

Case Study – 2

Modification in kiln car furniture by replacing 'Solid Cordierite Kiln Car Shelves (Saggers)' with 'Oxide Bonded Silicon Carbide (SiC) Shelve'

Implementing the technology

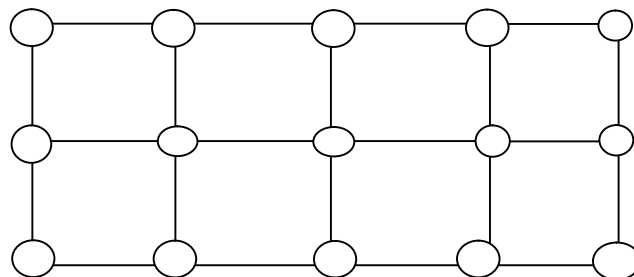
- The kiln used at the industry is a tunnel kiln, made up of ceramic fibre walls with asbestos covering outside.
- Capacity: **3300 Kg/day**.
- Average fuel consumption: **475 SM³/day**(144 SM³/ton product)
- Car capacity of kiln: **27 Cars**
- Kiln Car Dimensions: **(46" * 23" * 30")** (Length * Width * Height)



- Cycle Time: **80 Minutes**
- Total time inside kiln for a car: **37.5 Hours**
- Average material loading per car: **165 Kg**

Before Cleaner Production:

- The platforms used to hold the moulded insulators were made up of '**Cordierite**'
- Dimension of cordierite plates: **11"*11"* 1"** (280mm * 280 mm * 25mm)
- Each layer of car contained **8** plates.
- The graphical design (Top View) of the kiln car is as shown here.



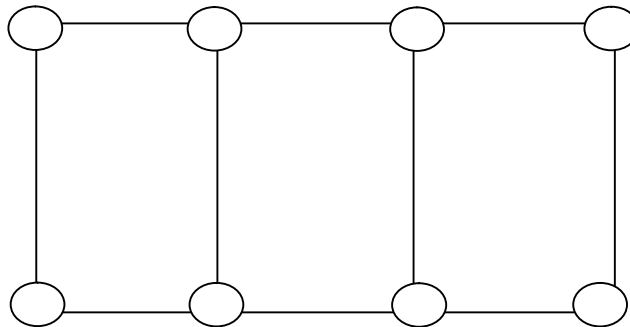
- With this structure, approximately **24 Kg** of product could be loaded on one layer
- Each car contained approx**5 layers** of cordierite plates.
- Total weight of products loaded on car with above structure:

$(24 \text{ Kg} * 5 \text{ layers}) = 120 \text{ Kg}$ approximately.

- As the car loading cycle time is 80 minutes,
Per day car sent for baking: 18 cars
Per day firing of products: 2160 Kg approximately
- Average gas consumption per day: $545 \text{ SM}^3 / \text{Day}$ Approx.
Gas consumption per ton of product: $(545 \text{ SM}^3 / 2160 \text{ Kg})$
 $= 252 \text{ SM}^3 / \text{MT}$

After Cleaner Production:

- The platforms used to hold the moulded insulators are made up of 'Oxide Bonded Silicon Carbide'
- Dimension of SiC plates: $15'' * 22'' * 0.6''$
 $(381\text{mm} * 560\text{mm} * 15\text{mm})$
- Each layer of car contained 3 plates.
- The graphical design (Top View) of the kiln car is as shown here.



- With this structure, approximately 30 Kg of product could be loaded on one layer
- Each car contained approx 6 layers of oxide bonded silicon carbide plates.
- Total weight of products loaded on car with above structure:
 $(30 \text{ Kg} * 6 \text{ layers}) = 180 \text{ Kg}$ approximately.
- As the car loading cycle time is 80 minutes,
Per day car sent for baking: 18 cars
Per day firing of products: 3240 Kg approximately
- Average gas consumption per day: $488 \text{ SM}^3 / \text{Day}$ approx.
Gas consumption per ton of product: $(488 \text{ SM}^3 / 3240 \text{ Kg})$
 $= 150 \text{ SM}^3 / \text{MT}$

Benefits

Environmental

Before CP:

	<ul style="list-style-type: none"> Per Day Consumption of fuel: 545.984 SM³/Day <p>After CP:</p> <ul style="list-style-type: none"> Per Day Consumption of fuel: 488.371 SM³/Day Reduction in fuel consumption: = (545.984 – 488.371)= 57.61 SM³/Day = 20739.72 SM³/Year = Reduction in Green House Gas Emission = 43385 Kg CO₂. Percentage reduction of fuel consumption: 10.55% 	
Economical	<p style="text-align: center;">Before CP</p> <ul style="list-style-type: none"> Fuel expense per day = (Rs. 40/SM³) * (545.984) = Rs. 21,839/Day 	<p style="text-align: center;">After CP</p> <ul style="list-style-type: none"> Fuel expense per day = (Rs. 40/SM³) * (488.371) = Rs. 19,534/Day Savings of Rs. 2,305/Day Rs. 69,150/Month
	<ul style="list-style-type: none"> Average Productivity per day: 2160 Kg 	<ul style="list-style-type: none"> Average Productivity per day: 3240 Kg Increase in productivity: 1080 Kg/Day % increase in productivity: 50%
	<p style="text-align: center;">Total Investment: Rs. 14,70,000/- (One time) Total Savings: Rs. 8,29,800/- Per Annum Payback Period: 21 Months</p>	