

Case Study – 4	Table ware Industry: Modification in kiln car furniture by modifying the shape of cups and saucers holding shelves (Fuel: Natural Gas)
Implementing the technology	<ul style="list-style-type: none"> • The kiln used at the cup – saucers manufacturing industry is a tunnel kiln, made up of ceramic fibre walls. • Product Capacity: 2952 Kg/day. • Average fuel consumption: 890 SM³/day (301 SM³/ton product) • Car capacity of kiln: 24 Cars per day • Kiln Car Dimensions: (1700 * 1000 * 800) mm (67" * 39" * 31.5") • Kiln Length: 40.8 m (1606.3") <p style="text-align: center;">Before Cleaner Production:</p> <p>The industry has been using round shape cranks with three legs made up of solid cordierite material having diameter 5.5 inches for holding the saucers while firing in biscuit kiln. The crank is shown.</p> <div style="display: flex; justify-content: space-around;">  </div> <div style="text-align: center; margin: 10px 0;">  </div> <ul style="list-style-type: none"> • No. of cranks per car: 792 Pieces per car • Weight of each crank: 0.218 Kg (218 gm) • Total weight of cranks per car: 173 Kg

- Total weight of cranks on 24 cars: 4152 Kg

Also, the industry uses Box type sagger to hold the cups, made up of solid cordierite material having dimensions:

(11" * 11" * 3.74") and weight 3 Kg.

- No. of box sagger per car: 48 Pieces per car
- Weight of each box sagger: 3 Kg
- Total weight of box sagger per car: 144 Kg
- Total weight of box sagger on 24 cars: 3456 Kg

This way, the total weight of the structure per car becomes:

(173 + 144) = 317 Kg. Adding to that, 123 Kg of product loaded per car, thus making total weight loaded on a car: 440 Kg

After Cleaner Production:

It is suggested to replace the entire saucer holding cranks with small size stilts made up of high alumina. The diameter of the stilts being 2.36 inches (60 mm) and height being 0.6 inch (15 mm) and weight being 15 gm only. The image of the stilt is shown here.



With this structure, the cumulative height of the stilt and saucer becomes 0.88 inch (25 mm), allowing 12 more saucers to be placed on a single stack. (432 saucers per car)

- No. of stilts per car: 792 + 432 = 1161 Pieces of stilts per car
- Weight of each stilt: 0.015 Kg (15 gm)

Benefits	<ul style="list-style-type: none"> • Total weight of stilts per car: 17.5 Kg • Total weight of stilts on 24 cars: 418 Kg <p>Also, there is a scope of reducing weight of the cup holding box sappers by drilling 1 inch diameter holes in the bottom of all sappers, thereby reducing almost 20% of the total weight. The additional advantage would be improvised firing of cups. Hence, considering 20% reduction in weight of box sappers,</p> <ul style="list-style-type: none"> • No. of box sappers per car: 48 Pieces per car • Weight of each box sapper: 2.4 Kg • Total weight of box sappers per car: 115.2 Kg • Total weight of box sappers on 24 cars: 2765 Kg <p>This way, the total weight of the structure per car becomes: (115.2 + 17.5) = 132.7 Kg. Adding to that, 160 Kg of product loaded per car, thus making total weight loaded on a car: 292 Kg</p> <p>This whole structure will reduce (440 – 292) = 148 Kg of weight per car, with an increased productivity due to addition of more space on the top of car.</p> <p>Reduction in the weight of car = 148 Kg % Reduction in the weight of a car = 33.6%</p>
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Environmental	Before CP: <ul style="list-style-type: none"> • Per Day Consumption of fuel: 890 SM³/Day After CP: <ul style="list-style-type: none"> • Reduction in fuel consumption: 33.6% • Per Day Consumption of fuel: 590 SM³/Day • Per Day savings of fuel: (890 – 590) = 300 SM³/Day • Annual savings of fuel: 1,08,000 SM³/Day • Reduction in Green House Gas Emission = 202 MT CO₂. 	
Economical	Before CP <ul style="list-style-type: none"> • Fuel expense per day = (Rs. 28/SM³) * (890) = Rs. 24,920/Day 	After CP <ul style="list-style-type: none"> • Fuel expense per day = (Rs. 28/SM³) * (590) = Rs. 16,520/Day • Savings: Rs. 8,400/Day

	Rs. 30,24,000 per annum
	Total Investment: Rs. 2,40,000/- (For purchasing stilts for 24 cars)
	Total Savings: Rs. 30,24,000/- Per Annum
	Payback Period: 1 Month