

Energy Management

“The judicious and effective use of energy to maximize profits (minimize costs) and enhance competitive positions”

“The strategy of adjusting and optimizing energy, using systems and procedures so as to reduce energy requirements per unit of output while holding constant or reducing total costs of producing the output from these systems”

Energy Audit

As per the Energy Conservation Act, 2001, Energy Audit is defined as

“the verification, monitoring and analysis of use of energy including submission of technical report containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption “

Energy Conservation Tips

ELECTRICAL ENERGY

ELECTRIC MOTORS

- ⓐ For every 10°C increase in motor operating temperature over recommended peak, the motor life is estimated to be halved.
- ⓐ If rewinding is not done properly, the efficiency can be reduced by 5 - 8%.
- ⓐ Variable speed drive option can result in input energy consumption reduction by 5 - 15%. In some pump/fan applications saved energy could be as high as 35%.

ELECTRICAL ENERGY

PUMPS

Reducing the speed of a centrifugal pump by half would reduce the power consumption by 8 times

A reduction in 10% impeller diameter would reduce power consumption by 40 %

ELECTRICAL ENERGY

COMPRESSED AIR

- Every 5°C reduction in intake air temperature would result in 1% reduction in compressor power consumption.
- Compressed air leak from 1 mm hole size at 7 kg/cm² pressure would mean power loss equivalent to 4500 kWh per year.
- Reduction of 1 Kg/cm² air pressure (8 Kg/cm² to 7 Kg/cm²) would result in 9% input power savings .

ELECTRICAL ENERGY

REFRIGERATION

- Refrigeration capacity reduces by 6%, for every 3.5°C increase in condensing temperature.
- Reducing condensing temperature by 5.5°C, results in a 20 - 25% decrease in compressor power consumption.
- A reduction of 5.5°C in cooling water temperature at condenser inlet, reduces compressor power consumption by 3%.
- 1 mm scale build-up on condenser tubes can increase energy consumption by 40%.

ELECTRICAL ENERGY

LIGHTING

- ▣ Ensure proper illumination & efficacy (lumens / watt)
- ▣ Install photocells
- ▣ Use timers
- ▣ Retrofit occupancy sensor
- ▣ Use servo stabilizer in lighting circuit
- ▣ Replace High Pressure Mercury Vapor lamps with High Pressure Sodium Vapor lamps
- ▣ Replace conventional chokes with electronic chokes

Energy Conservation Tips

THERMAL ENERGY

⊕ BOILERS

- ⊕ 5% reduction in excess air increases boiler efficiency by 1% (or: 1% reduction of residual oxygen in stack gas increases boiler efficiency by 1%).
- ⊕ 22 °C reduction in flue gas temperature increases boiler efficiency by 1%.
- ⊕ 6°C raise in feed water temperature by economiser / condensate recovery corresponds to a 1% saving in fuel consumption, in boiler.
- ⊕ 20°C raise in pre-heated combustion air temperature by waste heat recovery results 1% fuel savings.

THERMAL ENERGY

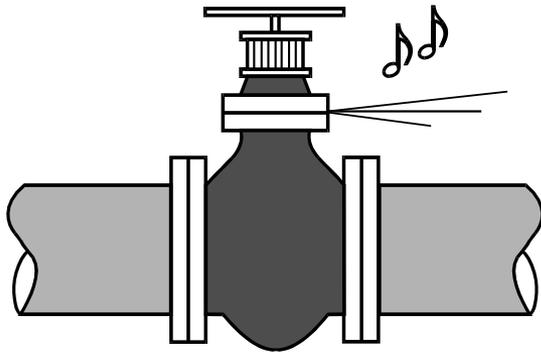
- A 3 mm diameter hole on a pipe line carrying 7 Kg/cm² steam would waste 32'650 litres of fuel oil per year.
- A 3 mm thick soot deposition on the heat transfer surface can cause an increase in fuel consumption to the tune of 2.5%.
- A 1 mm thick scale (deposit) on the water side could increase fuel consumption by 5 to 8%.

Steam Piping : Features

- A 100mm well lagged pipe of 30-meter length carrying steam at 7 Kg/cm² pressure can condense nearly 10 Kg. of water in the pipe in one hour unless it is removed from the pipe through traps.
- The pipes should run with a fall (slope) of not less than 12.5 mm per 3 meters in the direction of flow.
- Drain pockets should be provided at every 30 to 50 meters and at any low point in the pipe network.

Leaking Steam Pipe / Valve

Audible Leak

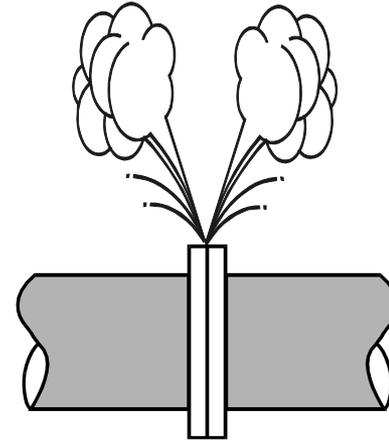


Weak whistling
Almost invisible steam jet

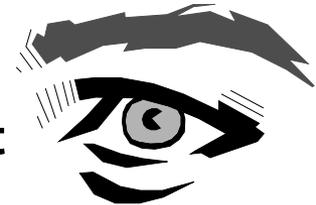


800 litre oil per year

Visible Leak

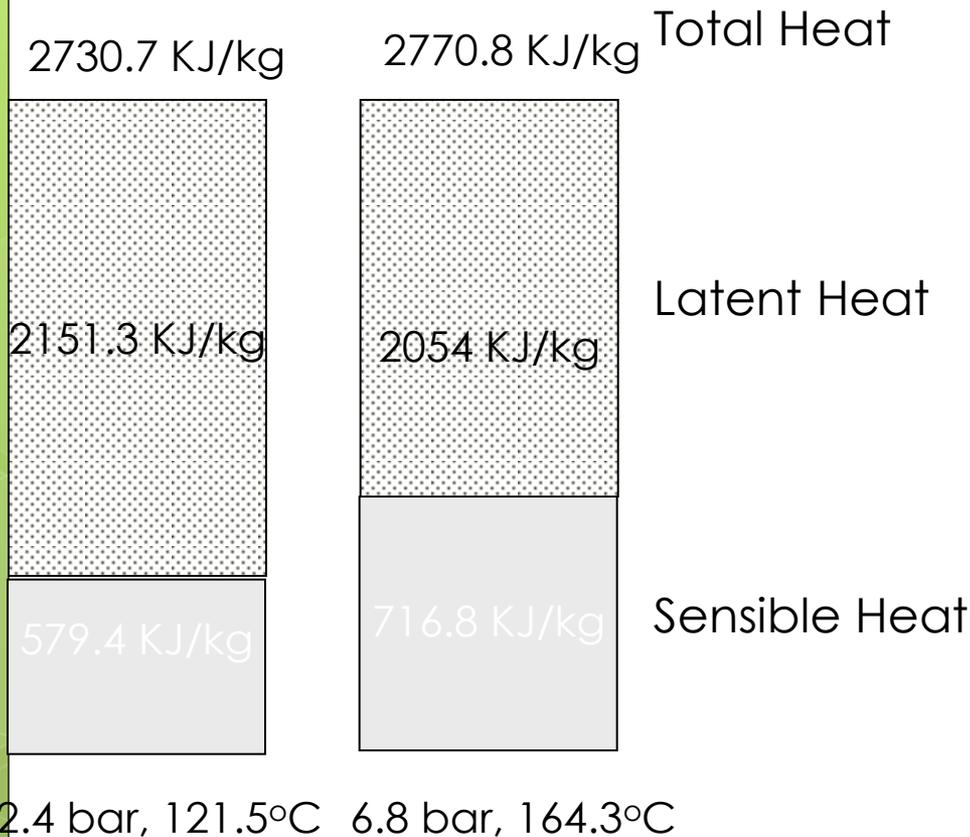


Weak hissing
Visible steam jet



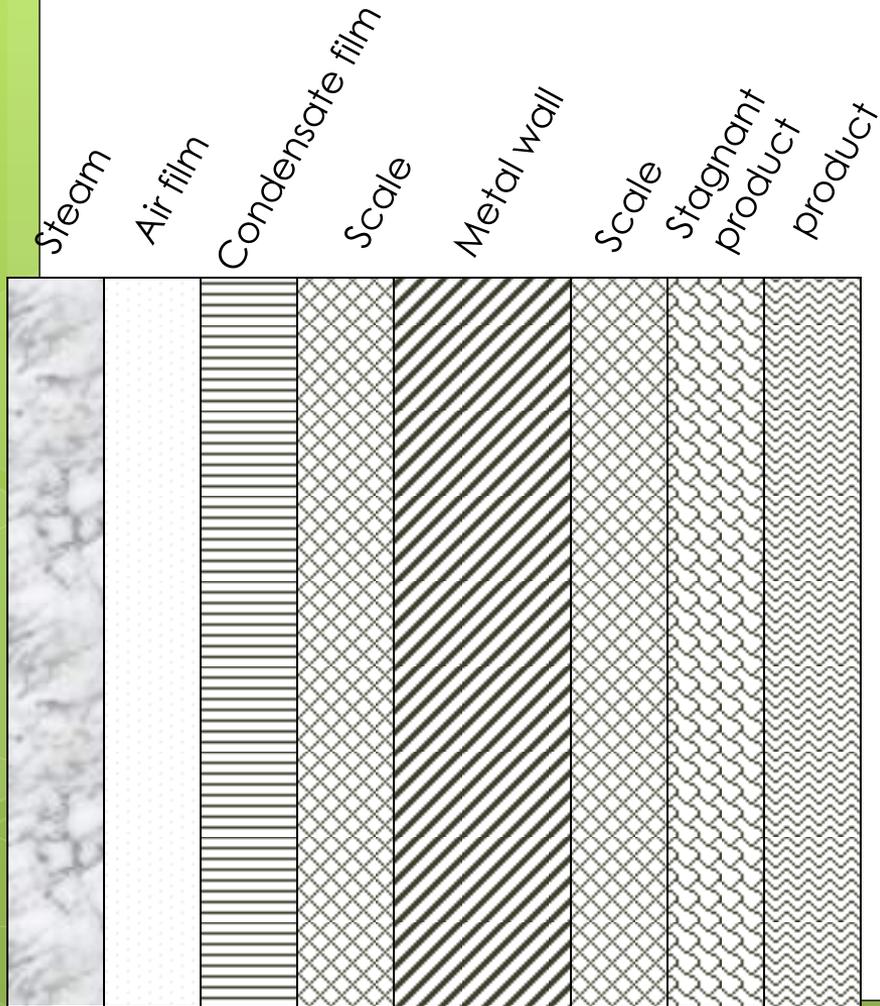
2,000 to 4,000 litre oil per year

Utilising steam at the lowest possible pressure



Steam should always be generated and distributed at the highest possible pressure but utilized at the lowest practicable pressure

Minimizing barriers to heat transfer



Resistance to heat transfer of water is 60 – 70 times more than steel and 500 – 600 times than copper

Resistance to heat transfer of Air is 1500 times more than steel and 19,000 times than copper

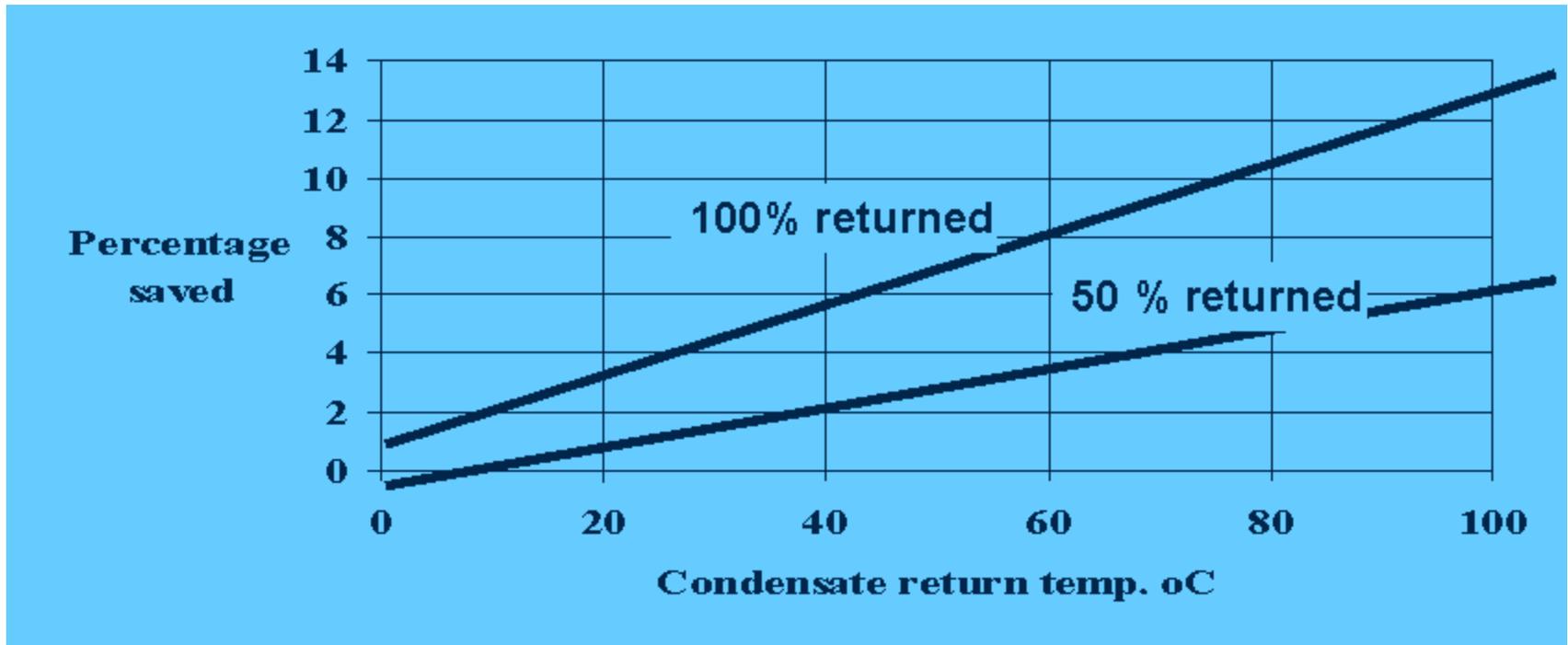
THERMAL INSULATION

Ⓢ The Insulation should be designed such that the skin temperature is not more than 20°C above the ambient temperature

A bare steam pipe of 150 mm diameter and 100 m length, carrying saturated steam at 8 kg/cm² would waste 25'000 litres furnace oil in a year.

Boiler Fuel Saving by Condensate Return

Saving in percent if condensate is returned to the boiler instead of draining



For every 6°C rise in boiler feed water temperature, there is a 1 % raise in boiler efficiency

Fuel and Energy Substitution

Fuel substitution

- Natural gas is increasingly the fuel of choice as fuel and feedstock in the fertilizer, petrochemicals, power and sponge iron industries.
- Replacement of coal by coconut shells, rice husk, etc
- Replacement of LDO by LSHS

Energy substitution

- Replacement of electric heaters by steam heaters
- Replacement of steam based hot water by solar systems