

Pressure Variation Along a Lawn Mower Blade

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Crosby Laboratory
University of Maine

By:
Benjamin Graham
Andrew Smith
Michael Smith

Assisted By:
Professor Bhaganagar

Object

A test of the pressure variation along multiple lawn mower blades was conducted in order to find the lawn mower blade with the smallest pressure differences. This would give us the information needed to find the blade with the smallest amount of losses due to a “fan effect”. The following results were determined:

- Pressure values along the length of each blade
- Blade with the minimum pressure difference

Apparatus, Equipment, and Instrumentation

Figure 11, below, shows a bird’s eye view of the placement of the pressure taps. Figure 12 shows the entire experimental setup.

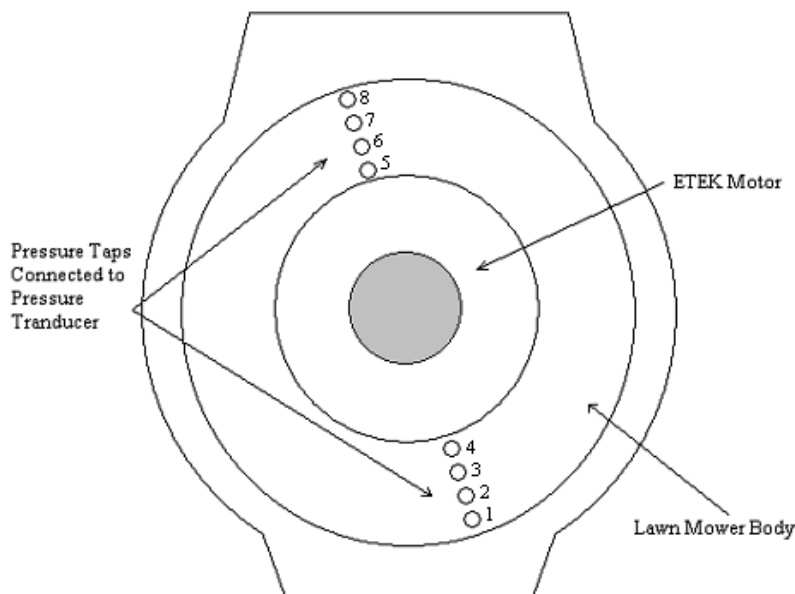


Figure 11



Figure 12

Test Item Identification

1. Pressure Transducer – Sentra Model 239, Range 0-15 WC, Excitation 22-30V
2. Multimeter – Micronta Model 22-195A
3. DC Power Supply – Aglient E3617A, 0-60V, 0-1A

Results

Table 1 shows the voltage readings obtained at each pressure tap for each blade tested.

Blade #	P1(mV)	P2	P3	P4	P5	P6	P7	P8
6294	270	185	225	200	-4	-6.7	183	172
6309	200	210	210	205	-6	-5.1	190	170
3361	245	215	240	220	-5.4	-11	210	185
3370	290	210	255	210	-6.5	-7	210	190
3379	130	140	185	147	-16	-6	158	125
stock	155	175	205	220	-15	-5.1	130	130

Table 1

Table 2 shows the calculated pressure reading at each pressure tap for each blade tested.

Blade #	P1(in_H2O)	P2	P3	P4	P5	P6	P7	P8
6294	0.4361	0.397	0.4154	0.4039	0.31006	0.308818	0.39608	0.39102
6309	0.4039	0.4085	0.4085	0.4062	0.30914	0.309554	0.3993	0.3901
3361	0.4246	0.4108	0.4223	0.4131	0.309416	0.30684	0.4085	0.397
3370	0.4453	0.4085	0.4292	0.4085	0.30891	0.30868	0.4085	0.3993
3379	0.3717	0.3763	0.397	0.37952	0.30454	0.30914	0.38458	0.3694
stock	0.3832	0.3924	0.4062	0.4131	0.305	0.309554	0.3717	0.3717

Table 2

A graph of the pressure values along the length of each blade is shown in Figure 13 in Appendix B. A graph of the maximum pressure difference for each blade can be seen in Figure 14 in Appendix B.

Conclusion

After running this experiment it was determined that Blade 3379 would be the blade that would have the least amount of pressure associated losses. Each blade that was tested has a similar pressure profile along the blade, but blade 3379 has the smallest maximum pressure difference meaning the other blades have greater losses because of the higher pressure differences. It is interesting to note that any of the purchased blades would be an improvement over the stock model blade. This is due to the intended designs of the blades. The stock blade was designed to help throw clippings out the back of the mower while the purchased blades were all designed to be simply mulching blades.

Appendix B

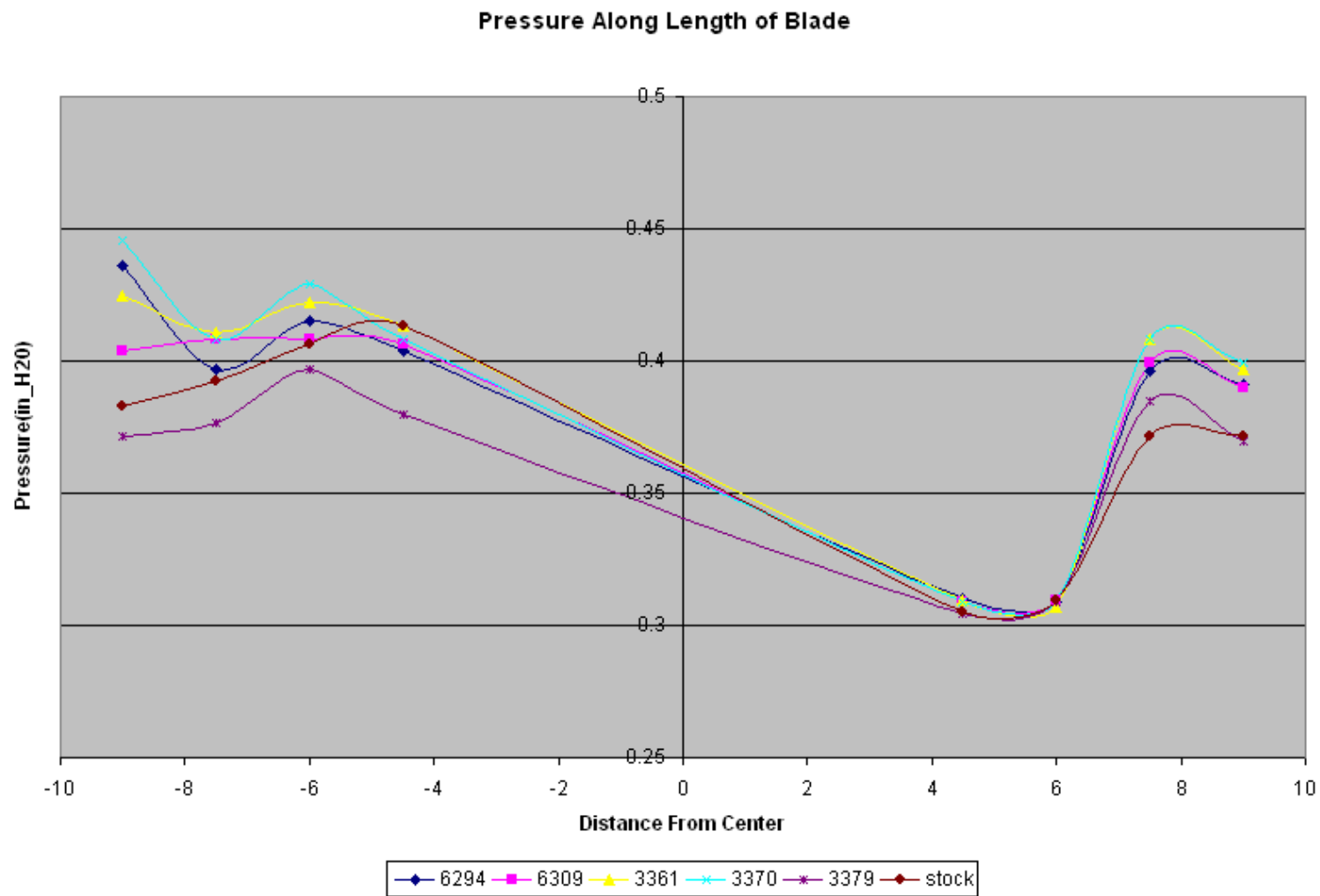


Figure 13

Maximum Pressure Drop

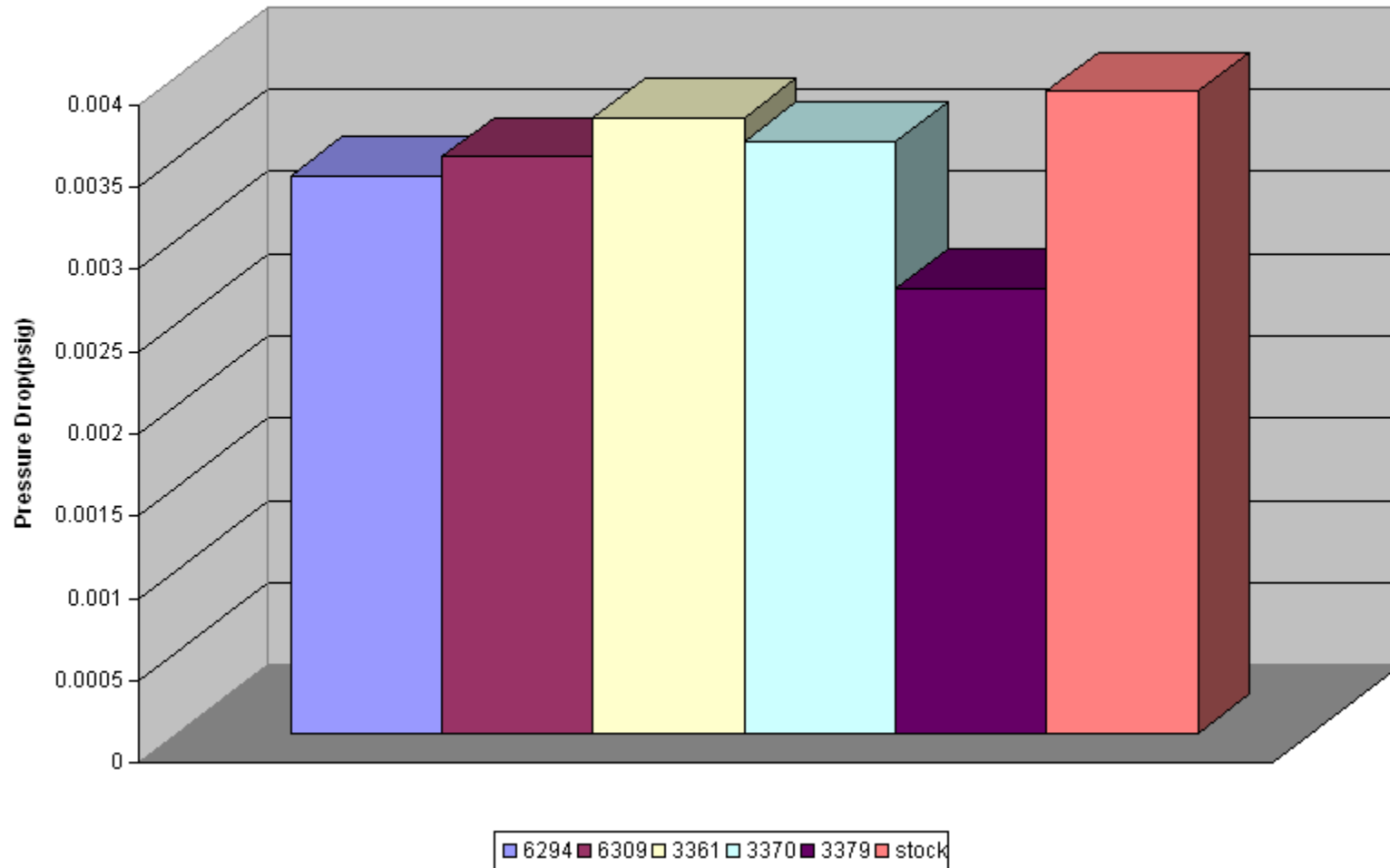


Figure 14

