

Women working in Refrigeration, Air-Conditioning and Heat Pumps: a Worldwide Survey

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ABSTRACT

The International Institute of Refrigeration (IIR) and the United Nations Environment Programme (UNEP) OzonAction undertook a worldwide survey on women in cooling. The aim was to better understand the background, motivation, challenges, and opportunities faced by women working in the Refrigeration, Air-Conditioning and Heat Pumps (RACHP) sector. In total 810 women replied to the survey. The results indicated a high industry retention rate, with 47% of the women working in the RACHP sector for more than 10 years. The three main challenges identified were: difficulties in managing a healthy work-life balance, lack of career advancement opportunities and stereotypes or prejudice about women from clients or customers. Conversely, the most proud career achievements were earning the respect and confidence of colleagues, developing a new product/service and training/teaching people.

The survey identified the challenges and opportunities faced by women working in the RACHP sector providing valuable insight to the development of new policies and initiatives to support women.

Keywords: Women, Careers, Cooling, Refrigeration, Air-conditioning, Heat Pumps

1. INTRODUCTION

Refrigeration, Air-Conditioning and Heating are crucial for our health, nutrition, comfort, and well-being. This sector crosscuts many of the United Nations sustainable development goals and can contribute significantly to safeguard the environment, advance welfare of humanity and support the growth of employment and economy worldwide.

Over 15 million people are employed worldwide in the refrigeration industry, which means that almost 5 out of 1000 people have a job linked to the manufacturing, installation, maintenance and servicing of refrigeration equipment, IIR (2019). Women are highly under-represented in this sector as indicated by the fact that only 6% of the members of national refrigeration associations/organizations/institutions are women Colombo et al. (2016). As the need for RACHP professionals continues to grow, there is a high potential that can be unleashed by encouraging women to pursue education and job opportunities in this sector.

Worldwide there over 300 national, regional, and international associations, organisations, and institutions in the RACHP sector. A review carried by Colombo et al. (2019) showed that a small minority of these organisations have women steering groups, which engage and empower women through networking, mentoring and nomination for awards and industry judging panels. These steering groups normally have a strong social media presence, thus shining a spotlight on role models. Other activities include outreach to schools thus promoting careers in Science Technology Engineering and Maths (STEM) to young people. An example of such initiative is STEMAzing an inspiration academy that supports women in STEM to run fun, interactive sessions with young people. The women in STEM participants take part in training and workshops

to build their confidence on camera and their STEM toolbox. These newly empowered role models then deliver a six week programme of STEM sessions designed to engage children aged seven to nine years old (STEMazing 2023).

Available data from five national organisations in Europe, North America, Asia, Africa and Oceania suggests that dedicated women steering groups directly increase female membership and more women became actively involved in committees, thus increasing women equality in decision-making.

In 2019, the UNEP OzonAction and UN Women published a booklet of stories of 107 women from 50 countries that work in the RACHP sector to raise awareness of the opportunities available to women and recognize their success. The booklet showcased inspirational career experiences from many women across the globe, but also highlighted some fundamental challenges, UNEP (2019).

In order to better understand the background, motivation, challenges, and opportunities faced by women working in the RACHP sector a worldwide survey was undertaken by the International Institute of Refrigeration and the OzonAction of UN Environment Programme in cooperation with several national associations. This paper presents and discusses the results of this survey and introduces a new initiative: an International Network of Women in Cooling (INWIC), which aims to provide networking, mentoring and internships for women working in RACHP as well as increasing the visibility of role models.

2. WOMEN IN RACHP SURVEY

The women in RACHP survey was published using the Survey Monkey platform and was available in the following languages: English, Chinese, Spanish, French, Arabic, Russian, and Portuguese. The aim was to increase the outreach of the survey as these are in the top ten of the most spoken languages around the world. The survey was widely disseminated in all continents by ten co-operating organisations. In total 810 women responded to the survey, which was carried out in 2022 (IIR and UNEP 2022). The 25-question survey was divided into four main topics: background, career, challenges, motivation and opportunities. The survey results presented in the next sections cover the key findings from each of the four main topics. The design of the questions did go through an iterative process with contributions from UNEP, IIR and Women in RACHP (WiRACHP) to ensure that the survey was clear and appropriate for all world regions. The aims and objectives of the survey and who was target audience were clearly indicated in the survey introduction to safeguard the reliability of the responses.

2.1. Background profile of respondents

Figure 1 details the the world region where the women that responded to the survey work.

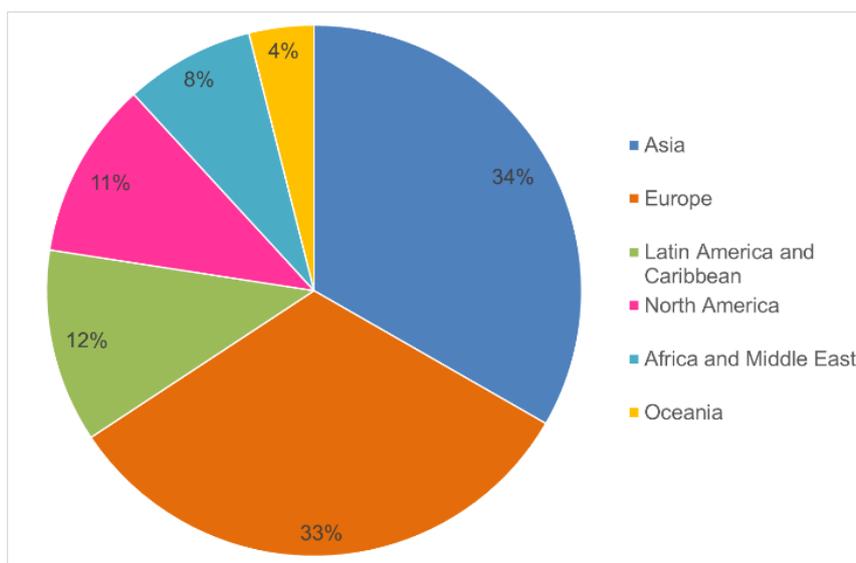


Figure 1: World region where women work in

The bulk of respondents worked in Asia (34%) and Europe (33%). In an earlier survey updated in 2019, Colombo et al. found that national associations/institutions in China (20.1%) and the EU (19%) had an above

average percentage of women members. 59% of the respondents were under 40 years of age and half had a postgraduate degree, indicating likely limitations in reaching women working in the field as technicians. Figure 2 shows that women area of work was evenly spread across residential/commercial refrigeration and air-conditioning, with one third of respondents working in more than one sub-sector.

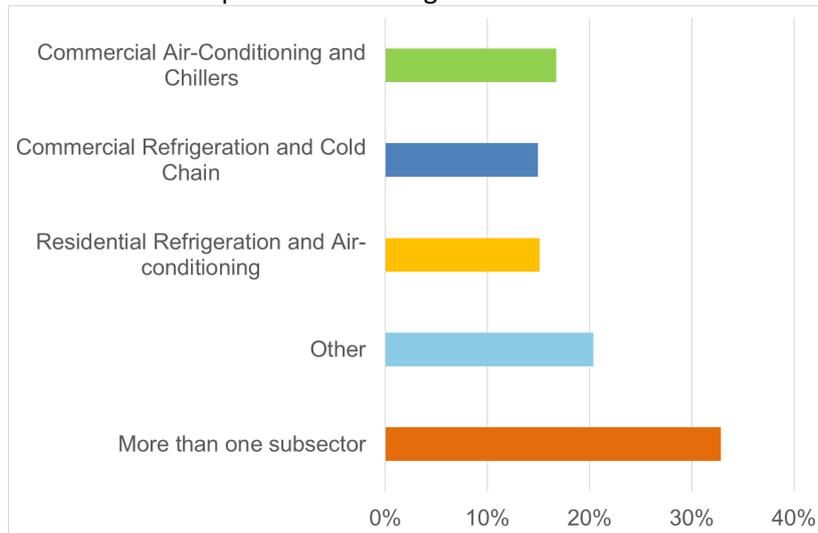


Figure 2: RACHP work discipline

2.2. Career

Figure 3 details the current job role of the survey respondents. With most respondents holding advanced degrees, there was a justifiably low percentage of women who reported working in RACHP applications servicing (8%). Half of the respondents declared working either in design and/or research and development (22%), in sales/marketing (15%), or held academic and teaching roles (13%). The survey results indicated a high retention rate in the industry with 47% of women working in the RACHP sector for more than 10 years. However, only one out of five women had been promoted twice in the last ten years and 24% had never been promoted, suggesting limited career progression opportunities.

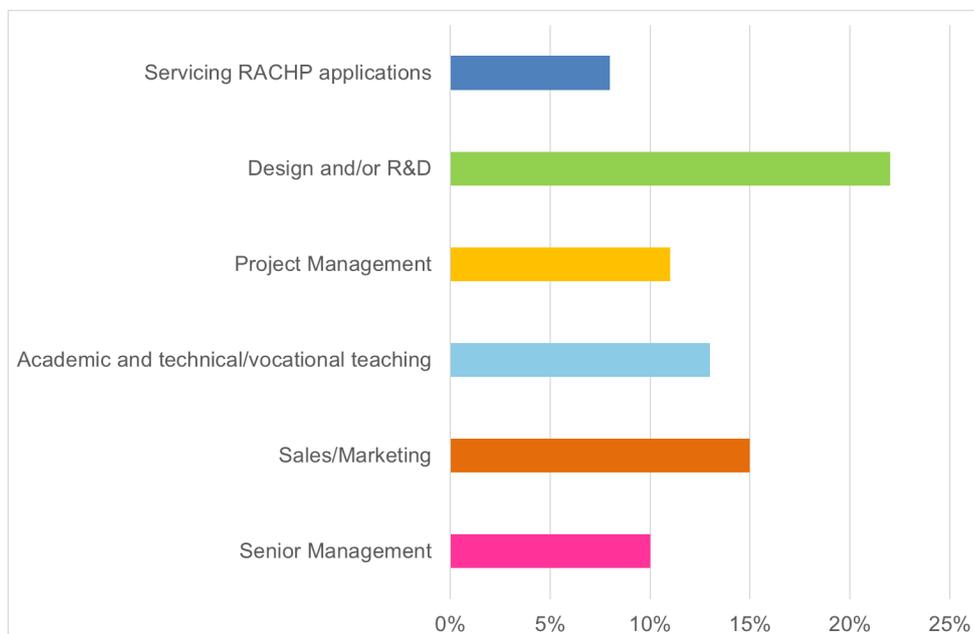


Figure 3: Current job roles in RACHP declared by surveyed women

2.3. Challenges

The surveyed aimed to identify the biggest challenges faced by women on a regular basis. Figure 4 illustrates the top five challenges that they experience the most in their workday.



Figure 4: Top five challenges faced by women working in RACHP

Companies can help women achieve a healthier work-life balance by adapting their human resources policies. For instance, they could allow flexible working hours and remote working where possible as well as fair pregnancy and maternity leave policies. The limited training and career advancement opportunities in the sector is a wider issue that will require national organisations and industry to work together on a solution. Stereotypes or prejudice about women from clients and customers is more difficult to tackle and it varies between regions. The fact that there are no female colleagues in their organisation underlines the lack of women representation in the sector.

2.3.1 Remuneration

The survey asked women if they were offered the same opportunities as men in similar positions and responses were divided: 40 % partially; 38% yes and 22% no. When asked about remuneration in relation to job specification, 55% of the women said they were fairly paid, however when asked how their remuneration compared to men in similar positions that percentage dropped to 45%.

2.4. Motivation and opportunities

Women were mostly motivated by the environmental impact of a career in RACHP, the feeling of carrying out work that is useful to society, the fact that is an interesting subject area, the diversity of roles available and the job security associated with the sector. Having an understanding of the motivation factors that are appealing to both women and men is crucial to ensure we have enough engineers in future generations.

Figure 5 shows women's most proud career achievement. Interestingly, earning the respect of their colleagues represented the proudest career achievement for many women. Previous studies have shown that support from co-workers, namely male colleagues, is crucial to maintain women in engineering positions and further their careers (Makarem and Wang, 2020; Duluni et al, 2018).

Other achievements mentioned were developing a new product or service and teaching/training people as well as generating profit for their company. In total 10% of women that responded to the survey work in a senior management role and the majority listed providing opportunities for their staff to develop their careers as a proud achievement.



Figure 5: Most proud career achievement

2.5 Inspiring the next generation

The survey showed that half of the women had no role model. The ones who had a role model had been influenced by either someone working in the RACHP sector, a teacher or a family member. Actually, the top three factors that had influenced their decision to pursue a RACHP career were (1) someone already working in the RACHP sector, (2) individual initiative through reading and research and (3) school, as illustrated in Figure 6.

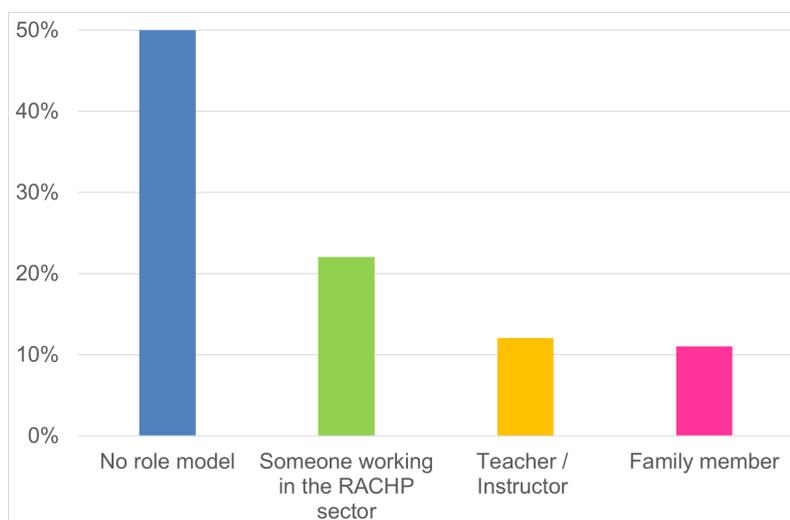


Figure 6: Top three factors that had influenced women's decision to pursue a RACHP career

This shows the importance of role models and STEM programs on inspiring more women and girls to work in this area. 53% of the respondents were directly responsible for encouraging more people to join the RACHP sector and were actively involved in activities such as training, workshops, mentoring or recruitment. These results show that there is clear scope to increase the visibility of women working in the sector by promoting role models and mentorship programs that benefit both individuals and organisations. Role models are paramount to highlight the career opportunities in RACHP and inspire the next generation of engineers. Increasing awareness of women in RACHP will also help break stereotypes and prejudice against women and empower women and girls to pursue a career in this sector.

2.6 Environmental impact

Figure 7 shows that 66% of women valued the environmental dimension of their work in the RACHP sector. Respondents indicated that their work involved topics such as energy efficiency, technology selection, compliance with environmental regulations and refrigerant choice.

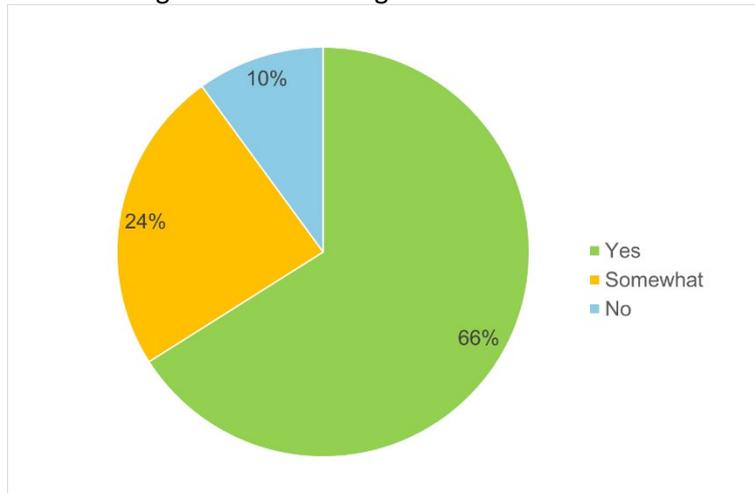


Figure 7: Environment dimension of RACHP work as an important motivation factor

In order to entice more women and young girls, training programmes could focus on environmental and sustainability-related courses, through either an experiential exposure or informational awareness of the link between sustainability themes and the profession (Ken-Giami et al, 2022).

3. INTERNATIONAL NETWORK OF WOMEN IN COOLING

The International Network of Women in Cooling (INWIC) is a networking, educational and mentoring platform to promote the role of women in the refrigeration, air-conditioning and heat pump industry. This initiative was launched followed the survey and it will connect women currently working in the sector, empowering them to progress in their career and to become visible role models, changing outdated perceptions and influencing the next generation of women engineers.

World Refrigeration Day (WRD) and the UNEP OzonAction lead the INWIC initiative in cooperation with founding partners' i.e. national RACHP associations from all world regions. By bringing together women from all continents, INWIC enables the sharing of experiences, successful local policies and career opportunities, which would not be available otherwise. It provides an opportunity to learn from each other, understand how to bring positive change in each cultural context and promote the environmental aspect of the RACHP profession. Figure 8 summarises the INWIC proposed eight work streams for the next two years.

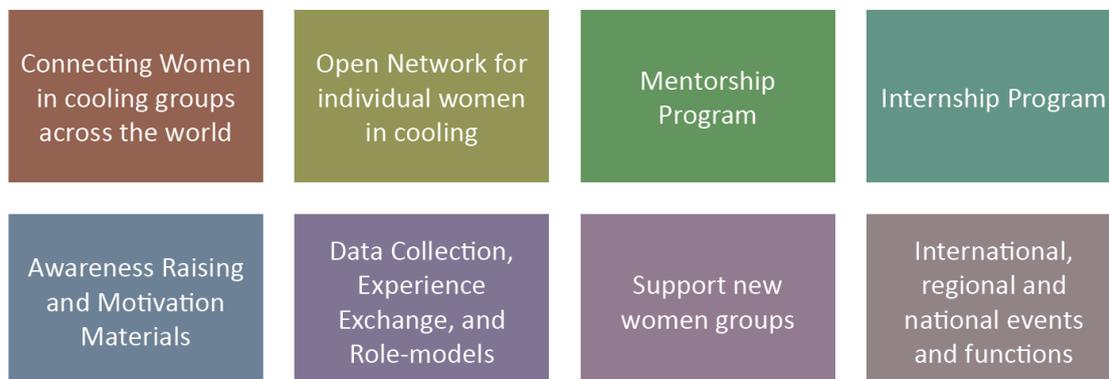


Figure 8: INWIC planned work streams for 2022 - 2024

The first stage of INWIC initiatives includes connecting existing women's groups/sections of national, and international RACHP associations/organisations/institutions to create a network that shares information and experiences. INWIC will pull together data from founding partners to raise awareness and motivation and to promote role models and outreach activities underway. A mentorship program is currently being developed for women already working in RACHP and for young women pursuing RACHP education. On a later stage, INWIC will establish an internship programme with focus on opportunities in developing countries. The first INWIC international event was carried out at the ASHRAE 2023 Winter Conference and another event is planned for the 2023 International Congress of Refrigeration. These events are a great forum to connect women in the sector and the plan is to have regular INWIC international, regional and national events. It is envisaged that the network will accelerate gender equality in RACHP, allowing women to be agents of change for a more sustainable and resilient future.

4. CONCLUSIONS

The women in RACHP global survey has shown that the environmental impact of this sector is a clear motivation factor and can be used to promote this career. Schools play a vital role in influencing career decisions and adapting training materials and courses to highlight the environmental and sustainability aspect of RACHP can have a major impact on securing a new generation of engineers.

Maintaining a healthy work-life balance is a challenge of modern times and is particularly taxing for women who are often the primary caregivers. However companies can significantly ease the burden on women by adapting their human resources policies by allowing flexible working hours and remote working as well as fair pregnancy and maternity leave policies. These actions will ensure that women stay in the RACHP industry, which already shows a high retention rate for the low percentage of women working in this profession.

The survey highlighted the need for more training and career development opportunities as well as equal pay for work of equal value and companies need to recognize and address these issues.

Role models and mentoring schemes will increase visibility of women working in the field and initiatives such as INWIC have a major role to play at bringing women together across the world and raising awareness of the opportunities available in the RACHP sector.

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