Team #17

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Mentors: Mark Gustin and Ralph Munguia

CUSTOMER BACKGROUND

Black Hawk Seals, "the distributor's supplier", is dedicated to providing the latest industrial sealing technology through superior engineering knowledge, innovative technical design, materials and manufacturing expertise.

PROBLEM STATEMENT / SCOPE OF WORK

Black Hawk Seals needs their current line of static seal products tested, analyzed, and compared to their competitors to allow them to bring a superior product line to the market.

Develop a Design of Experiment that includes each required variable (seal type, temperature, pressure)
Develop a method for heating the testing housings (emphasize seal temperature)
Develop a method for using thermocouples to monitor temperature values during testing
Perform static impulse testing procedures using testing housings provided by BHS
Capture data from tests, analyze and measure seal extrusion deformation, and provide a report of findings to BHS

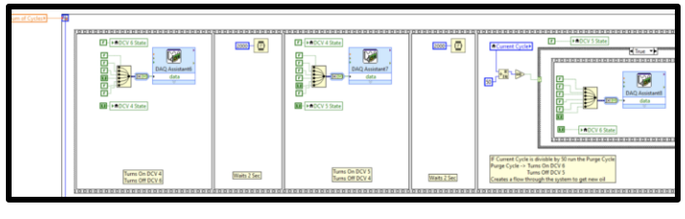
REQUIREMENTS

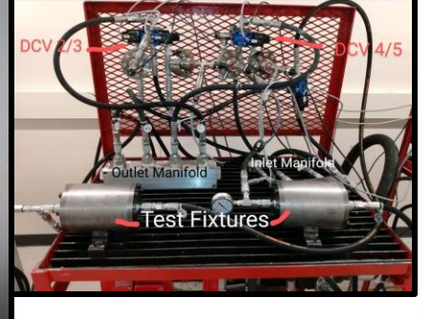
Rep. #	Requirement	Description	Test to Verify
1	Collect data on head seals at 3000 psi	Evaluate the performance of the head seals during and after the test at 3000 psi.	Static impulse testing
	Rational and Reference: Testing Procedure provided by Company Client		
2	Collect data on head seals at 5000 psi	Evaluate the performance of the head seals during and after the test at 5000 psi.	Static impulse testing
	Rational and Reference: Testing Procedure provided by Company Client		
3	Ambient temperature of 210°F ± 5°F	Evaluate the performance of the head seals during and after the test at this particular temperature range and at 3000 psi.	Static impulse testing under the condition of this temperature range
	Rational and Reference: Testing Procedure provided by Company Client		
4	Ambient temperature of 250°F ± 5°F	Evaluate the performance of the head seals during and after the test at this particular temperature range and at 5000 psi	Static impulse testing under the condition of this temperature range
	Rational and Reference: Testing Procedure provided by Company Client		
5	4s cycle time (2s on, 2s off)	Duration of the impulse of the hydraulic fluid within impulse test	Program into PLC through Labview
	Rational and Reference: Testing Procedure provided by Company Client		
6	10,000 cycle minimum per head seal and backup	Duration of entire test to be done on the head seals/back up	Program into PLC through Labview
	Rational and Reference: Testing Procedure provided by Company Client		

EXPERIMENTATION AND CONCEPTS

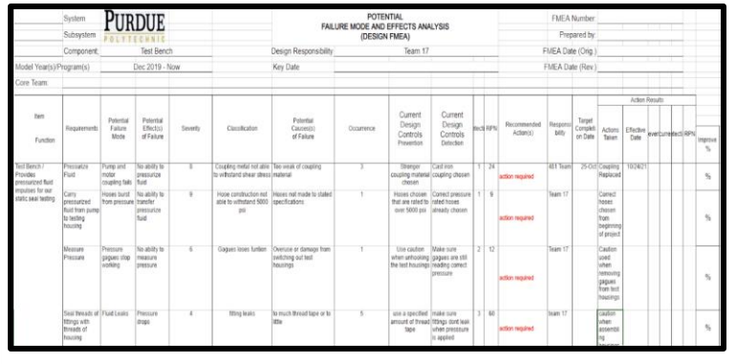
The heated testing temperature requirements are 210 and 250 degrees Fahrenheit. This temperature was to represent the seal temperature rather than the fluid temperature. To accomplish this, we needed a way to localize the heat over the seals while they were in the testing housings. After much research, we decided to purchase nozzle heaters designed for injection molding machines. These would fit over our testing housings where we could place them just over where the seals were placed. While they are able to reach temperatures of 750 degrees Fahrenheit, they are designed to run off 240 VAC. At Heavilon, we only have one 240 V plug. While they will still heat up using 120 V, this operation takes much longer to reach our testing temperature.

FINAL DESIGN

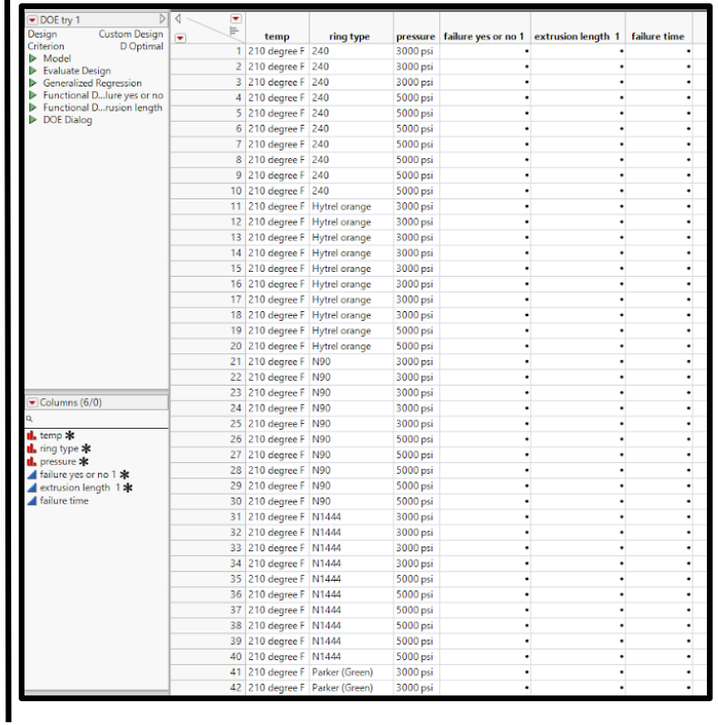




FMEA



TESTING



	temp	ring type	pressure	failure yes or no 1	extrusion length 1	failure time
1	210 degree F	240	3000 psi	•	•	•
2	210 degree F	240	3000 psi	•	•	•
3	210 degree F	240	3000 psi	•	•	•
4	210 degree F	240	5000 psi	•	•	•
5	210 degree F	240	5000 psi	•	•	•
6	210 degree F	240	5000 psi	•	•	•
7	210 degree F	240	5000 psi	•	•	•
8	210 degree F	240	5000 psi	•	•	•
9	210 degree F	240	5000 psi	•	•	•
10	210 degree F	240	5000 psi	•	•	•
11	210 degree F	Hytrel orange	3000 psi	•	•	•
12	210 degree F	Hytrel orange	3000 psi	•	•	•
13	210 degree F	Hytrel orange	3000 psi	•	•	•
14	210 degree F	Hytrel orange	3000 psi	•	•	•
15	210 degree F	Hytrel orange	3000 psi	•	•	•
16	210 degree F	Hytrel orange	3000 psi	•	•	•
17	210 degree F	Hytrel orange	3000 psi	•	•	•
18	210 degree F	Hytrel orange	3000 psi	•	•	•
19	210 degree F	Hytrel orange	5000 psi	•	•	•
20	210 degree F	Hytrel orange	5000 psi	•	•	•
21	210 degree F	N90	3000 psi	•	•	•
22	210 degree F	N90	3000 psi	•	•	•
23	210 degree F	N90	3000 psi	•	•	•
24	210 degree F	N90	3000 psi	•	•	•
25	210 degree F	N90	3000 psi	•	•	•
26	210 degree F	N90	5000 psi	•	•	•
27	210 degree F	N90	5000 psi	•	•	•
28	210 degree F	N90	5000 psi	•	•	•
29	210 degree F	N90	5000 psi	•	•	•
30	210 degree F	N90	5000 psi	•	•	•
31	210 degree F	N1444	3000 psi	•	•	•
32	210 degree F	N1444	3000 psi	•	•	•
33	210 degree F	N1444	3000 psi	•	•	•
34	210 degree F	N1444	3000 psi	•	•	•
35	210 degree F	N1444	5000 psi	•	•	•
36	210 degree F	N1444	5000 psi	•	•	•
37	210 degree F	N1444	5000 psi	•	•	•
38	210 degree F	N1444	5000 psi	•	•	•
39	210 degree F	N1444	5000 psi	•	•	•
40	210 degree F	N1444	5000 psi	•	•	•
41	210 degree F	Parker (Green)	3000 psi	•	•	•
42	210 degree F	Parker (Green)	3000 psi	•	•	•