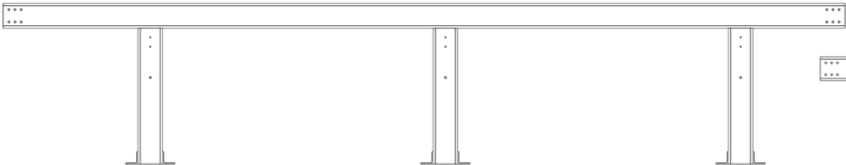
SPLIT
INSTANCES



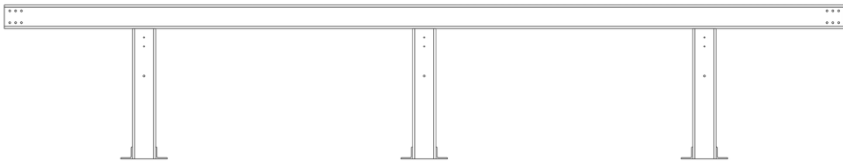
H06039
HOLLO-BOLT 3/8", 2" LONG

M10115	AA	MAIN LINE PROCESS SUB ASSEMBLY - AS-105	1	EA	AS-106
A06159	AA	COIL ARCH	2	EA	AS-105
H06039	AA	HOLLO-BOLT 3/8", 2" LONG	12	EA	AS-105
A06163	AA	COIL ARCH	4	EA	AS-105
H06039	AA	HOLLO-BOLT 3/8", 2" LONG	24	EA	AS-105
A06165	AA	COIL ARCH	2	EA	AS-105
H06039	AA	HOLLO-BOLT 3/8", 2" LONG	8	EA	AS-105

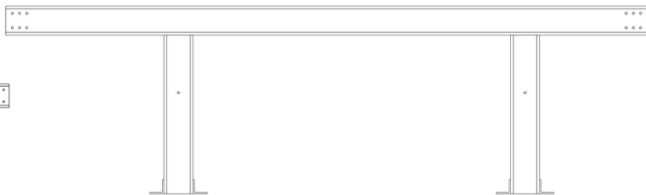
● A06159



● A06163



● A06165



Agenda

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- **Lessons Learned**
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Lessons Learned

- Gained a clearer understanding of how materials are procured, staged, and moved through production.
- Developed a stronger understanding of the manufacturing line, including the processes required to support each station.
- Learned the value of asking questions on the shop floor, where operators and technicians often have detailed insight into daily production challenges.
- Observed how carts, jigs, and other shop floor tools are used to improve productivity, consistency, and workflow efficiency.
- Recognized the importance of thorough, polished, and up to date documentation so changes can be implemented consistently across the production line.



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Looking to the Future

If I were to conduct another time study

- Record each operator's actions in greater detail
- Capture motion, part retrieval, tool usage, and other supporting activities.

In general

- Ask operators more questions about their work
- Continue building relationships with shop floor personnel



Final Thoughts

Now well equipped to

- Apply my growing knowledge of the manufacturing process to provide stronger support to both manufacturing and engineering teams.
- Contribute to the creation and revision of documentation so it better reflects continually evolving production processes.



Thank you!

Thanks for a good summer! I learned a lot about manufacturing and engineering practices.

