# OPTIMIZING PROFIT THROUGH OPTIMAL STEAM PLANT PERFORMANCE

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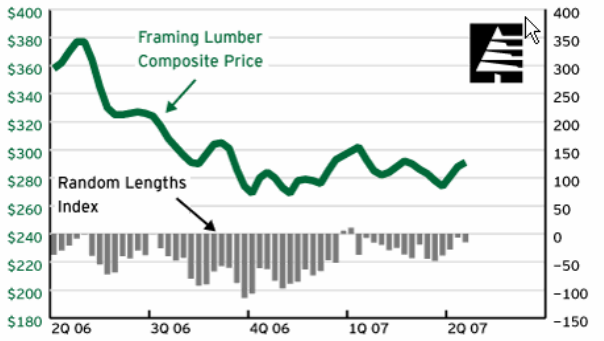
**The Good Old Days**

Lots of wood, lots of water, little regulation, and less competition.

**Today**

*Potlatch reports reduced earnings*- Potlatch Corporation reported earnings of 5.4 million, or 14 cents per diluted common share, for the first quarter of 2007. The company's earnings reached $69.3 million, or $2.33 per diluted common share, in the first quarter of 2006 (4/26/2007).



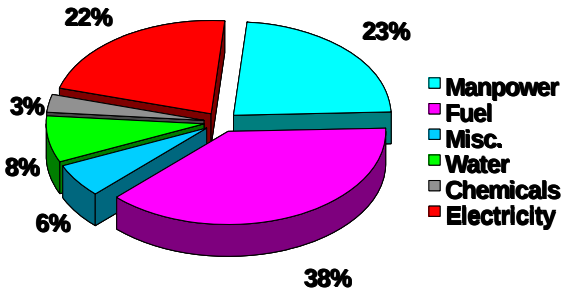

*Temple-Inland's first quarter earnings fall 52%* - Temple-Inland Inc., reported first quarter 2007 net income of $38 million, or 35 cents per diluted share, a 52% reduction when compared with first-quarter 2006 net income of $79 million, or 70 cents per diluted share (4/25/07).

*LP posts first-quarter loss, blames construction downturn* - Louisiana Pacific Corporation reported a first quarter net loss of $37 million, or 36 cents per diluted share, on sales of 406 million. In the first quarter of 2006, LP's net income was $84 million, or 79 cents per diluted share, on sales of $678 million. Company officials cited the downturn in new residential construction as a key factor in the 2007 first-quarter results.

**What Factors are Leading to these Trends?**

- Shrinking wood basket
  More competition = rising cost
- Less water
- Intense regulation
  Forest stewardship
  Environmental
  Water discharge
  Reuse
- Alternate markets and applications
- Truly is survival of the fittest
- In order to survive we must: know more, do more, make timely decisions, reduce the total cost of operations (TCO).

**Reducing Total Cost of Operation (TCO)**




**Potential to Increase Steam System Efficiency**

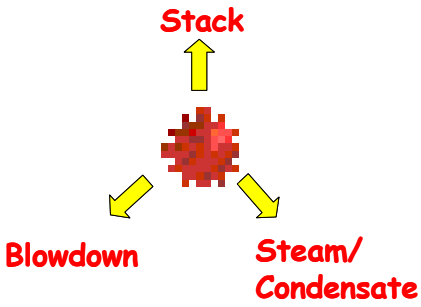
| | |
|---|---|
| **Boilers** | **2%** |
| Boiler tune-ups | 1-2% |
| Heat recovery equip | 2-4% |
| Emissions monitoring | 1-2% |
| **Operation and Maintenance** | **20%** |
| Water treatment | 10-12% |
| Condensate return | 5-10% |
| Load controls | 3-5% |
| **Distribution System** | **10-15%** |
| Steam leaks | 3-5% |
| Steam traps | 10-15% |
| Insulation | 5-10% |
| **Total** | **30-40%** |

**What Do We Need to Do?**

Johnny D always says: "you can't control what you can't or don't measure."

Do you know the following?

Your water quality?
Your cost to produce steam?
The value of your condensate?
Plant mass balance?




# Energy Tips


Steam


Motors


Compressed Air

### Monitor Flue Gas Temperature

An indirect indicator of scale or deposit formation is flue gas temperature. If the flue gas temperature rises (with boiler load and excess air held constant), the effect is possibly due to the presence of scale.

### Perform Visual Inspections

Visually inspect boiler tubes when the unit is shut down for maintenance. Scale removal can be achieved by mechanical means, or acid cleaning. If scale is present, consult with your local water treatment specialist and consider modifying your feedwater treatment or chemical additives schedule.

## Clean Boiler Water-side Heat Transfer Surfaces

Even on small boilers, the prevention of scale formation can produce substantial energy savings. Scale deposits occur when calcium, magnesium, and silica, commonly found in most water supplies, react to form a continuous layer of material on the waterside of the boiler heat exchange tubes.

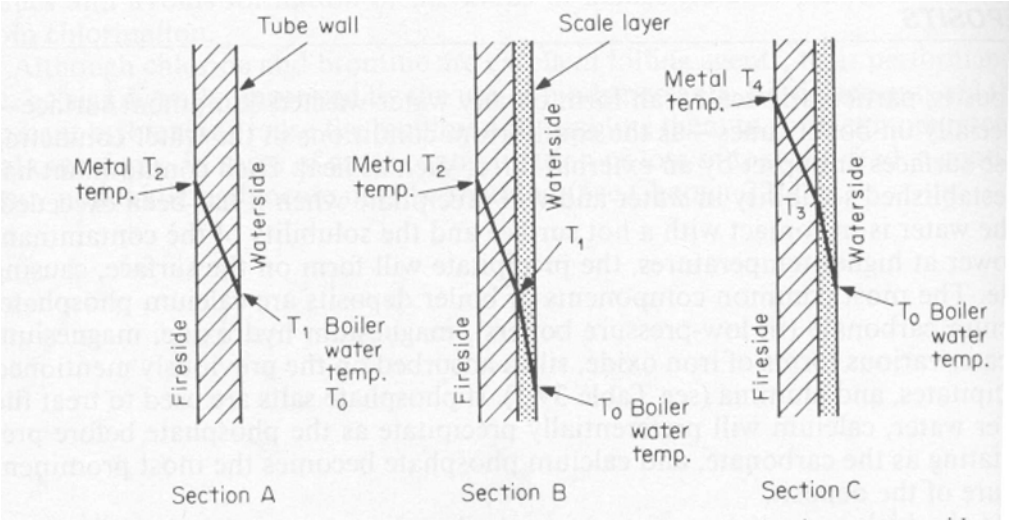
Scale creates a problem because it typically possesses a thermal conductivity an order of magnitude less than the corresponding value for bare steel. Even thin layers of scale serve as an effective insulator and retard heat transfer. The result is overheating of boiler tube metal, tube failures, and loss of energy efficiency. Fuel wastage due to boiler scale may be 2% for water-tube boilers and up to 5% in fire-tube boilers. Energy losses as a function of scale thickness and composition are given in the table below.

**Energy Loss Due to Scale Deposits***

| Scale Thickness, inches | Fuel Loss, % of Total Use | | |
|---|---|---|---|
| | Scale Type | | |
| | "Normal" | High Iron | Iron plus Silica |
| 1/64 | 1.0 | 1.6 | 3.5 |
| 1/32 | 2.0 | 3.1 | 7.0 |
| 3/64 | 3.0 | 4.7 | – |
| 1/16 | 3.9 | 6.2 | – |

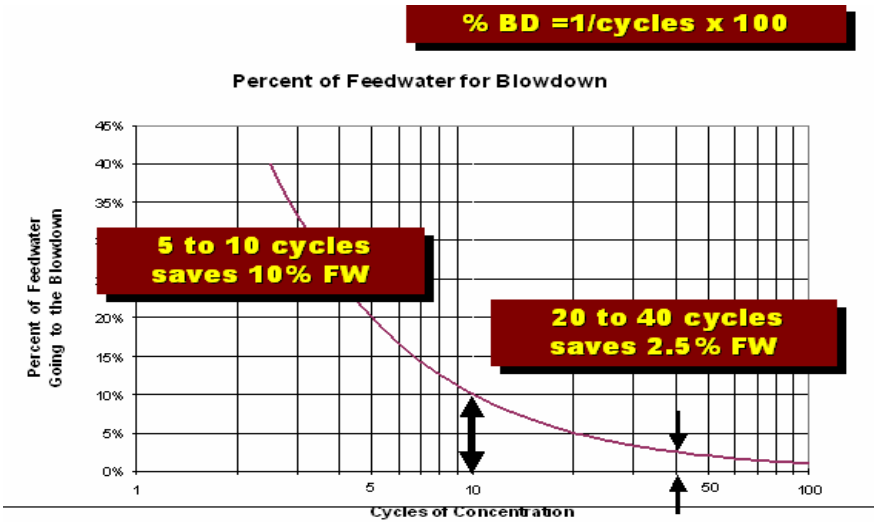
Note: "Normal" scale is usually encountered in low-pressure applications. The high iron and iron plus silica scale composition results from high-pressure service conditions.
*Extracted from National Institute of Standards and Technology, Handbook 115, Supplement 1.

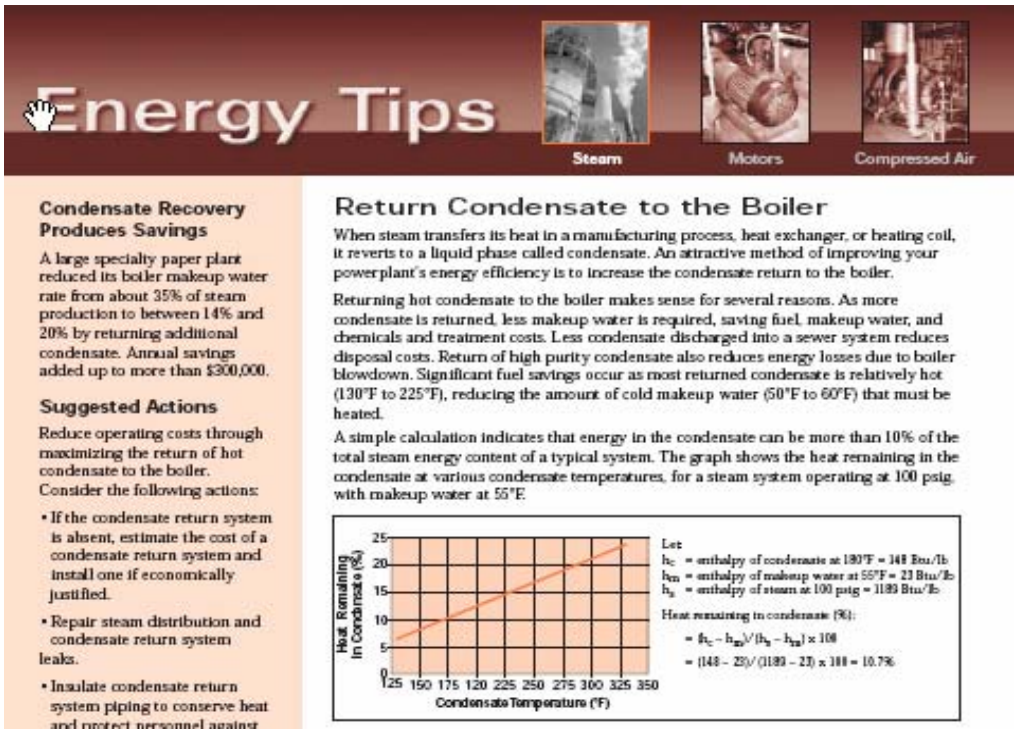
A scale layer reduces your heat transfer efficiency.




| Deposit thickness | Efficiency reduction |
|---|---|
| 0.0199 cm | 2 - 4% |
| 0.0397 cm | 4 - 6% |
| 0.0794 cm | 6 - 9% |
| 0.159 cm | 9 - 12% |
| 0.3175 cm | 12- 16% |
| 0.476 cm | 16 - 20% |
| 0.636 cm | 20 - 25% |
| 0.794 cm | 25 - 30% |
| 0.953 cm | 30 - 35% |
| 1.11 cm | 35 - 40% |
| 1.27 cm | 40 - 50% |

## Reduce Boiler Blowdown



**Typical Condensate Return**

| Industry | Typical % Return |
|---|---|
| Sugar | 100 + |
| Independent Power | 95-99 |
| Institutional | 80 + |
| Wood Processing | 75-90 |
| Corrugated Box Plant | 70-80 |
| Tire | 60-70 |
| Textiles | 50-60 |
| Canning | 50 |
| Grain Processing | 30 |

**How Do I Maximize Condensate Return**

- Good understanding of system
- Good maintenance (mechanically and chemically)
- Insulate as much as you can
- Good communication

**Where Do I Start?**

- Know your make up water quality
- Cost of water (make up and sewer)
- Cost of pumping
- Cost of pretreatment (salt chemical, etc.)
- Cost of fuel
- Boiler efficiency (75%)
- Blowdown rate
- Cost per mmlbs steam
- Define your goals, maximize boiler cleanliness
- Maximize boiler cycles of concentration: 50 cycles or 2%
- Maximize condensate return: >80% return
- Define your opportunities in terms the mill owner will understand

**Take-Aways**

- A clean boiler is an efficient boiler.
- Blowdown is big dollars–go get it!
- Use the pretreatment equipment that meets your needs.
- Survey and upgrade your condensate system.