

Ring of Fire Test Report

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Purpose

Calculate the reduction in time to boil and heat transfer efficiency improvement with the Ring of Fire.

Test Procedure

1. Measure and record ambient air temperature, test location and wind velocity.
2. Fill kettle with tap water and record pre heat water temperature.
3. Weigh propane tank and record.
4. Light burner, adjust regulator and record time.
5. At set heat intervals (100°, 150°, 200°) record time.
6. At 212° turn off burner, close propane tank, record time.
7. Weigh propane tank and record.
8. Calculate test results

Equipment list

1. Blichmann Boilermaker G2 20 Gallon kettle with sight glass
2. Blichmann Hellfire burner
3. 20 lb propane cylinder
4. Digital scale (.000lb resolution)
5. Digital temp gage (Keyence)
6. Digital timer

Test Results

Note: Due to differences in initial volume or weight of propane cylinders the flow rate varied across multiple tests. As a tank decreased in volume / weight the flow will decrease. During testing the regulator was not adjusted after it was initial set in efficiency mode. In Hellfire mode the regulator was open to maximum flow position so flow rate was dependent on tank volume. Therefore, an average across multiple tests was used to determine final results. The difference in average flow rates (BTU/hr) is shown in the cell highlighted in yellow.

Calculations

BTU's Used = Fuel used / (21,500 BTU / lb of propane).

BTU/hr = BTU's Used / Time to boil in hours

BTU's/Degree = BTU's Used / (212 – start temp)

Efficiency Mode

Ring of Fire	Time to boil (min)	Fuel used (lbs)	BTU's Used	BTU/hr (calc)	BTU's / degree
With	52.00	2.88	61823.3	71334.5	404.3
With	51.00	2.52	54180.0	63741.2	364.6
With	59.00	2.69	57835.0	58815.3	404.4
With	44.00	2.82	60630.0	82677.3	425.5
With	49.00	2.61	56115.0	68712.2	393.5
No	55.00	3.44	73895.5	80613.3	483.3
No	73.00	2.88	61812.5	50804.8	417.1
No	66.00	3.56	76540.0	69581.8	534.5
No	74.00	4.07	87505.0	70950.0	614.1
No	57.00	3.13	67295.0	70836.8	472.9

Avg with	51.00	2.70	58116.7	69056.1	398.5
Avg No	65.00	3.41	73409.6	68557.3	504.4
Improvement	21.54%	20.83%	20.83%	-0.73%	21.00%

Hellfire Mode

Ring of Fire	Time to boil (min)	Fuel used (lbs)	BTU's Used	BTU/hr (calc)	BTU's / degree
With	36.00	3.68	79012.5	131687.5	553.3
With	41.00	3.69	79335.0	116100.0	553.2
With	36.00	3.59	77077.5	128462.5	540.5
No	46.00	4.55	97717.5	127457.6	685.3
No	48.00	4.75	102125.0	127656.3	711.7
No	47.00	4.58	98470.0	125706.4	686.7

Avg with	37.67	3.65	78475.0	125416.7	549.0
Avg No	47.00	4.63	99437.5	126940.1	694.5
Improvement	19.86%	21.08%	21.08%	1.20%	20.95%

Conclusion

By adding the Ring of Fire to the brew kettle the time to boil was decreased by 20% in both Hellfire and efficiency mode. The heat transfer efficiency also increased by 20% as shown in the BTU/degree column.