DEMONSTRATING THE FEASIBILITY OF R-290 BASED AC MANUFACTURING: CHINA'S MIDEA AND MEIZHI CASE

Introduction

China prepared, in cooperation with UNIDO, a demonstration project for the conversion of compressors and split air-conditioners manufacturing from R-22 to R-290, at two major players in this sector: Guangdong Meizhi Co. Ltd and Guangdong Midea Refrigeration Equipment Co. Ltd. The project was approved by the Executive Committee in July 2010.

The R-290 (propane) is considered to be an ideal alternative to the use of R-22 in the refrigeration and air-conditioning (RAC) sector since it is a natural refrigerant with a low global warming potential and with excellent cooling performance. However, due to its chemical and physical properties, in particular its flammability, the application of R-290 refrigerant requires design and structural modifications of the R-22-based products and production lines.

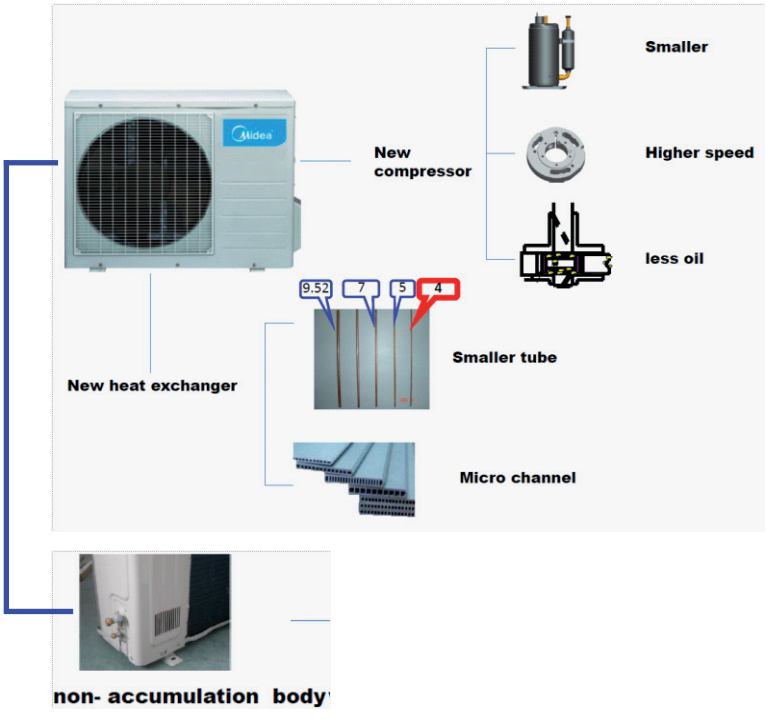
Description and challenges of the project

The project was designed so that the development of the new air-conditioning units and the new compressors could be done in parallel and in close cooperation between Midea and Meizhi, to ensure that an optimized system, based on R-290, is produced.

In the case of Meizhi, the selected production line has an annual production capacity of 1,830,000 rotary compressors that are applied in split air-conditioners of 1 hp and 1.5 hp. Regarding Midea, the converted production line is an advanced mechanized line with complete manufacturing functions, in which 200,000 split units are produced annually.

The main challenges in this project were related to the flammability of R-290, specifically for the implementation of safety measures in the production lines and new products, and their introduction in the Chinese market. Given these challenges, the project consisted of product redesign, procurement of necessary equipment and systems, modification of tools and parts, installation, debugging and trial of production lines, staff training, pilot production and performance testing of new products, as well as technology dissemination.

Concerning market introduction, the Chinese government has adopted in parallel safety standards and a market promotion subsidy scheme for using flammable refrigerants in the household, the industry and the servicing sector.



Picture 1: Components of new products

Successes and lessons learnt

After 30 months implementation, two types of R-290 compressors (fixed and variable speed) and two types of R-290 RAC units (split/VF and portable A/C) are available for mass production.

The new compressors manufactured by Meizhi will indirectly phase out 2,196 metric tons of R-22 with a total impact of 121 ODP tons per year, while Midea's new RAC appliances will allow the phase-out of 240 metric tons of this refrigerant, equivalent to 13.2 ODP tons, per year, once the converted lines reach full capacity.

The use of these new products will also reduce the emission of Green House Gases during the life time of the appliances and in the process of disposal. The estimated greenhouse gas emission reduction per year of operation of the lines at the given capacity is 8,852,533 MT CO2 equivalent in the case of Meizhi, and 967,490 MT CO2 equivalent, in the case of Midea.

From a technical point of view, the conversion has maintained the quality and performance of the appliances produced by these two companies, and their consistency with national and international standards has already been certified by the authorities. Through additional R&D and system optimization the energy efficiency of the new compressors and air-conditioning units has increased by 2%-3% and 5%-12%, respectively, compared to R-22 products.

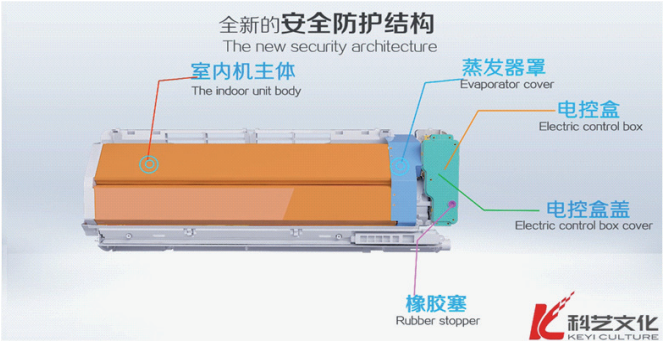
Further efficiency improvement could be achieved if the refrigerant charge sizes specified in international standards were relaxed. However, nationally R&D is ongoing with the aim to improve energy efficiency as well as expand the product range.

The new products have also a great potential for high ambient temperature, since their cooling performance improves compared to other R-22 alternatives in such context. In this regard, both companies are currently developing compressors and air-conditioning units for commercialization in high ambient markets.

In addition, given the safety measures applied in both projects, the new appliances can be handled and used safely, with no fire risks. Recent assessments undertaken by the Tianjin Firefighting Research Institute show that under household use conditions in China the possibility of fire and explosion for a wall-mounted R-290 air-conditioner is significantly less (10^{-8}-10^{-9} per year) than the acceptable risk to public (less than 10^{-5}).

In essence, the approval and implementation of this demonstration project was key for the development of R-290 units and was a basis for the RAC phase-out strategy in China. As a result, by now, most RAC manufacturers in China are involved in R-290 conversion activities and R&D, and it is expected that around 6 million R-290 units will be available in the market in coming years, through the implementation of the RAC sector plan.

For further information on the demonstration project, please refer to the document UNEP/OzL.Pro/ExCom/73/17/Add.1, available in the MLF website, where a complete report is attached.



Pictures 2 and 3: Components of the new split air-conditioning units.

Sources:

- Multilateral Fund
- UNIDO
- Guangdong Midea Refrigeration Equipment Co. Ltd
- Guangdong Meizhi Co. Ltd

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