Report

Abstract

Four people from different countries were connected in one team- group number 2 . These are Erasmus students in Porto. They are from Spain, Portugal, Poland and Hungary. They are very different. They have distinct personalities, a variety of cultures and sense of the time. They are looking for different Erasmus experiences. They have small problems with team working and communication but they have the same goal. They have to create humidifier with a web application for data-center. They knew nothing about humidifiers before they arrived at European Project Semester. How do they want to do it? What did they decide and why? Everything is in this report.

Glossary

Spray nozzle is a precision device that facilitates dispersion of liquid into a spray. Nozzles are used for three purposes: to distribute a liquid over an area, to increase liquid surface area, and create impact force on a solid surface.

Air compressor is a device that converts power into kinetic energy by pressurizing and compressing air, which is then released in quick bursts.

PLC is an programmable logic controller (PLC) or programmable controller is a digital computer used for automation of electromechanical processes.

Microcontroller is a computer-on-chip containing a processor, memory and peripheral input / output.

Java is a programming language and computing platform. It is the underlying technology that powers state-of-the-art programs including utilities, games, and business applications.

Tomcat is a Java Servlet container and web server from the Jakarta project of the Apache software foundation.

Notepad++ is a simple text editor for Microsoft Windows.

Introduction

Within the European Project Semester at ISEP, a final project to build a humidifier with a web interface was proposed. Thus, this report describes the beginning of construction of a humidifier.

This project will have as its main motivation the confrontation with real life and essential teamwork. We also have a great opportunity, not only to put into practice the knowledge acquired but also to learn new things.

The goal is to develop a humidifier with a Web interface for a server room of 80 m^3.

The final product must:

- maintain of a relative humidity between 40 % and 70 % (+- 5);
- distribute the generation of water vapour within the room;
- have two days of autonomy;
- be placed on the floor of the room;
- include water and humidity alarms;

- have an on-off switch;
- be compliant with the EU Directives 2006/42/CE 2006-05-17 and 2006/95/CE 2006-12-12;
- have a composite material structure to hold the control unit and the water container;
- include a life-cycle analysis.

We have as available parameters:

- air flow;
- incoming air temperature;
- chiller input temperature;
- budget limit: 900€.

Knowing all the topics desired by the customer, we hope to follow the requirements and complete the project successfully. For this to happen, initially, we divided the work into four black boxes designated as humidifier, tank, control and web interface and then, for a better organization the work, we developed a Gantt Chart and divided the tasks between us.

Task	Responsible
Humidifier	Mihály and Mateusz
Tank	Marc and Mihály
Control	Fátima and Marc
Web interface	Fátima and Mateusz

This report is structured in six chapters. The first chapter is the introduction and presents the problem, the motivation, the objectives, the expected results and the project work plan. The second chapter is the state of the art that describes the options for the construction of all the parts of the humidifier and our choices. The third chapter is the project development and presents the project architecture, the modules, the functionalities and the tests. The fourth chapter is the conclusion where the discussion and future developments of the project is presented. Finally, in the sixth chapter the bibliography we put the references to all the information found.

State of the Art

Type of humidifiers

- Steam humidifier

Working method: It makes the vapor by heating the water above its boiling point, than distibute this steam in the room.
Advantage: fast, can make a big amount of vapor
Disadvantage: need lot of energy, heating the room

- Fan humidifier

Working method: It contains a pot with water and a filter in it. That filter soak up the water. Above the filter there is a fan, what is moving the air of the room through the wet filter and the water vaporize in natural way.
Advantage: made from simple parts → less failure possibilities, not need complex control
Disadvantage: slow, also move the air too

- High water pressure:

Working method: pressure pump supply water to the nozzles at between 50-70bar. The nozzles are made for ceramic, opening 0,2- 0,5 mm.
Advantage: no algae – high pressure, high performance, quiet work,
Disadvantage: high cost

- Ultrasounds method:

Ultrasounds are made by piezoelectric cell. The sounds make water trembling. It makes very small drops of water.
Advantage: quiet work, very small drops
Disadvantage: algae, low performance-high energy consumption

- Compress air method

Compress air is mix with water in special nozzle(pressure about 2 bar). Nozzle distribute water
Advantage: quiet work – if we use fridge compressor, quite cheap, quite simple
Disadvantage: algae

Control

In control we found two solucions:

- Micocrontroller
- PLC

Microcontrollers are typically used in automation and control products and peripherals, as systems of automotive engine control, remote controls, residential and office machines, toys, surveillance systems. PLCs are based on microcontollers which allows solutions far economic.The current can be networked, often with private protocols of each manufacturer. It is increasingly common to use the Ethernet for connecting computers and PLC.

For our choice we made a small table with values between 0 and 5 with important aspects for the project:

	PLC	Microcontroller
Life	5	3
Price	2	5
Programming	4	3
Similar Aplications	2	5
Total	13	16

The final decision is to use the microcontroller. The PLC is used in large industrial applications and therefore is more expensive but has a language programing easier. Because of this we chose the microcontroller programming despite being more difficult than the PLC.

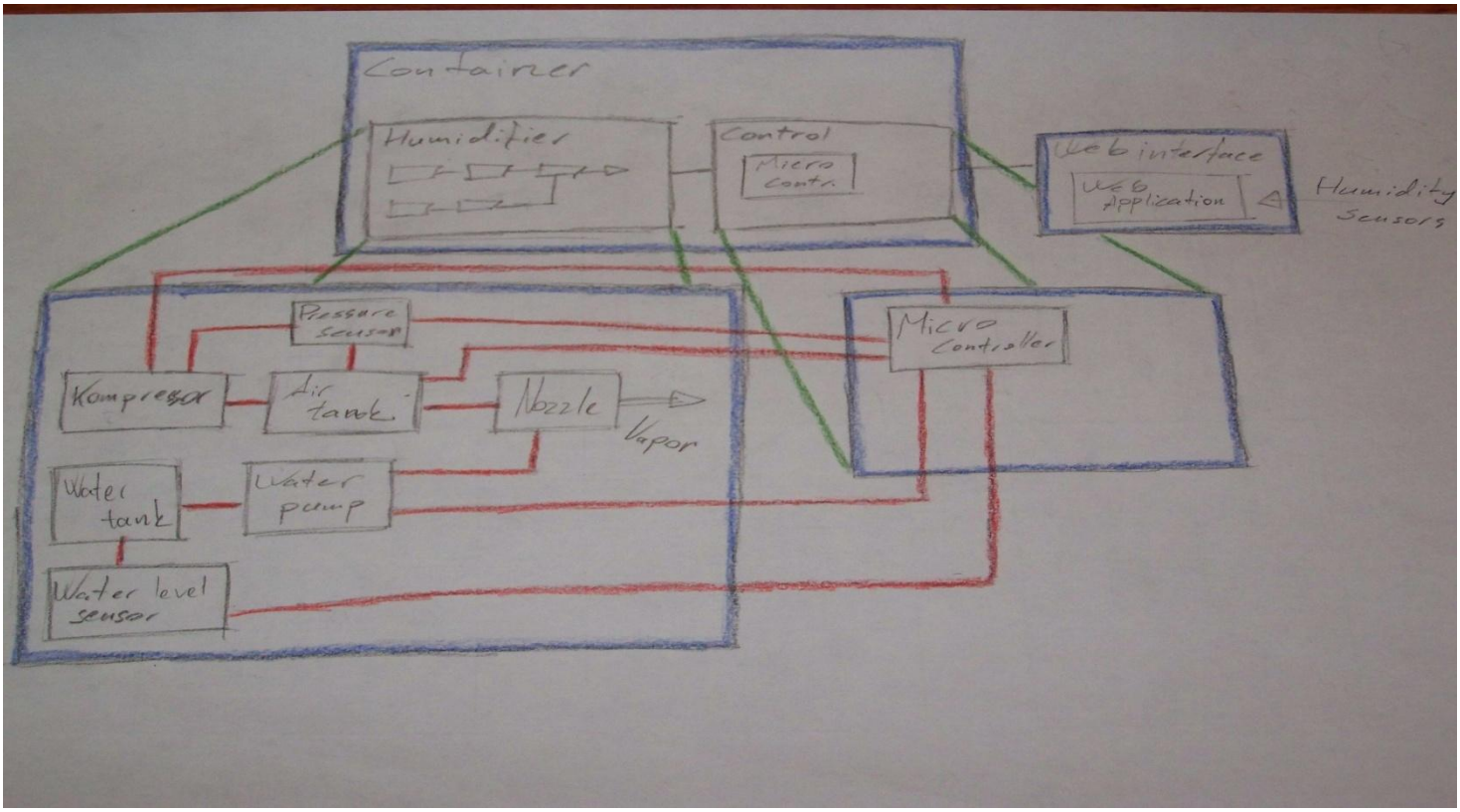
Web Interface

The web interface will be developed with Java. The language derives much of its syntax from C and C++ but has a simpler object model and fewer low-level facilities. Java is currently one of the most popular programming languages in use, and is widely used from application software to web applications. For the interconnection of various parts of the web interface we will use the following software:

- Tomcat
- MySQL
- Notepad ++

Project Development

Architecture



Modules

- Web interface
- Container
- Controll
- Humidifier
- Compressor
- Air tank
- Nozzle
- Water pump
- Water tank

Functionalities

Humidifier

Datacenter humidity needs to be between 40% - 70%. For This we need of a humidifier. The humidifier will be built with compressor that will go to make pressured air. The air tank will contains the compressed air. The nozzle will go to blow the vapor to the data center. The Water pump will deliver the water from the tank to nozzle.

Controll

The controll will serve to communicate with the sensors, sensing the water level of the tank, controll the switches for pump and electric valve. This controll will be done with arduino with internet connection.

Web interface

The web interface will be the hardest part. It will identify the sensors and life-cycle analysis of the humidity and temperature. The web interface is the tool that people use to control humidifier.

In a first contact with the language we develop a small program to test the interconnection and compiling of software:

Conclusions

Throughout these weeks the job was essentially to research and discussion. Initially we discussed the type of humidifier where we propose two options. The first option was using a humidifier cold type, through a nozzle, which should bring a compressor to supply compressed air and a water pump to provide water. The other option was to use a humidifier also cold, because hot type to use a humidifier too complicated and dangerous. The second option consists of a water tank which has a filter on top and a front fan, which means that there is an air circulation inside the tank and extract Humidity outward. In the end we opted for the first option, because the shape of the humidity injected in the room is much faster and instant.

The other discussion was to choose the type of control that we had to use because for the controll we found two options viables. One option was to use a small PLC, since these devices are designed for the industry and are very sturdy, its programming is also very easy, by GRAFCET. The other option was to use a microcontroller. It size is very limited and this makes it very easy to integrate it into the design of the humidifier, also these last devices are designed for this kind of small applications. The problem is that these last items are much more complicated to program the PLC. The final decision was the price of the items, since the PLC and cost over 300 € and the microcontroller costs about 60 €.

Now, with all decisions the next step is test these decisions with laboratory equipment that we have available. And then with the success of the test we can buy the necessary materials with more conviction that we are in a good way. Finally, we can start to built each part of the humidifier with the hope that we will achieve all the objectives initially set.

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