UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

International Copper Association
Copper Alliance

REFRIGERATION

Good refrigeration practice involves proper and environmentally responsible servicing and maintenance and proper disposal of the components. This results in financial and environmental benefits. Financial benefits include reduced servicing cost, energy savings, shorter payback period and durability whereas environmental benefits include reducing direct and indirect emissions which cause ozone depletion and/or global warming.

According to the 2016/17 Uganda National Household Survey, there was a 54% increase in the number of households with refrigerators. The financial and environmental impacts of the cooling sector in Uganda are not fully characterised. The environmental impacts are mainly due to direct and indirect emissions. Direct emissions include refrigerant leakage during manufacturing, while in operation, servicing and emissions during disposal whereas indirect emissions related to energy consumption over the lifetime of the refrigeration equipment. HCFCs and HFCs are the commonly used refrigerants but have high ozone depleting potential and global warming potential.

The Montreal Protocol stipulates phasing out of HCFCs by 2030 and phasing down HFC by 2045 for article 5 countries. In Uganda, only one institution (Kyambogo University) and four regional technical institutions offer refrigeration courses at diploma and certificate level respectively. This means that few technicians have got proper training in handling of refrigeration technologies. During the phase 1 of the HCFC phase out management plan implemented by UNIDO between 2013 and 2020, UNIDO provided equipment and training to trainers of technicians in four regional technical institutions on good refrigeration practices to prepare them for the conversion to alternative climate-friendly refrigeration technologies.

In addition, the Kigali Cooling efficiency program (K-CEP) was established as a philanthropic programme to support the Kigali amendment of the Montreal Protocol. The aim of K-CEP is to help increase the energy efficiency (EE) of cooling in developing countries while phasing down high GWP refrigerants. Under one of its projects of "Assessment of incremental capital and operating costs for improved energy efficiency (EE) in domestic, commercial and retail refrigeration" in five (5) countries including Uganda, cost guidelines for article 5 countries will be developed detailing the options for enhancing energy efficiency in new models, the impact of energy efficiency on production lines, incremental capital and operation costs, emission reduction and market barriers for energy efficient retail, commercial and domestic refrigerators.

Maintenance and servicing

Maintenance and servicing entails checking for refrigerant leakages, amount of refrigerant in the system, measuring of pressure and temperature, general handling and recycling of refrigerants as well as cleaning of the condenser to ensure that the refrigeration system is operating properly.

According to a survey carried out on 200 mini stores within Kampala, most end-users only service their refrigeration systems when need arises. However, company owned refrigerators are serviced regularly. In most cases, once the system is installed it is forgotten until something alarming happens.

Just like a car, a refrigeration system also requires regular maintenance to function well and save energy.

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design details of the product.

Refrigerant leakage:

All refrigeration systems have the potential to leak, because pressures in the system are usually much higher than atmospheric pressure. Refrigerant loss has been attributed to a range of factors for example:

- Gradual leakage through components over long periods of time before the leak is detected
- Catastrophic or physical damage resulting in large refrigerant losses over a short period of time
- Operation of pressure relief devices d) Small losses during routine maintenance, repair and/or recovery of refrigerant. Leakages commonly occur in pipe joints and seals/glands/cores. Refrigerant leakage results in financial and environmental impacts. Leakages affect the energy consumption of the refrigerator. A recent study at a local refrigerator manufacturer showed that for a system, if the refrigerant charge is reduced by 20% compared with the design charge, the energy consumption would be almost 70% higher compared with fully charged system.

Disposal

Additionally, proper disposa at the end life of a refrigeration system is equally as important. From the survey, it was discovered that most end users do not know what to do with their old refrigeration systems at their end life. Of the surveyed owners, 34% sell them for scrap while 24% retain them for storage.

When sold for scrap, the refrigerant is released into the atmosphere and the foam is burnt in open space which is damaging to the environment.

RECOMMENDATIONS

Having ratified the amendment to the Montreal Protocol, policy makers in Uganda might want to:

- Extend capacity building activities on best refrigeration practices to local on-the job trained technicians who have never attended any learning institutions. This is because most of the end users take their refrigeration systems to the local servicing workshops with uncertified technicians.

- Create ODS banks especially in urban areas which are highly populated. The aim of ODS banks management is to contain the gases and ultimately re-use or destroy the refrigerants. This can start with setting up an international registry of ODS/HFC banks under the Montreal Protocol and building reclamation and destruction facilities.

- Create awareness among end users about good refrigeration practices. Campaigns can be run through social media, short tv and radio commercials in local languages.

- Establish Minimum Energy Performance Standards (MEPS) for retail refrigeration and ensure routine monitoring and verification for compliance. Performance standards prescribe minimum efficiencies (or maximum energy consumption) that manufacturers must achieve in each product, specifying the energy performance but not the technology or design details of the product.

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