Aegis Power Systems IP67 Enclosure

Western Carolina University
School of Engineering + Technology

Problem Statement

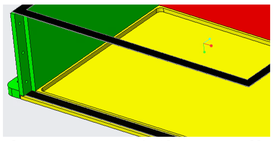
- Aegis currently uses a vegetable fiber gasket to achieve IP67 standards
- Gaskets are not reusable after routine maintenance and must be replaced
- Current gasket has not been tested under pressure wash conditions

Requirements

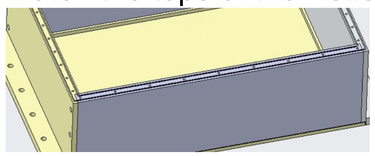
Req #	Requirement	Description	Verification
1	IP67 Ingress Protection	No ingress of any dust or solids plus waterproofing from a 15cm depth to a 1m depth for up to thirty minutes of submersion	Testing/Demonstration
2	Withstand High Water Pressure	A POSSIBLE achievement/test if there is time available. Test the enclosure against a pressure washer.	Testing/Demonstration
3	Removable	Must maintain an IP67 rating after reassembly	Inspection
4	Use of #6 screws	#6 screws are preferred from Aegis (100-degree CS Screw type)	Application
5	Cost Effective	Get at least three different quotes for the manufactured product	Lowest quote is chosen

Concepts

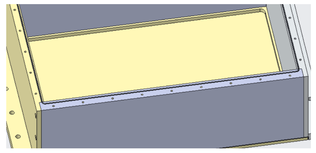
- 3 Original Gasket Concepts:



Flat Gasket
- A flat gasket that will match the tops of the walls
- Waste of material



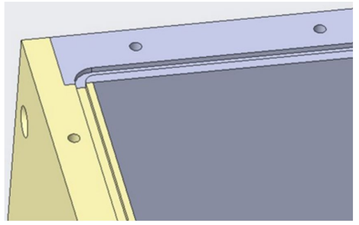
Single Groove Gasket
- A single groove is cut into the walls on both the top and bottom for a gasket to fit in
- Best overall option

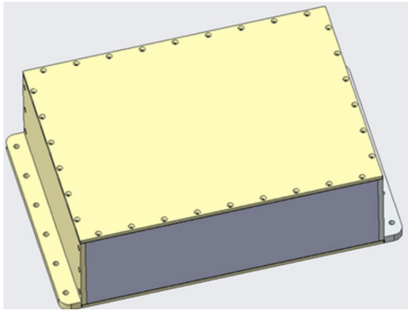


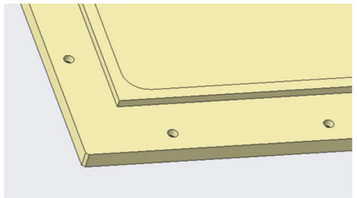
Double Groove Gasket
- A set of double grooves is cut into the walls on the top and bottom for the gaskets to fit in
- Most expensive to manufacture

Final Design

Single Groove Gasket:
- Screw hole placement is 1 5/8" apart for optimal testing and conforms to military EMD standards
- Prototype was produced in the WCU machine shop for a proof of concept before the final design was sent to Aegis' machining vendor for production
- A buna-n 50 durometer gasket bonded (at its ends) using Loctite 495 was used in the final product
- Testing proved a hole placement of 3.25" was sufficient for Aegis' requirements







Results

Test	Test Type	Duration	Gasket Material	Gasket Part Number	Testing Conditions	Pass/Fail	Results
1	Halfway sumersion	10 min	50 durometer silicone gasket	5229T47**	Submerged halfway in sink with one lid completely screwed in	Pass	No leakage through the bonding of the walls
2	Full sumersion	30 min	50 durometer silicone gasket	5229T47**	Fully submerged in testing appuratus with both lids completely screwed in	Pass	No leakage from the outside in but strips changed lightly in color due to moisture trapped inside the enclosure
3	Full sumersion	30 min	50 durometer silicone gasket	5229T47**	Fully submerged in testing appuratus with both lids completely screwed in and desiccant packs placed inside to remove moisture	Pass	No leakage from the outside and no moisture inside
4	High velocity water impact testing	n/a	50 durometer silicone gasket	5229T47**	Tested the worse case scenario by putting the pressure wash up against the crack of the lid (~ 1in distance from enclosure)	Pass	No leakage
5	Halfway sumersion	5 min	70 duro. bonded buna-n gasket and glue from splicing kit	9407K21**	Submerged halfway in sink with one lid screwed in with the every other hole pattern screwed in	Pass	No leakage
6	Full sumersion	30 min	50 durometer bonded* buna-n gasket	9864K23**	Fully submerged in testing appuratus with both lids screwed in with the every other hole pattern and desiccant packs placed inside to remove moisture	Pass	No leakage
7	High velocity water impact testing	n/a	50 durometer bonded* buna-n gasket	9864K23**	Tested the worse case scenario by putting the pressure wash up against the crack of the lid (~ 1in distance from enclosure)	Pass	No leakage

NOTES:
*All gaskets bonded with Lockttite 495 (Part #: 7520A13)
**All part numbers in this document are from McMaster-Carr

- Each test that was conducted passed

Summary

- Testing proved that screw hole placement of 3.25" is sufficient for both the submersion and pressure wash test
- The enclosure was tested under normal and extreme conditions of pressure washing
  - Normal: 1 ft of space between the pressure washer and enclosure lid
  - Extreme: ~1 inch between the pressure washer and enclosure lid

Team & Acknowledgements

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