

Table 1

	No. of heating off and on E	No. of heating off and on F
	34	39
	36	42
	36	44
	41	46
	32	39
	47	49
	53	54
	55	58
	61	60
	43	50
	51	52
	63	58
	60	60
	71	65
	54	53
GAS	49,13	51,27
StdDev	11,89757879	8,09291283
	24	29
	26	29
	26	32
	29	31
	22	30
	35	31
	38	36
	39	40
	43	40
	31	33
	38	34
	45	40
	44	42
	49	46
	36	36
IrD	34,94	35,28
StdDev	8,390963223	5,29267913

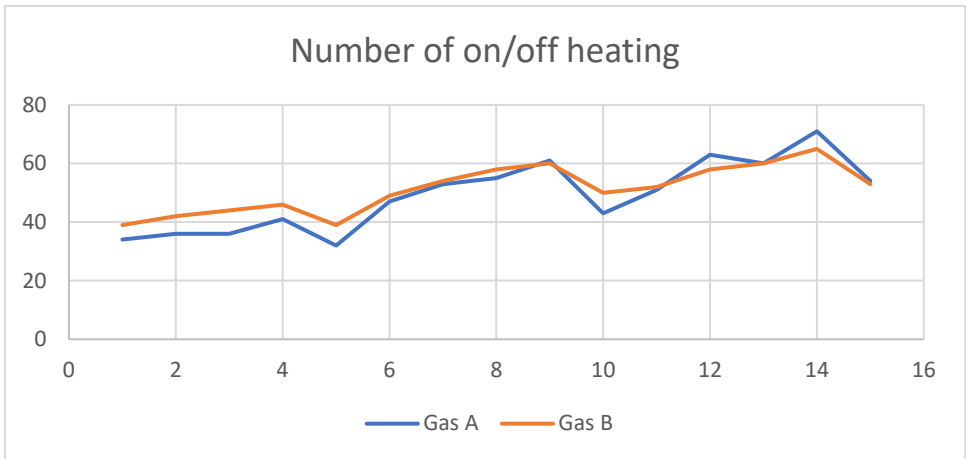


Figure 1: Distribution of heating with Gas on/off switches during lamination process for two segments

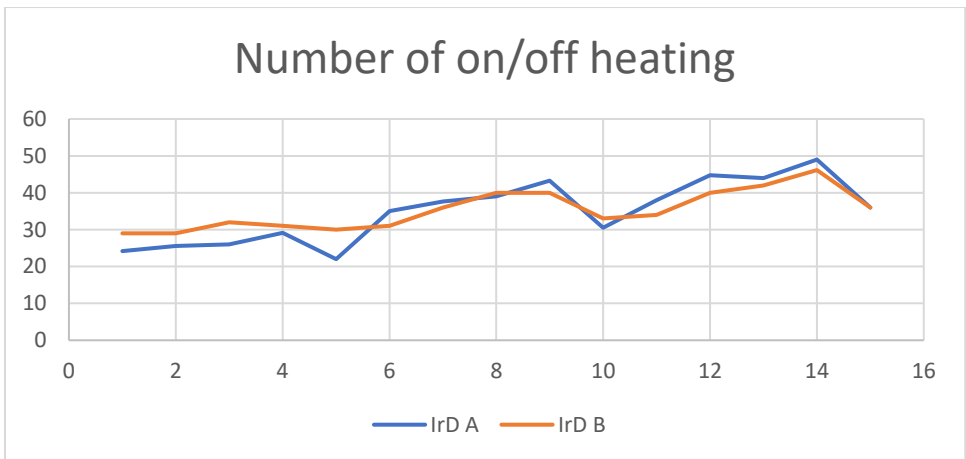


Figure 2: Distribution of heating with IrD on/off switches during lamination process for two segments

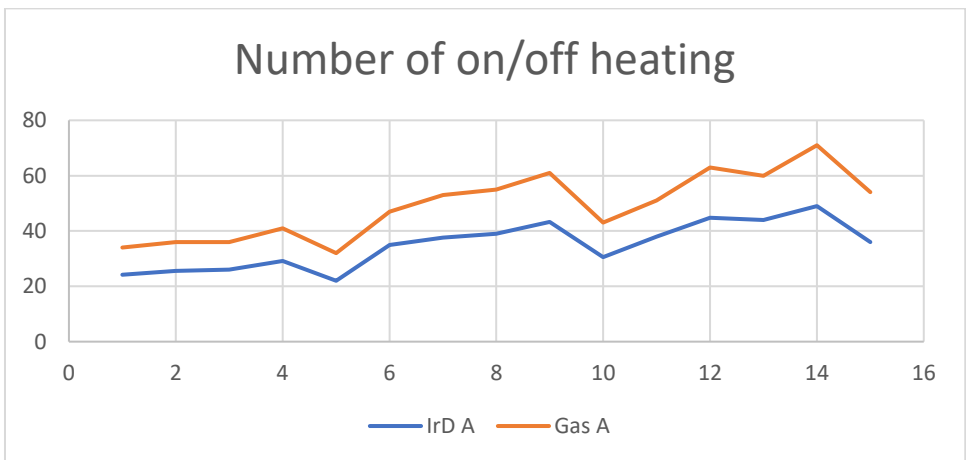


Figure 3: Comparison of distributions of heating with IrD vs Gas on/off switches during lamination process for segment A

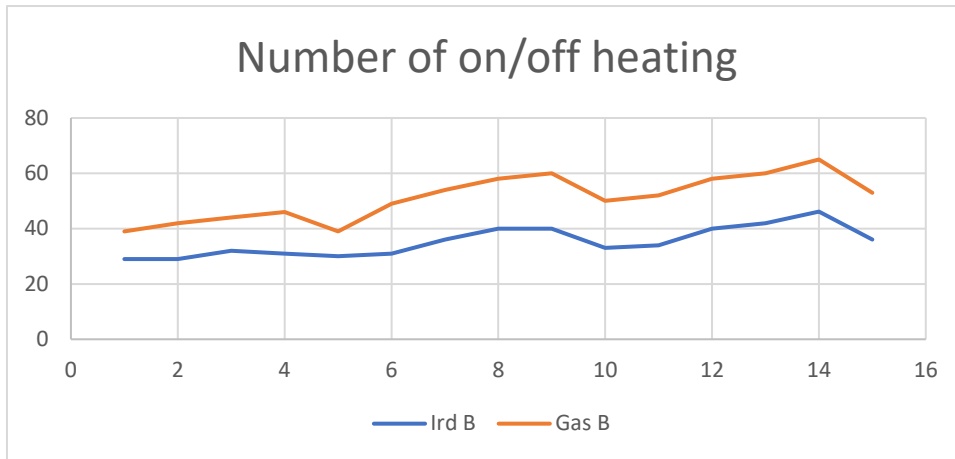


Figure 4: Comparison of distributions of heating with IrD vs Gas on/off switches during lamination process for segment B

Table 2

Mean Temp	Segment A	Segment B	Segment C	Segment D	Segment E	Segment F	Mean Segments	SD Mean Segment
GAS	60,48	87,63	112,42	123,08	112,63	122,10	103,05	24,47119827
IrD	60,39	88,98	113,54	123,23	112,52	122,38	103,51	24,48171067

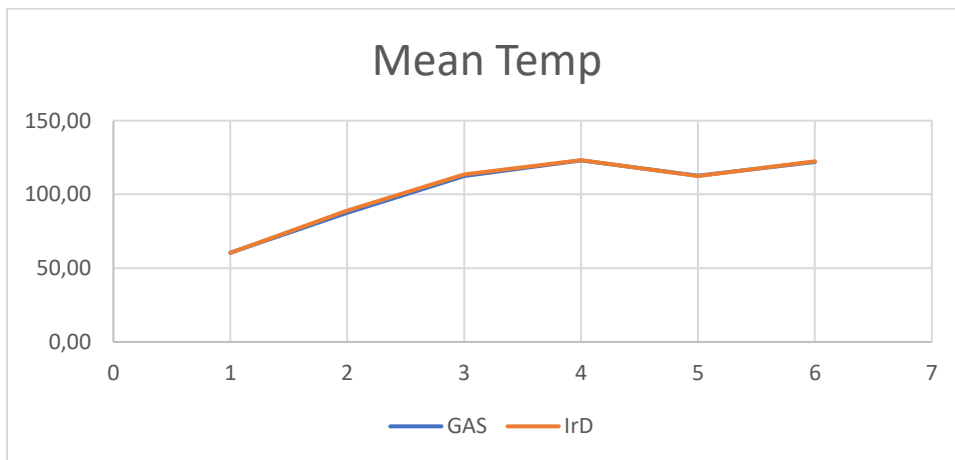


Figure 5: Mean oven temperature for GAS and IrD in lamination process

Table 3

Mean Time for Heating	Segment A	Segment B	Segment C	Segment D	Mean Segments Time	SD Segments Time
GAS	0:35	0:17	0:21	0:09	00:20:50	00:05:24
IrD	0:31	0:13	0:17	0:06	00:17:08	00:05:14

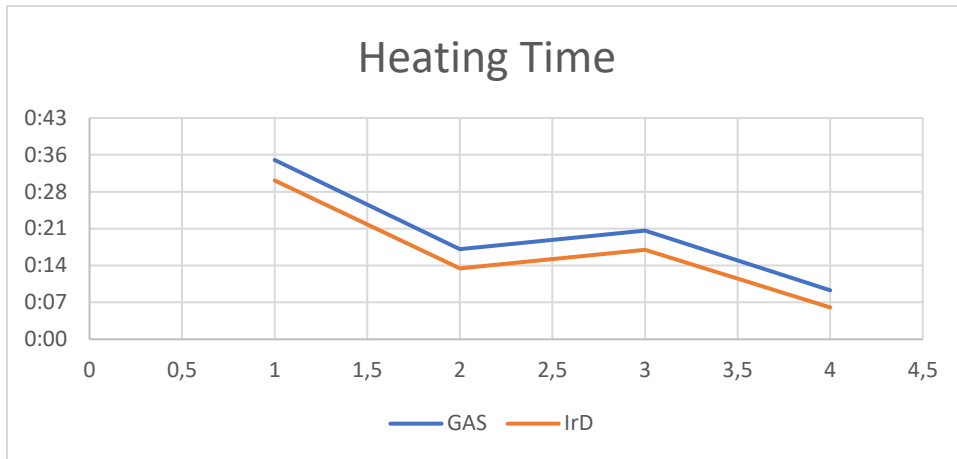


Figure 6: Mean heating time between on/off switches for GAS and IrD in lamination process

Conclusion:

Here we report an extensive comparison of heating systems for glass lamination process. We have investigated process data set for global process time in specific temperature range. Heating for lamination process is much efficient by using dual system including Infrared. We might see the clear significance:

- A. Amount of switching on and off heating in each heating period/cascade is by average 16 switches smaller (Figure 1-4/Table 1).
- B. With both heating systems we reach same and constant temperature (Figure 2/Table 2).
- C. Heating time for lamination is by average 3 min shorter by using dual system (Figure 6/Table 3).

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