PT. KRAKATAU STEEL

Burner Control System in Ladle Drying and Preheating Process

SUMMARY OF THE OPTION

PT. Krakatau Steel is a large government-owned integrated steel plant in Indonesia and produces hot rolled coils, plates and sheets; cold rolled coils and sheets and wire rods with capacity 2 million, 650.000, dan 20.000 ton per year.

The Slab Steel Plant (SSP)–II is one of the largest consumers of natural gas. The specific consumption of natural gas per ton of product processed in the Ladle Preheating and Ladle Drying processes was much higher than the standard. This was caused by unpredictable time schedules of the Preheating process and/or delay in casting process, the resulting Ladle Drying processes were often on hold, causing wasting energy because the burners kept running.

The solution was to install a Control System to control the burners automatically in Ladle Drying and Preheating process, and introduce a Utilization Time Management Scheme to link the operation of the Ladle Preheating and Ladle Drying processes with **the other production steps (casting process).** Natural gas savings were 1,112,877 Nm^3 or 757 tons per year, resulting in 2,217 tons CO_2 emissions per year. The system cost US$ 8,333, total savings were US$ 72,306/year, and the payback period was less than 2 months.

KEYWORDS

Indonesia, Iron & Steel, Furnaces & Refractories, Ladle Drying, Ladle Prehe ating

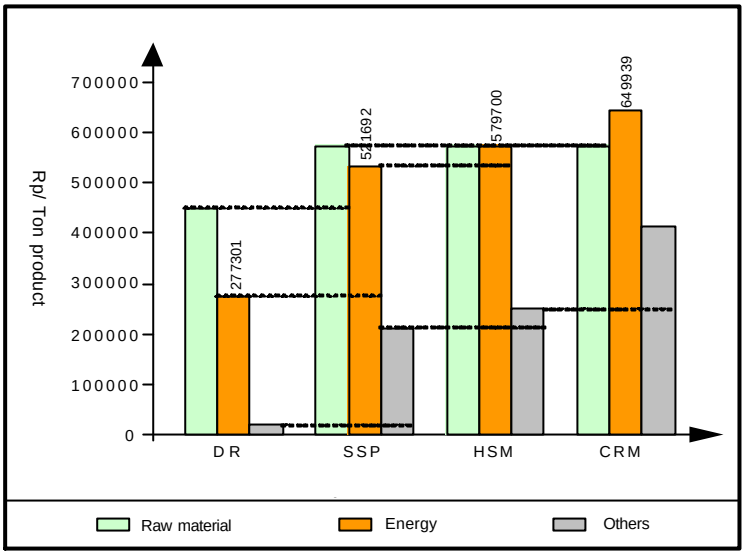
OBSERVATIONS

Slab Steel Plant II (SSP–II) is one of the six plants at PT Krakatau Steel with high energy and raw material costs per ton of product, as shown in Figure 1. Before a new batch in an EAF (Electric Arc Furnace), the empty ladles are first dried by direct firing of a gas burner inside the ladle. Preheating of the empty ladle is followed, again by a similar process. The ladle is next charged with raw materials.

The reason for the high energy consumption in the Ladle Drying process was the long heating time because the timing of ignition of the Ladle Drying was not adjusted to the schedule of the Ladle Preheating. This was caused by the unpredictable timing of the Ladle Preheating. As a result the Ladle Drying process was very often on hold and wasting energy because the burner was on all the time.

The reason for the high energy consumption in the Ladle Preheating process was because the burner was kept running while the preheating process was on hold because of uncertainty in tapping process prior to the Ladle.

Figure 1: Cumulative variable cost in each plant



OPTIONS

The option was to optimize the operation of burners by linking the timing of the Ladle Preheating and the Ladle Drying processes with other production steps.

This was achieved by by installing a Ladle Control System of the burners in the Ladle Drying and Preheating processes to and introducing a Time Utilization Management Scheme. This included:

- Installation of PC hardware
- Installation of connections between the burner control and the PC hardware
- Development of program software to control the burners at both processes

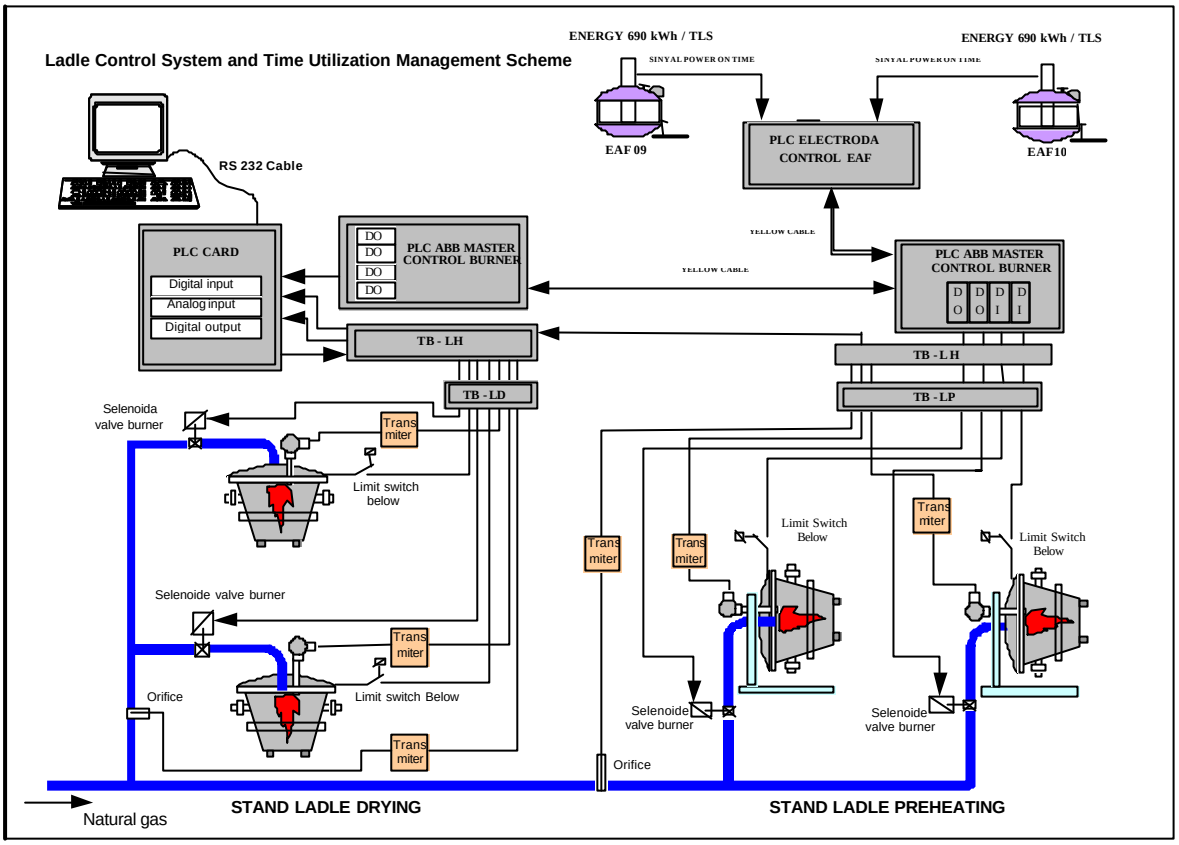
Because burners could now be turned on and off automatically to suit the production schedule, the time that burners were on hold and using natural gas unnecessarily was kept to a minimum. The target for natural gas consumption was set at 80% of the standard consumption values, which was based on the delay of the operating system at SSP-II, and calculated as follows:

The targeted natural gas savings were about 1,341,523 Nm^3 as shown in Table 1.

Table 1 – Calculation of the energy saving target

No	Item	Specific Energy Consumption Nm^3/ton			Energy saving opportunity	Saving Target		
		Actual	Standard	Difference	Nm^3/yr	Nm^3/ton	Nm^3/yr	Mill Rp./yr
1.	Drying	2.18	0.68	1.5	910,536	1.2	728,429	425.95
2.	Preheating	1.16	0.45	0.71	430,987	0.568	344,790	201.617
	TOTAL saving target				1,341,523	1.768	1,073,218	627.568

Figure 2: Diagram of Ladle Burner Control System and Utilization Time Management



The improvement after the implementation of the option, in ladle heating and the drying process can be seen in the following figure:

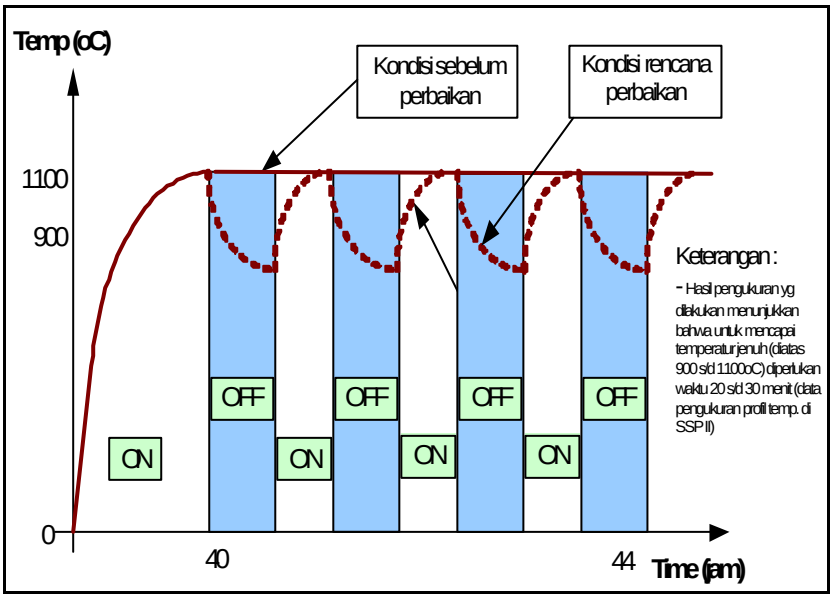


Figure 3 - Improvement plan in Ladle Preheating Process

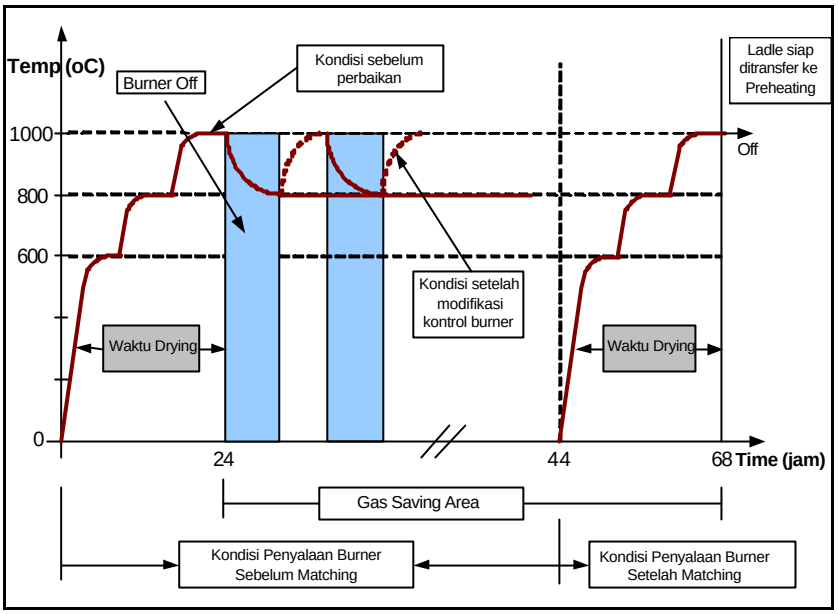


Figure 4 - Improvement plan in Ladle Drying Process

RESULTS

Financial benefits

- Investment: US$ 8,333
- Annual cost savings: US$ 72,307
- Payback period: less than 2 months **(**0.015 year)

Environmental benefits

- Annual energy saving: 1,112,877 Nm^3 or 757 tons natural gas (1,112,877 Nm^3 *0.00068 ton/Nm^3)
- Annual GHG reduction: 2,217 ton CO_2 (757 * 2.93 ton CO_2/ton natural gas)

Expected/targeted and actual financial and environmental benefits were calculated as shown in Table 2.

Table 2 - Comparison between natural gas savings targets and actual savings

No.	Item	Unit	Saving		
			Target	Actual saving	% Target
1	Drying	Nm^3/ton	1	1.27	106
2	Preheating	Nm^3/ton	0.568	0.560	99
	Total	Nm^3/ton	1.768	1.830	
		Nm^3/yr	1,073,218	1,112,877	
	(Nm^3/yr * 0.00068 ton/Nm^3)	Ton/yr	730	757	
	Cost savings in Rupees (Nm^3 LNG/yr* 584.75 Rp/Nm^3 NGas)	Mill Rp./yr	628	651	
	Cost saving in US$ (9,000 Rp = 1 US$)	US$/yr	69,729	72,307	

FOR MORE INFORMATION

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