



# HUGHES MACHINERY

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## State of Kansas Realizes Impressive Savings with Limpsfield Retrofit



When the State of Kansas began researching retrofit options for their Cleaver-Brooks 150 HP, 15 psig steam boilers at the Eisenhower State Office building in Topeka, the options appeared to be few. They knew that their boilers were well maintained and in good condition, in spite of their age, but burner parts were getting hard to source and the boilers were not operating efficiently. They had just completed a controls retrofit on a similar boiler room in another State building, but were not happy with the results. While the different options were being considered, the State heard about an exciting European burner line from Limpsfield Engineering, represented by Hughes Machinery. At first, the promises from Limpsfield seemed too good to be true!

Due to its unique burner head design, every Limpsfield burner is guaranteed to operate at or below 3% O<sub>2</sub> across the firing range. Most well tuned burners can only achieve 5% O<sub>2</sub> before the flame begins to become unstable. Even 5% is not feasible across most burners' firing ranges. O<sub>2</sub> readings are directly related to excess air, which in turn is directly related to boiler efficiency. An O<sub>2</sub> reading of 3% equates to a boiler efficiency of over 85%, the maximum possible without condensing. Before the retrofit, the Eisenhower boilers were operating at about 12% O<sub>2</sub>, less than 80% boiler efficiency.

The table below shows the relationship between excess oxygen, stack temperature and boiler stack efficiency loss. With stack temperatures of 310 F and 8% O<sub>2</sub> a boiler would have 19.48% stack losses (80.52%) while the same boiler with the same stack temperatures would only have 16.55% losses (83.45%) if the O<sub>2</sub> could be maintained at 2%. Of course for total boiler efficiency you would also have to subtract radiant (stand by) losses and boil down losses with steam boilers.

**Table B.1. Natural gas stack loss (%)**

Flue gas O <sub>2</sub> content (%)	Flue gas temperature—combustion air temperature (°F)														
	230	250	270	290	310	330	350	370	390	410	430	450	470	490	510
1.00	14.49	14.92	15.36	15.79	16.23	16.67	17.11	17.55	17.99	18.43	18.88	19.32	19.77	20.21	20.66
2.00	14.72	15.17	15.63	16.09	16.55	17.01	17.47	17.93	18.39	18.86	19.32	19.79	20.26	20.73	21.20
3.00	14.98	15.46	15.94	16.42	16.90	17.38	17.87	18.36	18.84	19.33	19.82	20.31	20.80	21.30	21.79
4.00	15.26	15.77	16.28	16.79	17.29	17.81	18.32	18.83	19.35	19.86	20.38	20.90	21.41	21.93	22.46
5.00	15.59	16.12	16.66	17.20	17.74	18.28	18.82	19.36	19.91	20.46	21.00	21.55	22.10	22.65	23.20
6.00	15.96	16.52	17.10	17.67	18.24	18.82	19.39	19.97	20.55	21.13	21.71	22.29	22.88	23.46	24.05
7.00	16.38	16.98	17.59	18.20	18.82	19.43	20.04	20.66	21.28	21.90	22.52	23.14	23.77	24.39	25.02
8.00	16.86	17.51	18.16	18.82	19.48	20.14	20.80	21.46	22.12	22.79	23.46	24.12	24.79	25.47	26.14
9.00	17.42	18.13	18.83	19.54	20.25	20.96	21.68	22.39	23.11	23.83	24.55	25.27	25.99	26.72	27.44
10.00	18.09	18.86	19.62	20.39	21.16	21.94	22.71	23.49	24.27	25.05	25.83	26.62	27.41	28.19	28.98
11.00	18.89	19.73	20.57	21.42	22.26	23.11	23.96	24.81	25.67	26.52	27.38	28.24	29.10	29.97	30.83
12.00	19.87	20.80	21.73	22.66	23.60	24.54	25.48	26.43	27.37	28.32	29.27	30.22	31.18	32.13	33.09

Limpsfield has partnered with AutoFlame combustion controls to further improve the performance of their burners. The State of Kansas choose the AutoFlame Mark VI linkage-less control package with exhaust gas analyzers for more precise boiler tuning and control. Variable frequency drives were also added to the existing blower motors for additional electrical savings. The existing burner gas trains were re-used to save on project cost.

After one complete heating season, the results have been phenomenal. The winter of 2009/2010 was a very cold one for Topeka, however the Eisenhower Building stayed toasty warm without ever firing more than one boiler at a time. In fact, on the coldest day, one boiler could heat the building without ever exceeding 80% modulation! In past winters, it took two boilers firing at 100% to carry the load.

The Limpsfield motto is “no bad jobs” and they make certain every customer is completely satisfied. This was definitely the case with the State of Kansas when “too good to be true” became reality.

Contact a member of Hughes Machinery’s Energy Group today to discuss Limpsfield options for your facility.