



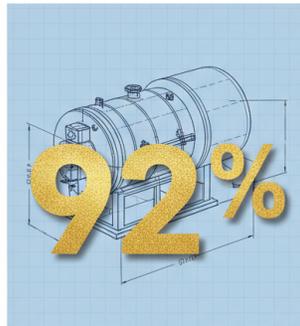
**SEACPL**

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## Steam Insight Series | Week 1

### Why 92% Efficiency on Paper in Gas/Oil-Fired Boilers Often Means 82% in Reality

**92 % EFFICIENCY ON PAPER. 82 % IN REALITY.**



Ideal test vs. field operation – where does the missing 10 % go?

SEACPL × CHEEMA BOLLERS — ENGINEERING PARTNERSHIPS THAT POWER INDUSTRY

Most gas/oil-fired boilers advertise an impressive 92% efficiency on paper — yet real-world readings in operating plants often hover between 82–85%. That 7–10% gap, invisible in spreadsheets, directly translates to higher fuel bills and lower plant performance.



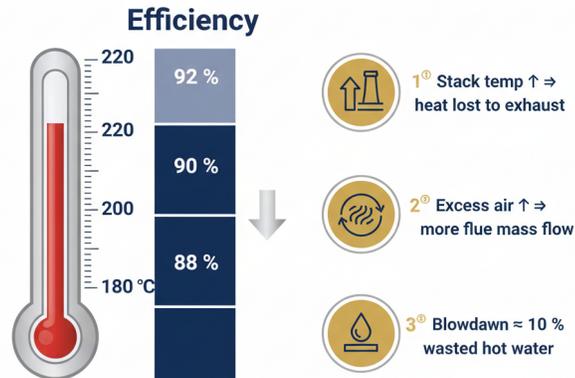
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## EACH 20 °C RISE IN STACK TEMPERATURE = ~1 % FUEL LOSS



**SMALL DEVIATIONS... LARGE FUEL BILLS.**

SEACPL x CHEEMA BOILERS — ENGINEERING PARTNERSHIPS THAT POWER INDUSTRY

### 1. Why the Gap Exists

Manufacturers test under ideal conditions: clean tubes, 3% O<sub>2</sub>, 180°C stack temperature, steady full load, and 2% blowdown.

But field realities differ — leading to measurable losses.

### 2. Quantified Loss Mechanisms

- Stack Temperature: Every 20°C rise = ~1% fuel loss (e.g., 180°C → 220°C = -2%).
- Excess Air Drift: Each +1% O<sub>2</sub> increases flue losses by ~0.5%; +3% = -1.5%.
- Blowdown: At 300 ppm feedwater and 3000 ppm boiler water, blowdown ≈ 10–11%. Each 1% blowdown ≈ 0.25% efficiency loss → total -2.5%.
- Cycling & Part Load: Adds -1–2% annualized loss.

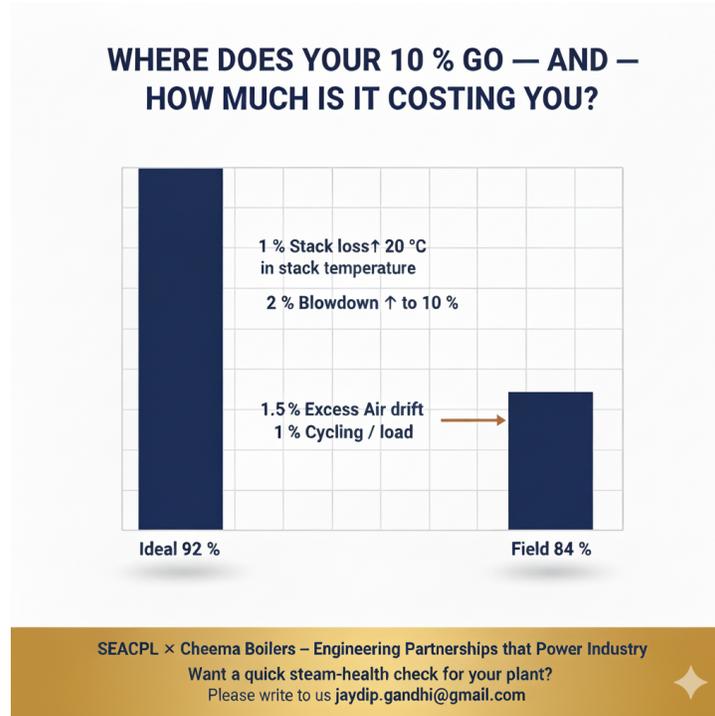


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### 3 Net Result

92% (Test) – 2% (Stack) – 1.5% (O<sub>2</sub> Drift) – 2.5% (Blowdown) – 1.5% (Cycling) =  $\approx$  84.5% Actual.

### 4 What It Means Financially

In a 10 TPH boiler consuming  $\sim$ 2,200 Sm<sup>3</sup>/hr of natural gas at ₹3.5/m<sup>3</sup>, a 7% efficiency gap adds nearly ₹5.0–5.5 lakh/month in wasted fuel cost. Over a year, this equals the cost of an economizer or automation system.



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## 5 How to Close the Gap

- ✓ Quarterly flue-gas analysis (O<sub>2</sub> and stack temperature).
- ✓ Automatic TDS control & blowdown heat recovery.
- ✓ Burner tuning & O<sub>2</sub>-trim system.
- ✓ Improve condensate return and insulation.
- ✓ Modulating or sequencing control to reduce cycling.

## Appendix A — Key Assumptions and Efficiency Rules

### Assumptions — Test vs Field Conditions:

- Test sheet basis (typical): clean tubes, ~3% O<sub>2</sub>, ~180°C stack, ~2% blowdown, steady full load.
- Field deviations observed: O<sub>2</sub> 5–7%, stack 200–230°C, blowdown 8–12%, variable load.

### Rule of Thumb — Quick Reference:

- Stack temperature: every +20°C ≈ -1% efficiency
- O<sub>2</sub> drift: each +1% O<sub>2</sub> ≈ -0.5%
- Blowdown: each +1% BD ≈ -0.25% (if unrecovered)
- Cycling/part-load: -1-2% annualized

👉 *Click the link below or scan the QR code to access the checklist:*



<https://drive.google.com/file/d/18Tb--z0cN6MgeBqvcFU3SB2Kbp7hZ6C1/view?usp=sharing>

SEACPL × Cheema Boilers Limited — Engineering Partnerships that Power Industry.



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