The vessel at Stony Brook pfRICH project

C-J. Naïm on behalf of the Stony Brook team

Center for Frontiers in Nuclear Science

pfRICH group meeting March 28, 2024





Time Line of the pfRICH vessel

| Task N | Task Name | Duration Start | | Nov '23 Dec '23 Jan '24 | | | Jan '24 | Feb '24 | Mar '24 | Apr '24 | May '24 | Jun '24 | Jul '24 |
|------------------------|--|----------------|----------------------------|-------------------------|----------|-------------|----------|-----------|---------|----------|----------|---------|----------|
| | | | | ME | BME | BME | BME | BME | BME | BME | BME | BME | BME |
| 1 | Vessel & mirror construction | 197 days | Mon 10/23/23 | 1 - | | | | | | | | | |
| 2 | Overall design parameters frozen | 1 day | Mon 10/23/23 | | | | | | | | | | |
| 3 | Purdue (Vessel) | 56 days | Tue 2/20/24 | | | | | - | | - | 1 | | |
| 4 | End ring prototype with small radius | 5 days | Tue 2/20/24 | | | | | | | | | | |
| 5 | Surface roughness, tool compensation | 12 days | Sun 2/25/24 | | | | | 1 | - | | | | |
| 6 | Tool machining start | 6 days | Sun 3/10/24 | | | | | | | | | | |
| 7 | Tool ready - metrology and QC/QA | 1 day | Fri 3/15/24 | | | | | | ÷. | | | | |
| 8 | Layup of all 4 end ring quarters | 12 days | Sat 3/30/24 | | | | | | | 0 | | | |
| 9 | Machining & Assembly of 4 quarters | 6 days | Mon 4/15/24 | | | | | | | - 11 | | | |
| 0 | Layup of all 4 end ring guarters (ring 2) | 1 day | Mon 4/15/24 | | | | | | | | | | |
| 1 | Machining & Assembly of 4 quarters (ing 2) | 1 day | Thu 4/25/24 | | | | | | | | | | |
| 2 | Ship End Ring 2 to SBU | 6 days | Tue 4/30/24 | - | - | - | - | | | - | - | - | - |
| 3 | Ship End Ring 1 to SBU | 8 days | Sat 4/20/24 | | | | | | | | | | |
| 4 | Stony Brook (Vessel) | 129 days | | - | - | - | - | _ | - | - | - | - | - |
| 5 | Order Motion Components | 1 day | Fri 2/02/24 | _ | - | | | - | | - | - | | - |
| 6 | Honey Comb Arrives | 0 days | Tue 4/09/24 | - | <u> </u> | | - | | - | | <u> </u> | - | |
| 7 | Magnetic Stripe Arrives | 0 days | Mon 2/26/24 | - | - | - | - | | - | 1-1- | | - | - |
| 8 | Carbon Fiber Arrives | 0 days | Fri 2/16/24 | - | - | - | - | 12- | | | | - | |
| 9 | Shaft Arrives | 0 days | Tue 2/27/24 | - | - | - | - | | - | | | - | - |
| 0 | Foam Arrives | 0 days | Sun 3/24/24 | | - | - | - | | 3 | | | - | - |
| 1 | 8020 acquisition / procurement | 1 day | Fri 2/02/24 | - | - | - | - | | | | | - | - |
| 2 | Foam blocks procurement | 1 day | Tue 2/27/24 | - | - | - | - | | | | | - | - |
| 3 | Mandrel 80-20 parts ready for assembly | 0 days | Tue 2/27/24 | - | - | | - | | | | | - | - |
| 4 | Set up Motors | 2 days? | Fri 3/01/24 | - | - | - | - | | | | | - | - |
| 5 | 80-20 Table Assembly | 1 day | Wed 2/28/24 | - | - | - | - | | 1 | | | - | - |
| 6 | Mandrel 80-20 frame assembly | 14 days | Tue 3/05/24 | - | - | - | - | | | | | - | - |
| 7 | Install Mandrel Frame | 1 day | Mon 3/25/24 | - | - | - | - | | | | | - | - |
| 8 | Order Shell Materials | 1 day | Fri 2/02/24 | - | - | - | - | | | | | - | - |
| 9 | Begin Milling | 0 days | Fri 4/19/24 | - | - | - | | - | | 3 | | - | - |
| 0 | Table Leveling | 1 day? | Thu 2/29/24 | - | - | - | - | - | | | | - | - |
| 1 | Surveying Allignment | 3 days | Wed 4/17/24 | - | - | - | - | | | 0- | | - | - |
| 12 | Foam preparation | 10 days | Mon 3/25/24 | - | - | - | - | | | 1 | | - | - |
| 0 | Foam installation | 7 days | Mon 4/08/24 | - | - | - | - | - | | Test. | | - | - |
| н | Foam milling to shape | 20 days | Mon 4/22/24 | - | - | - | - | - | | | L | - | - |
| 15 | Outer shell construction | 30 days | Mon 5/20/24 | - | - | - | - | | | - | | - | |
| 6 | All components ready for assembly | 42 days | Wed 6/05/24 | - | - | - | - | - | | - | - | - | <u> </u> |
| 7 | All components are assembled | 1 day | Thu 8/01/24 | - | - | | | | | - | - | - | - |
| 8 | Stony Brook (mirrors) | 43 days | Tue 1/30/24 | - | - | | <u> </u> | | _ | - | - | | - |
| 9 | Evaporation 3 Reflectivity Test | 3 days | Tue 1/30/24 | - | - | - | | - | - | 1 | <u> </u> | - | <u> </u> |
| 0 | | | | - | - | - | - | | | - | - | - | <u> </u> |
| 1 | Designing Large Lexan Cone | 14 days | Thu 2/01/24 Thu 2/22/24 | - | - | - | - | | - | - | - | - | - |
| 2 | Lexan Cone Completion | 13 days | Thu 2/22/24 Thu 2/01/24 | - | <u> </u> | - | | L | F)- | - | - | - | <u> </u> |
| 3 | Ordering Reference Mirror | 1 day | | - | - | - | - | <u>-</u> | | - | - | - | <u> </u> |
| 3 | Reference mirror arrives | 1 day | Wed 2/07/24 | - | - | - | - | 0 | | - | - | - | - |
| 4 | Full Lexan cone coating | 1 day | Tue 3/12/24 Tue 2/06/24 | - | - | - | - | | | - | - | | - |
| 2 | Bi-weekly Evaporation | 38 days | | - | - | - | - | codi il i | | - | <u> </u> | - | <u> </u> |
| 2 | Lexan cone reflectivity test | 3 days | Wed 3/13/24 | | | | | | | | | | |
| | Task Split | | Miestone | Ð | S | ummary | | _ | • Proj | ect Summ | ary " | _ | |
| roject: Project One | External Tasks External Milestone | 7 | Inactive Task | _ | - Ir | active Mile | estone | | Inad | ive Summ | | | |
| late: 03/19/2024 14:11 | Manual Task Duration-only | _ | Summary Rollup | _ | N | lanual Sur | mary | | Star | l-only | | | |
| | Finish-only Progress | | Deadline | 8 | | | | | | | | | |

Material Procurement Summary

| Item | Measurements | Quantity | Delivery Time | Total Price (\$) | | | | |
|-------------------------------------|---|----------|---------------|----------------------|--|--|--|--|
| 8020 | | | | | | | | |
| Double T Slotted | Length (ft): 10 | 8 | 1 week | 1230,88 | | | | |
| Single T Slotted | Length (ft): 10 | 5 | 1 week | 396,85 | | | | |
| Table Quad | 3 ft long, 3 × 3 (inch) | 4 | 1 week | 309,68 | | | | |
| T-Slotted Framing Silver Bracket | - | 30 | 1 week | 291,90 | | | | |
| Machinable Foam | H3 x L48 x W96 | 4 | 3 weeks | 5,687.12 | | | | |
| Carbon Fiber | Inner: 0.5 (mm) x 80.4569 (in) x 19.3307 (in) | 2 | 2 weeks | 1274.32 | | | | |
| | Outer: 0.5 (mm) x 82.875 (in) x 19.3307 (in) | 2 | | | | | | |
| HoneyComb | H0.750 × L48 × W96 | 2 | 9 weeks | 1775.32 + 400 (max) | | | | |
| Shaft | 4 (ft) × 2 (in) | 1 | 7 days | 242.00 | | | | |
| Magnetic strip | 3 ft | 1 | 20 days | 122 | | | | |
| DP460 | - | - | few days | - | | | | |
| Total | - | - | - | 11730,07 | | | | |
| Machine shop | | - | - | 832 | | | | |
| Total | - | - | - | 12562,07 | | | | |

Mandrel building in pictures I

Link to the photos





Mandrel building in pictures II Link to the photos



• Building the 8020 frame: step done.

Focus on the attachments - mandrel building

- Adjusting the junctions can enhance alignment, with the primary goal being perfect alignment of the outer part of the dodecagon.
- Further alignment refinement will be carried out when applying the foam to each side of the dodecagon.



Next steps

- Poor vendor-university communication causing a 15-day delay.
- All components assembly: ready for $\pm \frac{June}{Iuly}$.

Foam prepation

- **Foam arriving**: max. April 11.
- ▶ In meanting: foam design/motor setup.

| 14 | Stony Brook (Vessel) | 129 days | Fri 2/02/24 | | | | | | | 1 |
|----|--|----------|-------------|----------|---|----|----|----|-----|---|
| 15 | Order Motion Components | 1 day | Fri 2/02/24 | - | | | | | | |
| 16 | Honey Comb Arrives | 0 days | Tue 4/09/24 | | | ÷. | | 5 | | |
| 17 | Magnetic Stripe Arrives | 0 days | Mon 2/26/24 | 3 | | | | | | |
| 18 | Carbon Fiber Arrives | 0 days | Fri 2/16/24 | | | | | - | | |
| 19 | Shaft Arrives | 0 days | Tue 2/27/24 | | | | | | | F |
| 20 | Foam Arrives | 2 days | Thu 4/11/24 | | | | | | | |
| 21 | 8020 acquisition / procurement | 1 day | Fri 2/02/24 | | | | | | | Г |
| 22 | Foam blocks procurement | 1 day | Tue 2/27/24 | 1 | | | | | | F |
| 23 | Mandrel 80-20 parts ready for assembly | 0 days | Tue 2/27/24 | | h | | | | | Г |
| 24 | Set up Motors | 2 days? | Fri 3/01/24 | | | | | | | Г |
| 25 | 80-20 Table Assembly | 1 day | Wed 2/28/24 | | | | | | | F |
| 26 | Mandrel 80-20 frame assembly | 14 days | Tue 3/05/24 | | 1 | | | | | t |
| 27 | Install Mandrel Frame | 1 day | Mon 3/25/24 | | 1 | | | | | Г |
| 28 | Order Shell Materials | 1 day | Fri 2/02/24 | 1 | | | | | | F |
| 29 | Begin Milling | 0 days | Fri 5/10/24 | | | | Ψh | | | Г |
| 30 | Table Leveling | 1 day? | Thu 2/29/24 | | - | | | | | Г |
| 31 | Surveying Allignment | 3 days | Wed 5/08/24 | | | | 0. | | | F |
| 32 | Foam preparation | 10 days | Mon 4/15/24 | | | - | | | | Г |
| 33 | Foam installation | 7 days | Mon 4/29/24 | | | | 1 | | | Г |
| 34 | Foam milling to shape | 20 days | Mon 5/13/24 | | | | - | 10 | | Г |
| 35 | Outer shell construction | 30 days | Mon 6/10/24 | | | | | 1 | - h | Г |
| 36 | All components ready for assembly | 42 days | Wed 6/05/24 | | | | _ | - | _ | Г |
| 37 | All components are assembled | 1 day | Thu 8/01/24 | | | | | | | T |

Link to the report

pfRICH Vessel: Engineering and Design report