SUMMARY TABLE :

	Required Change to Reduce Fuel Rate by 10 kg/thm	Approx. % Change (based on avg)
Slag Rate	–33.33 kg/thm	**–6.7%** (from 500 kg)
Hot Blast Temp	+40 °C	**+3.5%** (from 1150 °C)
Moisture	–4%	**–50%** (from 8%)
Gas Utilization Efficiency	+5%	**+10.6%** (from 47%)
Flame Temperature	+200 °C	**+9.1%** (from 2200 °C)
Top Pressure	+1 bar	**+43.5%** (from 2.3 bar)

These small shifts can **save 10 kg/thm** while maintaining furnace safety and output.

Theoritical Fuel Rate Adjustment Table

Parameter	Unit	Change	Fuel Rate Adjustment (kg/tHM)
Moisture Injection	g/m³ STP	+ 10	+ 6
Top pressure	bar	+ 0.1	– 1.2
Blast temperature	°C	+ 100	– 9
Slag	kg/thm	+ 10	+ 0.5
Gas Utilization	%	+ 1	– 7

Predicted Fuel Rate Adjustment Table

Parameter	Unit Change	Fuel Adjustment (kg/thm)
Moisture injecition	+ 10%	+ 12.7
Top Pressure	+ 0.1 bar	– 5.6
Blast Temperature	+ 100 °C	– 12.4
Slag Rate	+ 10 kg/thm	+ 0.3
Gas utilization efficiency	+ 1%	– 5
Flame Temperature	+ 100 °C	– 3.6

NOTE: There is difference in unit for Moisture Injection for the tables

Summary

- Moisture injection: Positive correlation with fuel rate (higher moisture → Higher fuel),
- CO Efficiency: Slight negative correlation (higher CO utilization → lower fuel), Better CO gas utilization clearly reduces carbon consumption by making use of CO for reduction.
- Hot Blast Temperature: Plot shows negative trend (higher temp → lower fuel), and theory indicates the same: hotter blast reduce fuel consumption.
- Slag Rate: Clear positive correlation (higher slag rate → higher fuel), moderate strength. Additional slag requires extra heating and melting, raising the fuel cosumption.
- Flame Temperature: Flame Temperature have a Negative correlation with fuel rate. Higer Raceway flame temperature → Lower fuel rate.
- Top Pressure: Top Pressure have a Negative correlation with fuel rate; fuel rate is decreasing by increasing top-gas pressure.

Recommendations -

- Maximize CO to CO_2 conversion efficiency / Gas Utilization Efficiency (optimize burden mix and gas flows to lower top-gas CO ratio).
- Operate at the higher practical hot-blast temperature.
- Reduce slag production (better raw-material quality and flux control) to avoid melting costs.
- Carefully control charge moisture: minimize unnecessary water in feed, but use precise steam injections only to the extent they improve permeability.
- Maintain stable flame temperature and top pressure through proper O_2 and burden control, their direct impact on fuel rate is significant.