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Improving Refrigeration Efficiency

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DEFINITION OF ENERGY EFFICIENCY

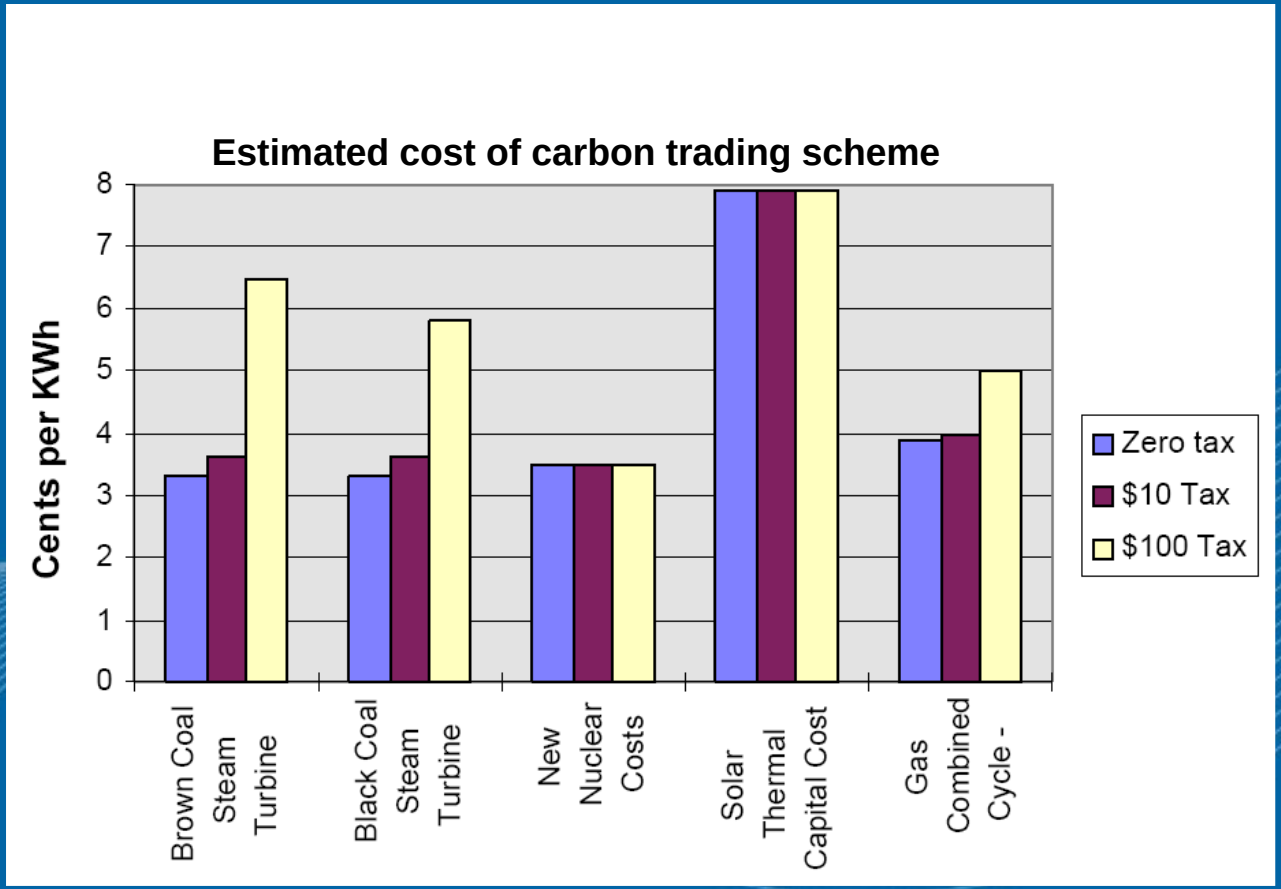
TO THE ENGINEER:

Efficiency η = Output / Input

TO THE ACCOUNTANT:

Efficiency encompasses all changes that result in decreasing the amount of energy use to produce one unit.

IMPORTANCE OF ENERGY EFFICIENCY



ENERGY USE WITHIN THE WINERY

Refrigeration accounts for 40 to 60 % of the total energy use

Refrigeration used to:

- Chill must
- Cold settle juice
- Control fermentation
- Storage
- Cold stabilize
- Air condition storage areas

IMPROVE EFFICIENCY BY

- REDUCING THE NEED, BY
  - Improving planning and processes
  - Good layout
  - Insulation
- IMPROVING EFFICIENCY OF EQUIPMENT, BY
  - Selection of equipment
  - Correct setpoints
  - Balance in the system
  - Maintenance and service
- SOME OTHER OPPORTUNITIES
  - Discharge heat exchanger
  - New CO2 systems
  - Co-generation and Absorption chillers

PLANNING AND PROCESSES

Minimize need through:

- Correct temperature range and cooling rate
- Grape intake
- Control of product flow through and waiting times
- Refrigeration temperatures adapted to process temperatures (Cold stabilizing in certain periods only)
- Better control of plant and tank farm
- Thermal storage
- Product to product heat exchange
- Make available energy use data

WINERY LAYOUT

Considerations are:

- Existing winery layout
- Refrigeration system capacity versus type of system
- Running costs
- Capital costs

INSULATION

- Maximum capacity available
- Insurance against failure of plant

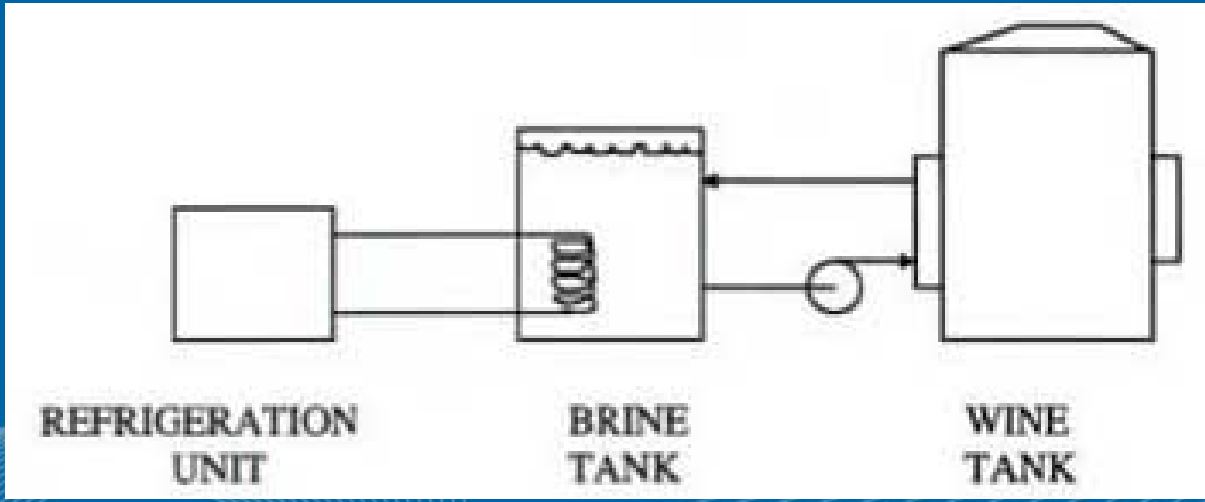
INSULATION OF:

- Cold pipework
- Tanks
- Tank doors
- Valves
- Plant heat exchangers
- Pumps

EQUIPMENT SELECTION

- Tank design
  - Horizontal or vertical dimple plate
  - Agitation
- Compressors
  - Multiple compressors
  - Screw or reciprocating
- Condensers
  - Type of condenser
  - Coil surface
  - Maintenance
- Exchangers
  - Large surface
  - Maintenance

BALANCE



SET POINTS

- Changes to set points only by authorized personnel
- Minimize temperature lift

  Every 1°C cuts energy by 2-4%
- Prevent short-cycling

MAINTENANCE AND SERVICE

- Regular maintenance program
- Simple tasks by winery personnel
- Complicated tasks by trained mechanic

OTHER OPPORTUNITIES

- Discharge heat exchanger
- Gas cooling in transcritical CO2 systems
- CO2 as secondary refrigerant
- Co-generation and absorption chillers

CONCLUSION

- Measure current use
- Reduce the need for refrigeration
- Improve your efficiency
- May-be look at other opportunities

Thank you for your attention.

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