

Virtual teaching and learning method. Online learning refrigeration

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Abstract: - To ensure that the next generations have a well-trained workforce that is capable of tackling complex challenges that face these days improving access to information is a key component in order to effectively compete in the global labor market. Studies points out that interactive teaching methods create a deeper learning, students develop better thinking skills by presenting concrete examples and students demonstrate better memory and are more appreciated. All research proves that learning is the result of the exercise, or actually seeing what was learned. This leads students to process information and give it meaning. Over time, it was found that teaching on blackboard with chalk and implement a written course are a minimum mandatory but not sufficient, as proven by many of today's courses are made using digital presentations. This paper presents a new method of teaching and learning Refrigeration, for students enrolled in Building Services specialization, in the Faculty of Civil Engineering, part of Transylvania University from Brasov.

Key-Words: - new teaching method, learning refrigeration, online courses, website

1 Introduction

Education system cannot afford to ignore that mobility and easy access to information, these days go hand in hand and because of that teaching methods should be supplemented with modern ways of learning taking into account that internet is now offered at most libraries, coffee shops, and even gas stations by Wi-Fi or users uses their 3G connection from their device to access it.

All research proves that learning is the result of the exercise, or actually seeing what was learned. This leads students to process information and give it meaning. Over time, it was found that teaching blackboard with chalk and implement a written course are a minimum mandatory but not sufficient, as proven by many of today's courses are presented on CD or completed with digital presentations. Studies points out that interactive teaching methods create a deeper learning, students develop better thinking skills by presenting concrete examples and students demonstrate better memory and are more appreciated.

Among the subjects studied on Building Services specialization in the Faculty of Civil Engineering Braşov is found also Refrigeration, about some may say it is a matter more "curious" for students because it combines knowledge from many fields such as hydraulic, heat and mass transfer, chemistry,

thermodynamics, automation etc., so that students are not very used with.

2 Project description

Inspiration for this project came as a result of the lately massive development of innovative portable devices that users interact with, such as smart mobile phones, tablets, laptops, to name just a few.

The overall objective of the "project" started last year is to give students access to a new method of learning through an online site that follows the syllabus of the written course "Refrigeration Installations" [Alexandru Serban, Florea Chiriac - Refrigeration Installations – "University Courses. Masters." AGIR Publishing, Bucharest, 2010], except that it is more explicit and also interactive. Website realized with the support of society Galati SC AltFactor SRL, which develops educational products full of e-learning has the web address www.dralexandruserban.ro and is an educational product that provides a modern and flexible training, a solid educational foundation, a component of comprehensive information, interactivity and attractiveness.

In the traditional school, the teacher has full control over knowledge, but introducing interactive component scheme, the school is student-centred,

making it the core of the problem, which coincides with the current educational policies geared more and more towards a pedagogy that involves direct involvement of student learning. Scientific-pedagogical approach taken in this sense is part of late didactics development trends.

By accessing the web address www.dralexandruserban.ro users are greeted by Mr. Alexandru Serban Associate Professor Ph.D., professor at the Faculty of Civil Engineering Brasov, Building Services Specialization, and is presented by displaying his Curriculum Vitae.



Fig. 1. Presentation page www.dralexandruserban.ro

By clicking on the link “Resurse educationale - Educational Resources”, the user is displayed a page where at this stage, it can access the Refrigeration Course, in the form of seven major chapters, as shown in Figure 2 shown below.



Fig. 2. Educational Resources page of the website www.dralexandruserban.ro

As can be seen in the figure above the Refrigeration Course is divided in seven chapters:

1. Mechanical Vapour Compression Refrigeration Systems;
2. Vapour Absorption Refrigeration Systems Based on Ammonia-Water Solution;
3. Vapour Absorption Refrigeration Systems Based on Water-Lithium Bromide Solution;
4. Refrigeration Compressors;
5. Condensers;
6. Evaporators;
7. Applications of Artificial Cold.

With a click on the first chapter the user begins the interactive training module that includes a number of components common to all chapters and facilitate the conduct of the course in a way as simple and as intuitive. The main components of interactive mode are: course title in the top of the page, the title section, immediately beneath the left panel content page that can be displayed or hidden, glossary button to identify unfamiliar terms in the upper top right, represented by an open book, the "Info" button, "Full screen" button to switch to full screen view mode, progression-back buttons in the lower right corner and in the middle of the course page itself. All the items above can be seen in Figure 3, shown below.

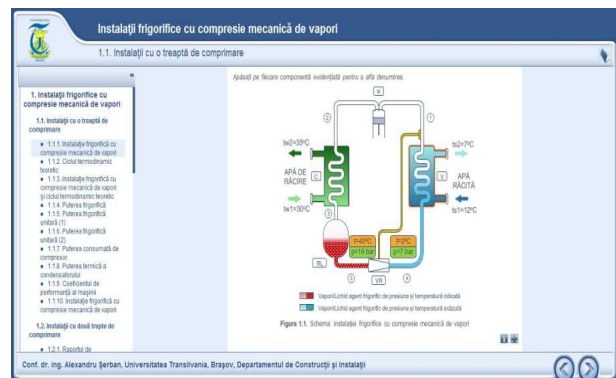


Fig. 3. First page of interactive course “Mechanical Vapour Compression Refrigeration Systems”

On the first page of the course is shown a diagram of one stage mechanical vapour compression refrigeration system which interactivity consists of many actions that the user can perform on the page course such as pressing system components to highlight their name, pressing "Play" to animate the installation diagram and highlighting its operating principle, pressing the "Info" to highlight additional information about the current course page, which in this case in the form of text is the operating principle for one stage mechanical vapour compression refrigeration system in one

stage, for a better understanding of animation and hence the scheme.

If we were to draw a parallel between the written course and the interactive website, those two would look like in Figure 4. As can be seen the interactive course copy the exact schemes from the written course but with the major differences that the components and the working fluids are colored differently, depending on fluid's state and user / reader can actually see what happens inside the system. This way the learning process take less time, is more enjoyed and increases learning.

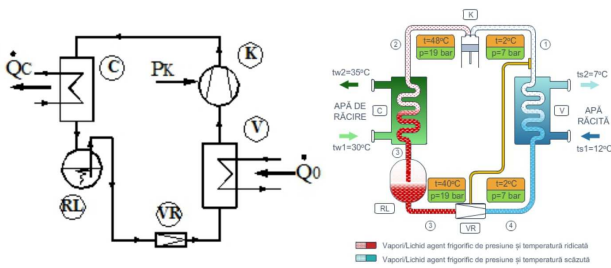


Fig. 4. Comparison between the traditional and the interactive scheme

On the second page of this course the user can see the theoretical thermodynamic cycle analysis for the refrigeration system shown in the previous diagram temperature-entropy and pressure-enthalpy diagram. The user can click on each segment on the theoretical cycle represented to highlight the process that occurs from the point x to point y state. On this page the "Info" button explains the user all cycle transformations. The second and the third page of the first course can be seen in Figure 5, hereinafter.

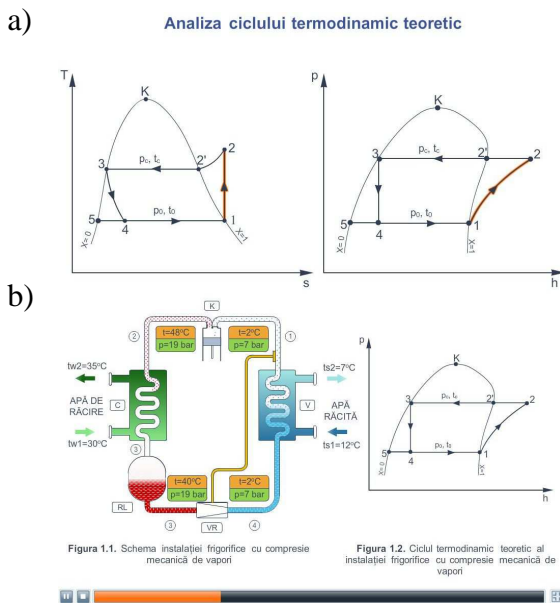


Fig. 5. Page 2 of the first course (a) and page 3 (b)

On the next page of the course, the user is presented both the system diagram and its theoretical thermodynamic cycle, so that the user can more easily make the connection between the two.

Of course both thermodynamic cycle and the scheme are animated for a better understanding of the phenomena that occur inside a one stage mechanical vapour compression refrigeration machinery.

All other pages of the other six courses are engineered and designed in the manner described above, offering the possibility of substantiating both theoretical and practical subject being treated in the course.

In the second course, students learn about vapour absorption refrigeration systems based on ammonia-water solution, by starting from a simple absorption refrigeration systems (see Figure 6) because usually is more difficult for student to understand how they operate, at first sight. This machine works with a thermal compressor, called by some and thermodynamic compressor, consisting of a set of absorber and distillation column. These machines use binary solutions of where one of the components is the refrigerant. The best known binary solutions used in refrigeration are based on ammonia-water solution and those based on water-lithium bromide solution.

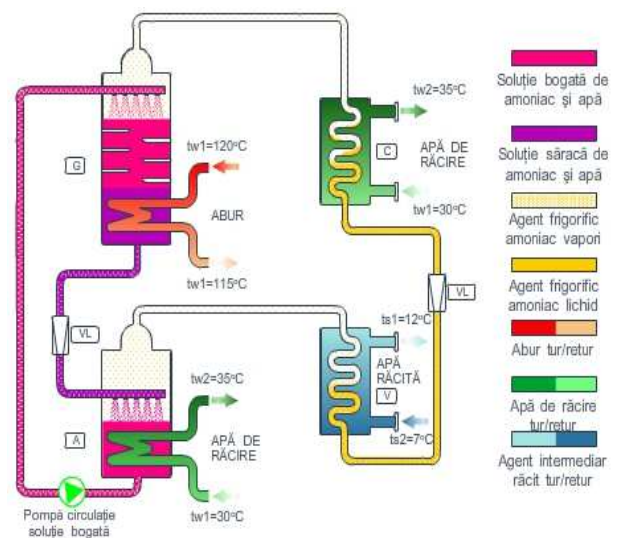


Fig. 6. Simple absorption refrigeration systems based on ammonia-water solution

After passing the barrier of understanding the principle of simple operation of absorption refrigeration machine, students are introduced to more complex schemes such as solar cooling installation, which is a scheme that falls among

energy efficient systems and that uses renewable or recoverable sources.

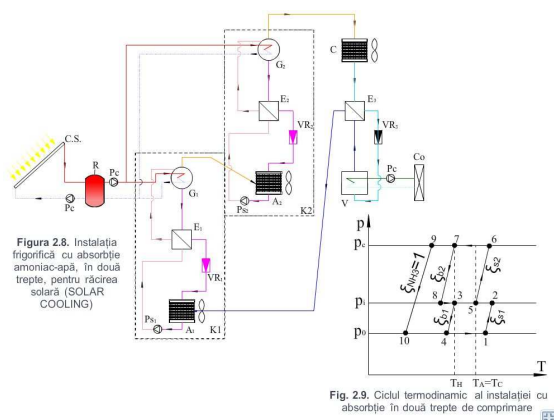


Fig. 7. Solar cooling absorption refrigeration systems based on ammonia-water solution and theoretical thermodynamic cycle

At the end of third course is explained the operation principle for small power absorption system as is the case with absorption refrigerator after Platern and Munters.

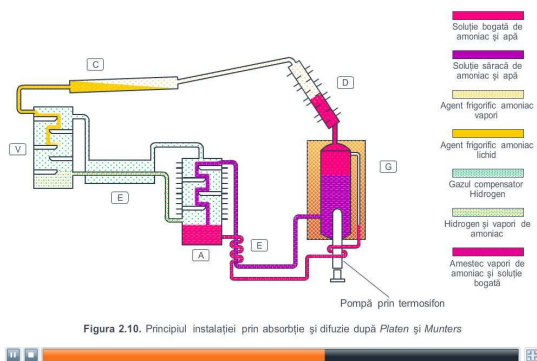


Fig. 8. Principle of small power absorption refrigerator after Platern and Munters

Further examples are presented in the following pages of courses to highlight the transition from a passive education act to an always looking one, to research and investigate accumulated knowledge in order to formulate a response to a specific requirement.

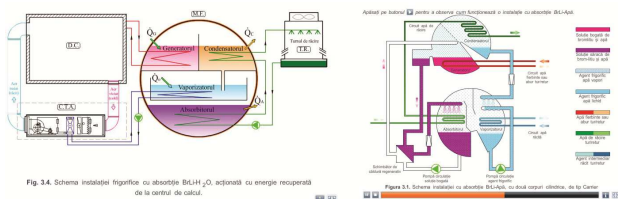


Fig. 9. Sample pages from Course 3



Fig. 10. Sample pages from Course 4

Each of the seven courses at the end of a page has the text "Questions?" To the end of the course gives students the opportunity to interact with the teacher, when the college course is conducted on the interactive whiteboard to clarify any issues or additional questions.

Due to the positive feedback from students at the end, we want in the future to perform other several courses of this type and to diversify the interactivity on the site to be even more attractive.

4 Conclusion

In our current society, there is a dynamic process which requires all walks of life to keep up with the evolution of society and therefore education. The application of new learning methods require time, diversity of ideas, commitment to action, discovery of new values, teaching responsibility, confidence in personal ability to apply them creatively to streamline the educational process.

Virtual teaching and learning refrigeration consist of presenting courses online in the classroom and offers students the possibility to learn not only at school but also when they are on the move, using online environment on modern portable devices.

This mode the Refrigeration course is more easily assimilated by the students and motivate them for choosing this area in future engineering profession.

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