

Energy Consumption Management for Parked Trains

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Introduction

- The size of the pie
- The Process
- Opportunities
 - Practical measures
 - Passive Measures
 - Active systems
- Conclusions
- Recommendations

Thank you!

- NSR, Arriva Trains Wales , SBB, NSB, Chiltern, OBB, RENFE – Operadora, VR, ZSSK Cargo, SNCB, Northern
- Jan Hoogakker, Catherine Tryon, Markus Halder, Diggory Waite, Dr Leopold Cecil, Juan Antonio Gil Vera, Vesa Stenvall, Peter Cervenka, Willy Bontinck, Joris Vanderstappen, Falco Mooren

Size of the Pie



- Parked train is a
 - Stabled train or
 - Waiting longer than 15 minutes at a station or
 - Sat in sidings idling
- Trainer Project identified
 - 10% of Energy consumed is by parked trains
 - 50% of this could be saved

Process

UIC Document
Process,

Power,

People

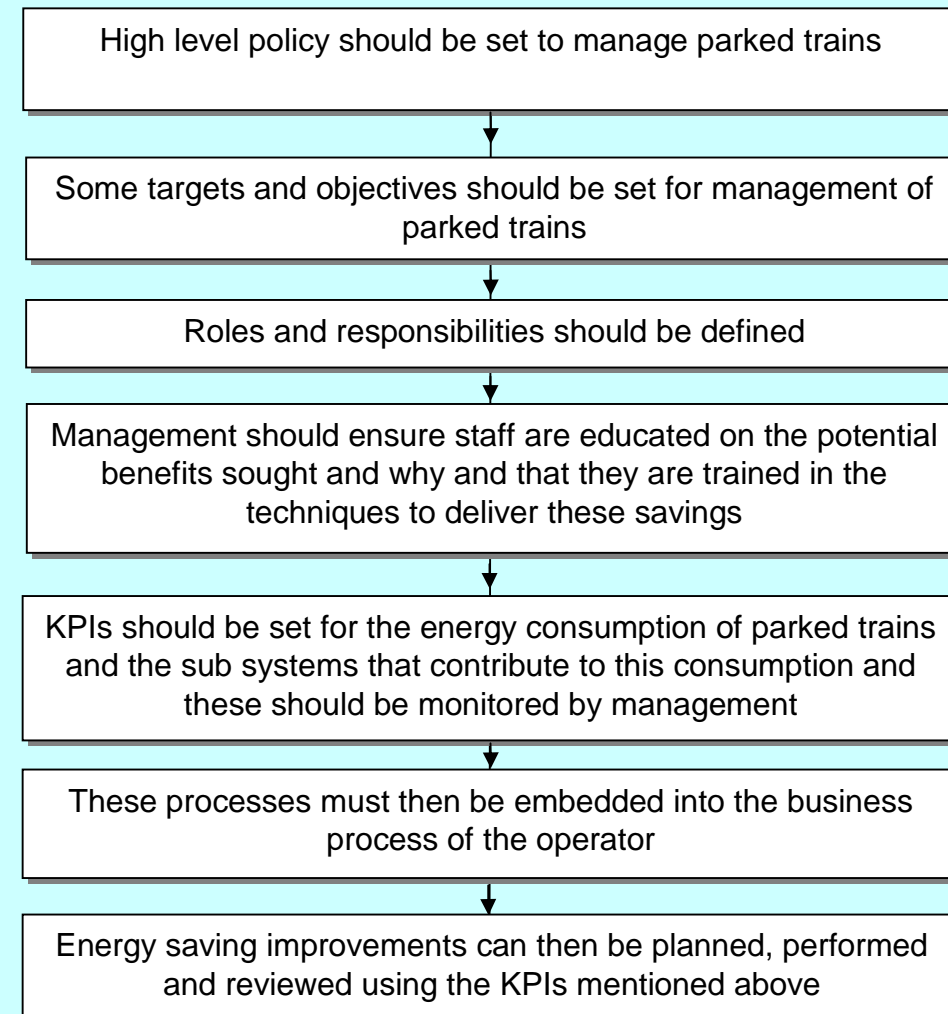


Figure 1. Process – Management Principles for Energy Efficiency: applied to parked trains. (Derived from Process Power People)

Opportunities

Practical Measures

Better Insulation

- Most vehicles contain this
- Some more than others
- Some train operators citing different U factors $\text{kW/m}^2\text{K}$
- Can be implemented during overhaul
- Ensure good seals on windows and doors

Est. saving 20% of HVAC energy consumption (parked or not)

Recommendation: UIC leaflet to specify U value for trains

<http://www.insulation-guide.com/save-with-insulation.html>



LED Lighting

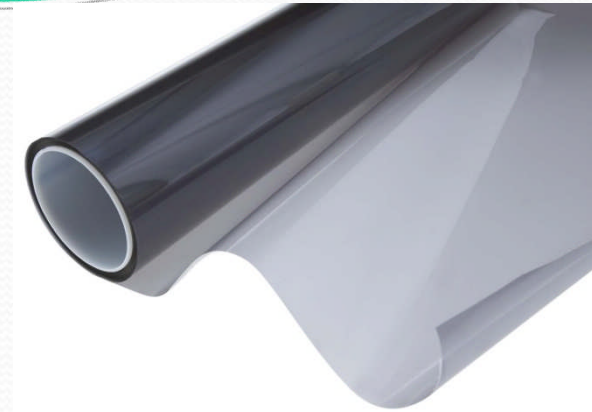
- 3-13Watts LED vs 75-100Watts Bulb
- Last up to ten times longer
- Can be dimmed
- Reduce heating load for HVAC to deal with



Not cost efficient as a one off fleet fitment but can be done 'fit on fail'

Window Films

- 3M claim 35% of heat can be reflected
- UV protection up to 99%
- Could be supplied with anti scratch properties
- Pendolinos fitted in the UK

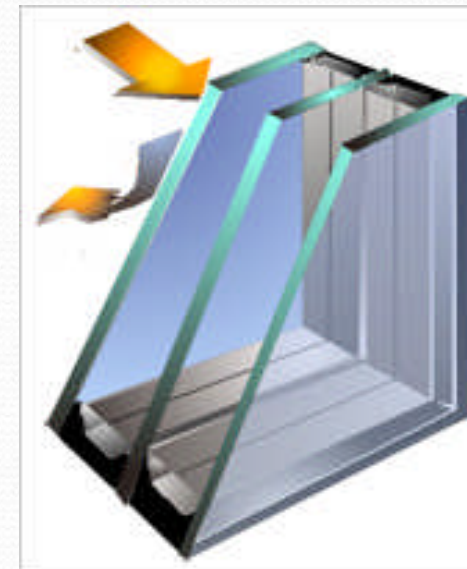


*Not cost efficient as a one off fleet fitment but
can be supplied pre fitted to the Glass pain 'fit on fail'*

Triple Glazing

- According to Thermotech insulates ~60% better

| Window | Insulating Value | Percentage Improvement |
|--|-------------------|------------------------|
| Existing double glazed casement Metal spacer, clear glass | R-2.0 (U 0.50) | -39% |
| Thermotech double glazed casement (211) 1 SuperSpacer™, 1 (low-e & argon) | R-3.3 (U 0.30) | - |
| Thermotech triple glazed casement (321) 2 SuperSpacer™, 1 (low-e & argon) | R-4.3 (U 0.23) | +39% |
| Thermotech triple glazed casement (322) 2 SuperSpacer™, 2 (low-e & argon) | R-5.3 (U 0.19) | +61% |



*Not cost efficient as a one off fleet fitment but
Can 'fit on fail'*

Varying HVAC Settings annually

- Higher interior temperature in Summer
- Lower interior temperature in Winter
- No figures but logical saving and easy to do
- Theory is people wear more clothes in Winter



**No
Chance!**

- and less in summer

Opportunities

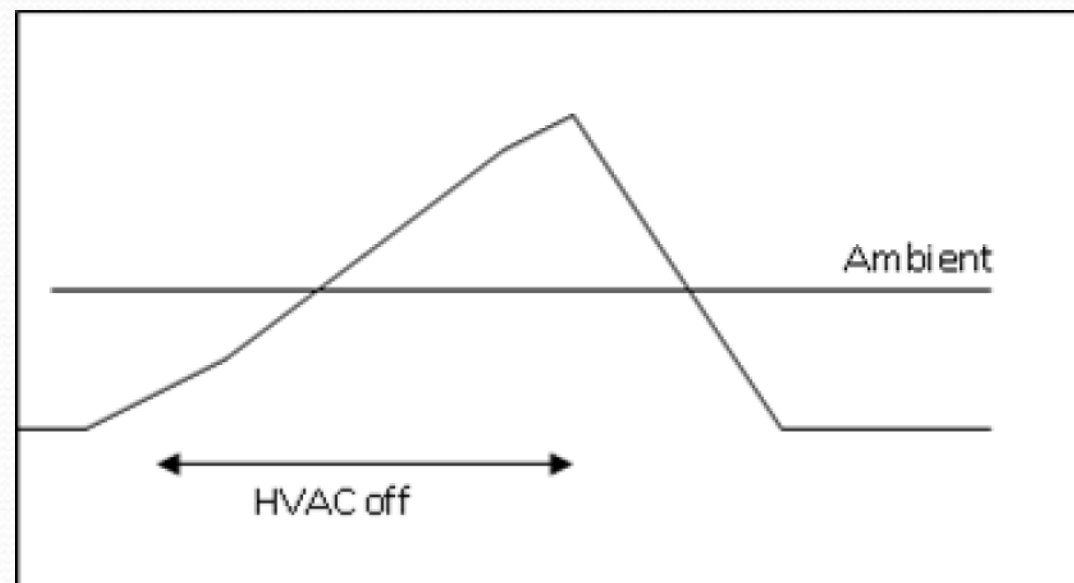
Passive

Closing Doors and Windows

- Windows and Doors



Manually Isolating HVAC

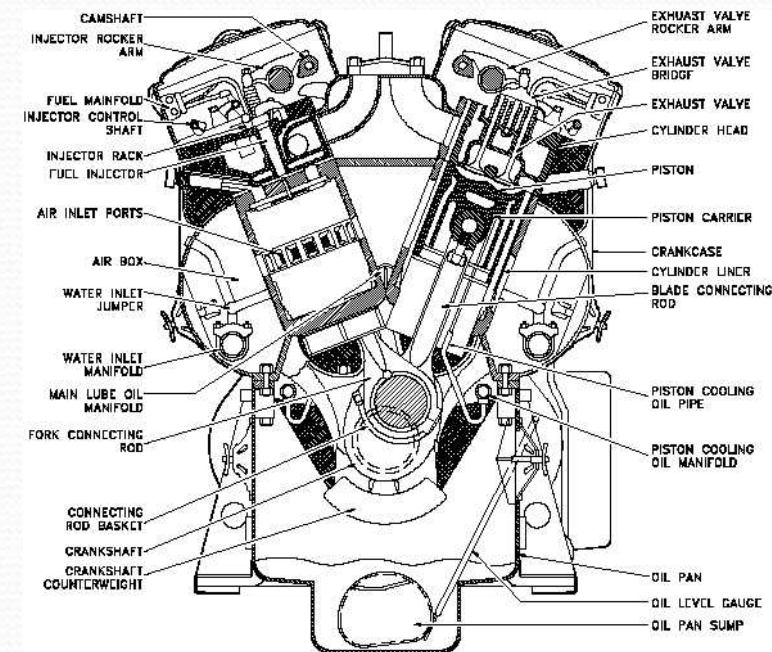


Turning HVAC off in high ambient conditions can create delays in achieve acceptable travelling conditions. Leaving the system running but aiming for a internal temperature similar to ambient when parked will minimise heat gain

- Savings based on type of HVAC equipment and duration of standby

Engine shutdown

- Test Cycle F reveals engines spend ~60% of their time idling
- Possible to reduce by switching off engines on parked trains
- Savings based on engine type and no of engines shut down



Opportunities

Active

Door Auto Close

*Recommendation: UIC
leaflet to specify U value
for trains*



Ancillary systems shutdown

- Can ancillary systems be shut down?

Recommendation: UIC leaflet to specify U value for trains



Auto stabling mode

- Able to remotely switch on HVAC, Lighting, etc
- Could be automated based on timetable
- Reliability/Availability benefits from knowing condition of train





Conclusions and Recommendations

Conclusions

- Energy Savings are possible
- At low cost and
- With additional benefits
- Some can be done now but
- Some are better done during overhaul or
- New train Procurement

Recommendations

- Operators to develop a high level policy using steps outlined in Process, Power, People
- Techniques shown today should be considered using this framework
- UIC to develop Insulation standards
- Clear instructions to staff on what equipment to manually isolate, When and How
- CEN to standardise Auto close
- Rail Sector to consider an EN specifying Auto Stable functionality into new trains



Thank you!

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