ENERGY EFFICIENCY IN SERVICING SECTOR

JIM CURLIN
UNEP OZONACTION

Tuesday, 5 November 2019 | 18:00 - 20:00 | Iran room
SIDE EVENT
SERVICING INDUSTRY IN AFRICA AND IN OTHER DEVELOPING COUNTRIES
CAPACITY BUILDING FOR ENHANCING ENERGY EFFICIENCY IN RAC EQUIPMENT

Training and Certification for Improving Efficiency through Periodical Inspections

Speaker:
Marco Buoni
Secretary General ATF-Associazione dei Tecnici del Freddo
Assessments made by the International Energy Agency forecast that the number of air conditioners in use globally will increase from 1.5 billion to 5.5 billion units between 2015 and 2050 (figure 1). Meanwhile, the number of domestic refrigerators would double to more than 2 billion.

Figure 1: Project growth of global air conditioner stock between 2015 and 2050 (Source: IEA)
Many of the available energy efficiency improvements create positive financial returns for the end user. The cost of energy dominates the lifecycle cost of most RACHP equipment, as illustrated in figure 416. Over the life of the equipment, the cost of energy can be around five times the original capital cost. End users can accrue significant financial return over the lifetime of their equipment by opting for more energy efficient alternatives. Figure 4: Example RACHP lifecycle costs
OEWG 40 – presession on Energy Efficiency in RAC (3)
Energy Efficiency measures in EU (some of the..)

Systems and buildings we have several measures at EU level

• Meps (Minimum Energy performance standards)
  – Energy Labelling
  – Ecodesign

• Maintenance
  – EPBD
  – Fgas regulation
• Recital (26) of the EBPD 2010 sets out that regular maintenance and inspection is needed to ensure maintained optimal performance of heating and air-conditioning systems. Missing inspection and maintenance leads to significant system deterioration and unnecessary energy use.

• Inspections ensure buildings & products deliver on their energy savings According to a number of can generate energy savings in buildings, ranging from 20% to more. These can also significantly contribute to improving the health-related benefits of good air quality in buildings.

Source: EPEE, EPBD Implementation Guidelines
Financial, energetic, environmental, safety & reliability: Alternative Refrigerants & Leakage

- From

<table>
<thead>
<tr>
<th>Type of Equipment</th>
<th>Typical Range in Charge Capacity (kg)</th>
<th>Installation Emission Factor (% of initial charge)</th>
<th>Operating Emissions (% of initial charge/ year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Refrigeration</td>
<td>0.05 - 0.5</td>
<td>0.2 - 1.0</td>
<td>0.1 - 0.5</td>
</tr>
<tr>
<td>Stand-alone Commercial Applications</td>
<td>0.2 - 6</td>
<td>0.5 - 3</td>
<td>1 - 15</td>
</tr>
<tr>
<td>Medium &amp; Large Commercial Applications</td>
<td>50 - 2,000</td>
<td>0.5 - 3</td>
<td>10 - 35</td>
</tr>
<tr>
<td>Transport Refrigeration</td>
<td>3 - 8</td>
<td>0.2 - 1</td>
<td>15 - 50</td>
</tr>
<tr>
<td>Industrial Refrigeration (inc. food processing and cold storage)</td>
<td>10 - 10,000</td>
<td>0.5 - 3</td>
<td>7 - 25</td>
</tr>
<tr>
<td>Chillers</td>
<td>10 - 2,000</td>
<td>0.2 - 1</td>
<td>2 - 15</td>
</tr>
<tr>
<td>Residential and Commercial A/C including Heat Pumps</td>
<td>0.5 - 100</td>
<td>0.2 - 1</td>
<td>1 - 10</td>
</tr>
<tr>
<td>Mobile Air Conditioning</td>
<td>0.5 - 1.5</td>
<td>0.2 - 0.5</td>
<td>10 - 20</td>
</tr>
</tbody>
</table>

Source: IPCC (2006), Guidelines for National Greenhouse Gas Inventories

- To Stek (NL) report a leakage rate now to be as low as 4-5 %
Financial and Energetic Costs

Cost of a Refrigerant leak

- Consequential losses
- Additional energy costs
- Repair cost
- Refrigerant loss

Operator's business is now affected

Time:
- Leak Starts
- Buffer of refrigerant is used, efficiency tails off
- System can no longer support cooling load

Costs (£):

1  2  3  4  5  6  7  8  9  10
To increase energy efficiency and safety -- Training and certification

The Refrigeration, Air Conditioning and Heat Pumps systems containing fluorinated refrigerants in EU should have:
- Logbook
- Periodical inspections
- Installation, repair only by certified craftsmen
- Right equipment (also suitable for alternative refrigerants)
2 assessment methods

Theoretical

Practical
## Structure

13 activities

### Table A.5 — Fluids

<table>
<thead>
<tr>
<th>Fluids</th>
<th>Design</th>
<th>Pre-assembling</th>
<th>Installation</th>
<th>Putting into Operation</th>
<th>Commissioning</th>
<th>Operating</th>
<th>In-service Inspection</th>
<th>Leakage checking</th>
<th>General Maintenance</th>
<th>Circuit Maintenance</th>
<th>Decommissioning</th>
<th>Removing Refrigerant</th>
<th>Dismantling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.8</td>
<td>3.9</td>
<td>3.10</td>
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<td>3.16</td>
<td>3.17</td>
<td>3.18</td>
<td>3.19</td>
<td>3.20</td>
</tr>
</tbody>
</table>

### Skills to assess

- Refrigerant behaviour
- Coolant, secondary loop fluid
- Toxicity
- Flammability
- Fractionation

Each cell = level of expertise
- White = theoretical assessment
- Grey = practical assessment
- Black = not applicable
Reduction of leakage due to increase in competence and EU Fgas regulation

Reducing leakage makes business, financial and environmental sense. The benefits to business include:

- Compliance with legislation including the F Gas regulation;
- Improved “green” credentials;
- Reduced production down time / increased sales fixture availability / improved staff comfort as a result of improved reliability;
- Less health and safety risk from refrigeration or air conditioning – directly from refrigerant emissions and, for food applications, indirectly as a result of improved reliability.

In addition there are financial benefits:

- Less refrigerant cost;
- Less service cost;
- Lower costs associated with plant down time;
- No loss of energy efficiency associated with reduced refrigerant charge. These costs may need to be offset against increased maintenance or some additional capital expenditure, but usually the difference is positive.

The environmental benefits are in parallel with the benefits identified above and include:

- More efficient operation of RAC systems and hence lower emissions of CO2 at the power station;
- Lower emissions of greenhouse gases.
Training and certification worldwide

• Together with the UN implementing agencies UNEP, UNIDO, UNDP over the past few years AREA has been deeply involved in helping developing countries through training RSS technicians to install, repair, maintain and design RAC systems and numerous Certification Sessions in Africa and Asia.

• Pics from top: Rwanda, Former Soviet Unit Rep, Benin, Gambia, and also Ghana, Tunisia, Eritrea, Montenegro, Saudi Arabia, Turkey… etc…).
Assessing training centers in article 5 countries

- Gambia
- Rwanda
- Kuwait, Bahrain, Qatar
- Maldives
- Grenada (Caribbean) …

→ Good equipment,
→ Propose a package, tools, training and certification (pushing for including in the legislation) to make it sustainable
• If we want things to remain as they are, things will have to change (From the book «The leopard» il Gattopardo di Giuseppe Tomasi di Lampedusa in Sicily)
Thank You!

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