

IPRO 346

SUMMER 2010



ILLINOIS INSTITUTE OF TECHNOLOGY

Team Members

- **Abhishek Chandnani**

- achandna@iit.edu
- Mechanical Engineering
- Skills and Attributes
 - good organizational skills
 - interpersonal skills and networking capabilities
 - hands-on work experience in job environment
 - MS Word, MS Excel, MS PowerPoint, C++, AutoCAD, MATLAB

- **Jinwoo Lee**

- jlee185@iit.edu
- Skills and Attributes
 - computer - AutoCAD, 3dsmax, sketchup, Photoshop, illustrator.
 - language - Korean.

- **Christopher Najarian**

- cnajari1@iit.edu
- Electrical Engineering
- Skills and Attributes
 - Math skills, creative thinking, working in teams

- **Michael Regacho**

- mregacho@iit.edu
- Mechanical Engineering
- Skills and Attributes
 - AutoCAD and ProEngineer
 - paperwork and good organizational skills.
 - excel, word, picking up new skills quickly, hands-on work

- **Aanchal Taneja**

- ataneja6@iit.edu
- Electrical and Computer Engineering
- Skills and Attributes
 - Team worker
 - Hard Working
 - Inquisitive and Explorative
 - Communicative
 - Coherent with the subject material as well as some of its real life implications

- **Angad Singh**

- asingh63@iit.edu
- Mechanical Engineering
- Skills and Attributes
 - Analytical and Problem Solving Skills
 - Multi tasking
 - Hands on Experience with the underfill, Surface Mounting, assembly and testing procedures.
 - MS word, MS Excel and MS PowerPoint
 - Worked in a Professional environment for 8 months. (RIM)

- **Sami Somo**

- ssomo@iit.edu
- BME
- Skills and Attributes
 - MS Word, Excel, PowerPoint, MATLAB

- **Michael Spytek**

- mspytek@iit.edu
- Mechanical Engineering
- Skills and Attributes
 - Using MS word and Excel.
 - Basic operation of manual milling machines
 - Fabrication of test equipment
 - Basic wood and metal working skills
 - Business operations, including dealing with suppliers and customers
 - Automotive repair

- **Philip Tam**

- ptam2@iit.edu
- Chemistry
- Skills and Attributes
 - MS Word, Excel

- **Zachary Waas**

- zwaas@iit.edu
- Mechanical Engineering
- Skills and Attributes
 - MS word , excel, PowerPoint
 - group work, hands on metal and wood work
 - AutoCAD and SolidWorks
 - Creating dimensional drawings and 3-D renderings of various components

Statement of Problem

Condensate from commercial HVAC systems is currently drained as if it were waste water. This condensate can be recycled and be put to use depending on the output amount and chemical cleanliness.



PROJECT GOALS

Measure the amount of condensate produced by commercial HVAC systems.

Testing the condensate for bacteria and chemicals.

Developing feasible outdoor uses for the condensate based on the cleanliness and quantification.

Conduct market and business analysis for the potential uses of the condensate.

TEAM ORGANIZATION

Testing

Philip Tam (Group Leader)
Sami Somo
Abhishek Chandnani
Aanchal Taneja

Research

Abhishek Chandnani (Group Leader)
Michael Regacho
Angad Singh
Jinwoo Lee

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Team Leader: Zachary Waas
Minute Taker: Aanchal Taneja
Agenda Maker: Mike Spytek
Time Keeper: Angad Singh
iGroups Moderator: Zachary Waas

Survey

Sami Somo (Group Leader)
Zachary Waas
Michael Spytek
Christopher Najarian
Jinwoo Lee

Collection & Quantification

Michael Spytek (Group Leader)
Angad Singh
Zachary Waas
Aanchal Taneja

MAJOR OBSTACLES ENCOUNTERED

- Understanding how HVAC systems operate and learning how temperature and humidity affect condensate production.
- Figuring out a way to collect and quantify the amount of condensate produced.
- Collecting samples and conducting tests to determine the chemicals and bacteria contained.
- Limited amounts of data due to a short summer schedule.
- Lack of interest in the market place about the idea of condensate harvesting, this will cause problems when trying to pitch a recycling product or method.
- Uses of condensate are limited due to weather conditions and seasons.
- Working with laws and codes that also limit the recycling and uses of condensate.

Visiting Testing Sites

Visited Pentair in Delavan, Wisconsin to get a better understanding of how they operate. They gave us a tour of the manufacturing plant and informed us of their expectations for this IPRO.



(Visit to Pentair)



(Touring MTCC HVAC Systems)

Testing Sites

Set up multiple test sites which include MTCC, Spyco Industries Inc, and locations in India for measuring the amount of condensate.



(Spyco Industries)



(MTCC)

Method for Measuring Condensate

Rigged the flowtec pumps from Pentair with counters in order to determine the amount of condensate produced on a daily basis.

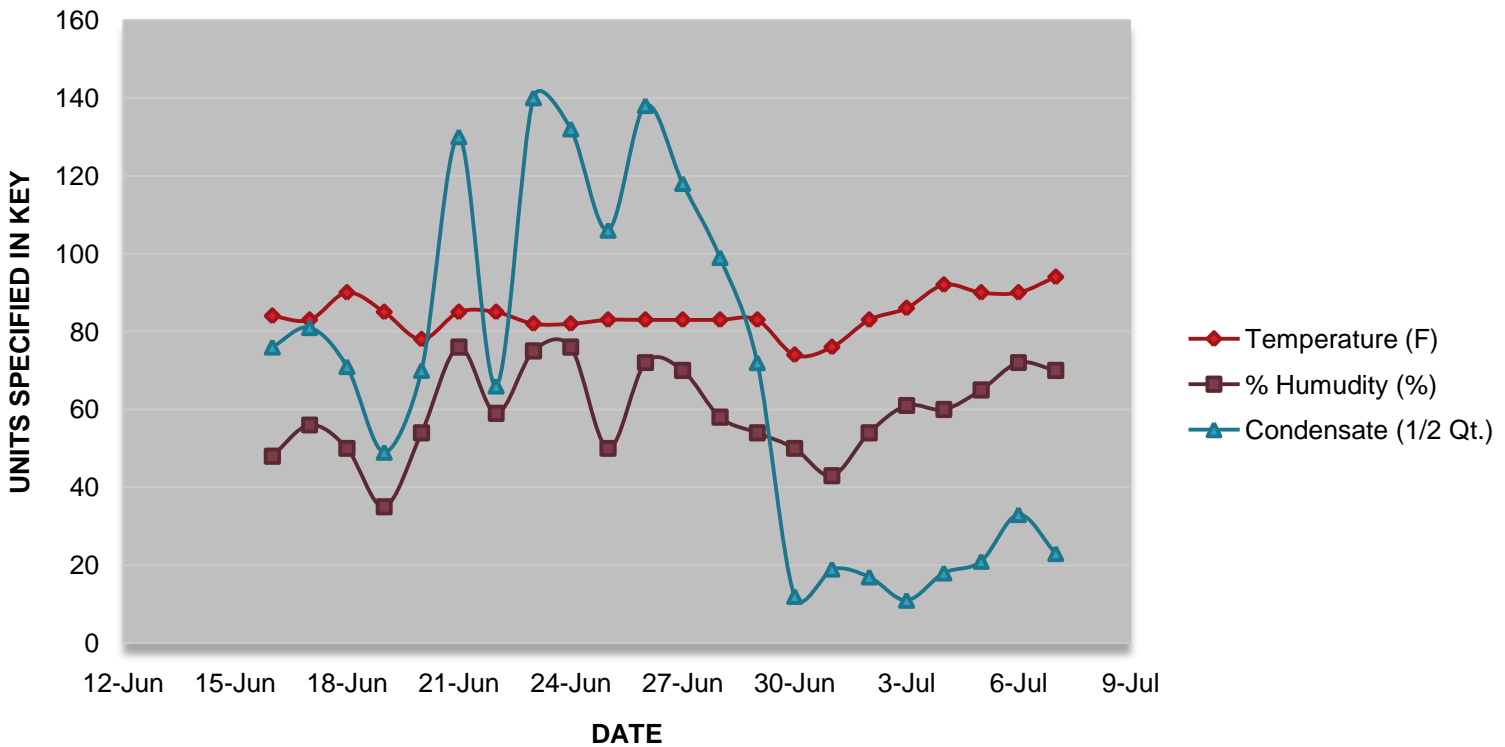


Test Setup



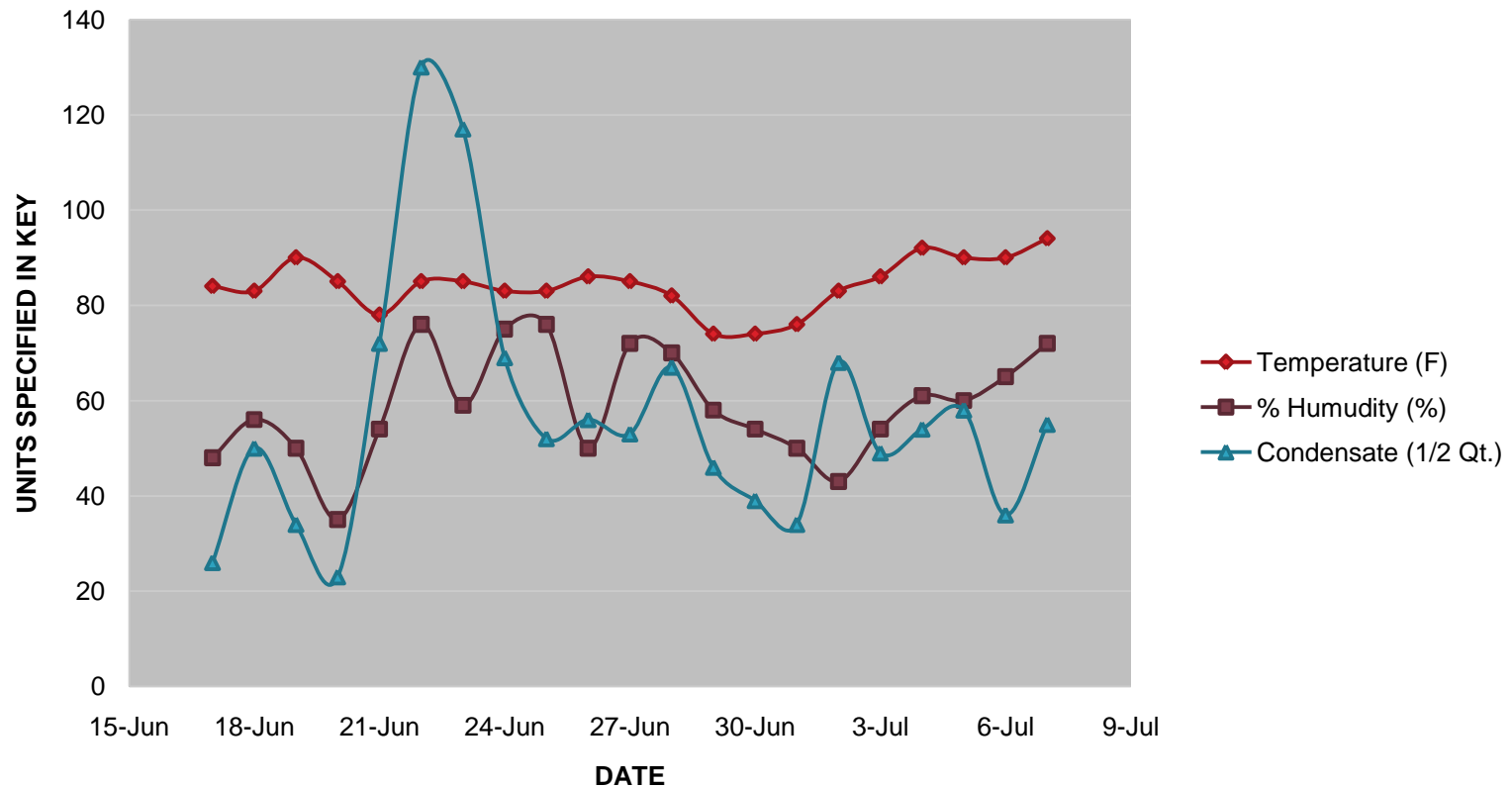
MTCC Test Site Data

**MTCC
(CHICAGO, ILLINOIS)**



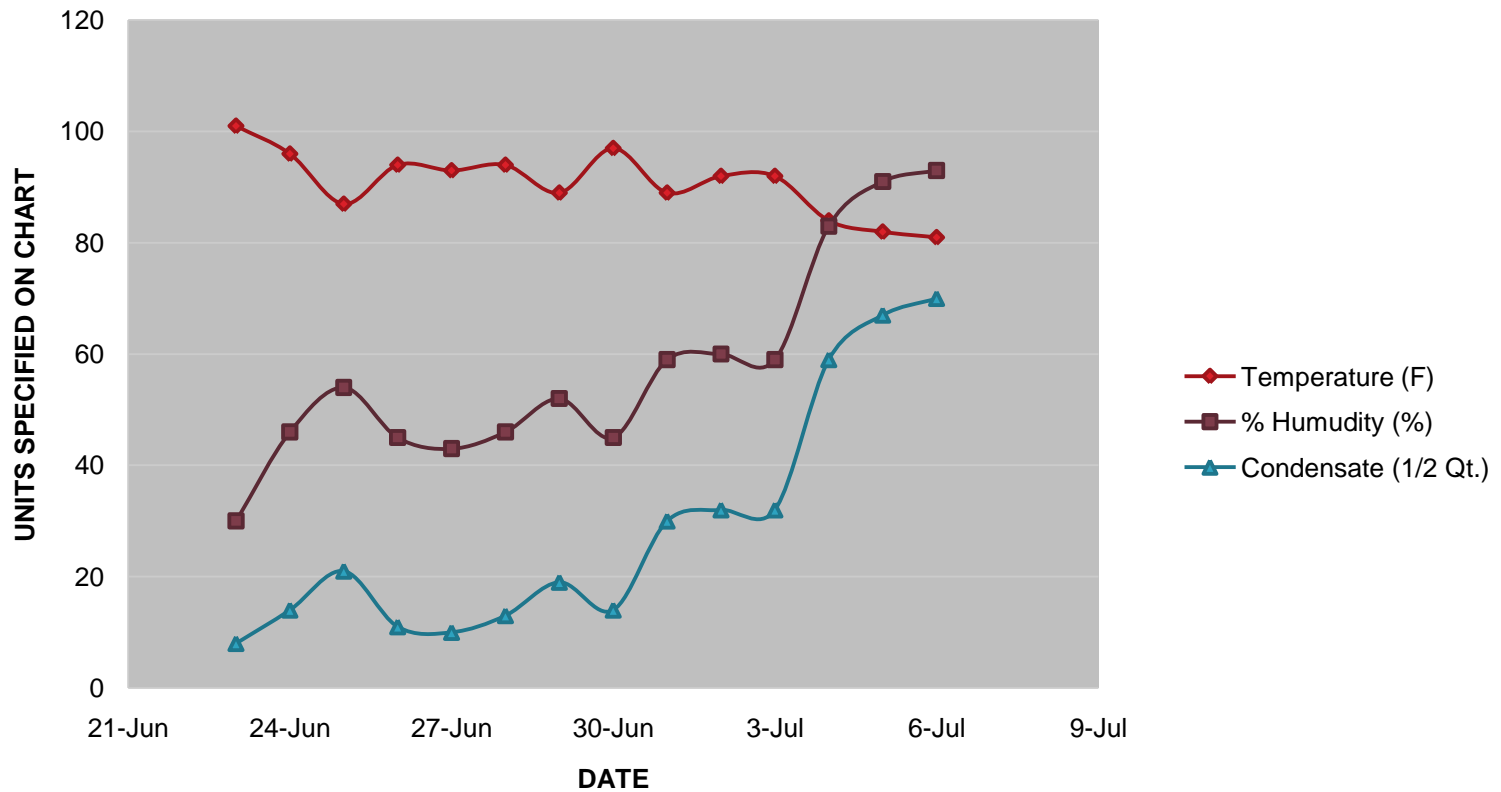
SPYCO Test Site Data

SPYCO INDUSTRIES (BURR RIDGE, ILLINOIS)



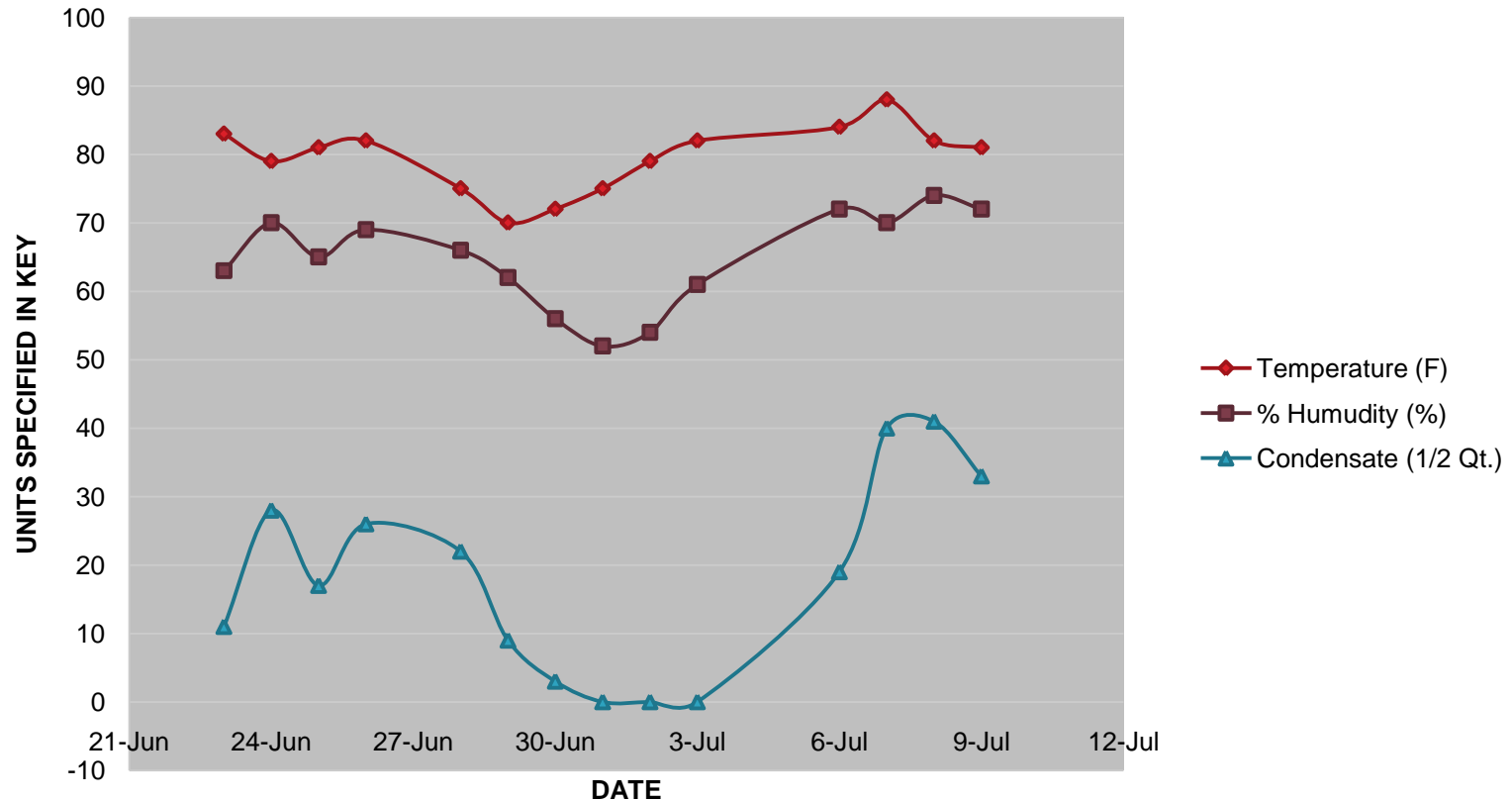
India Test Site Data

INDIA



Pentair Test Site Data

PENTAIR (DELAVAN, WISCONSIN)



Sample Testing

⦿ Atomic Absorption Spectroscopy

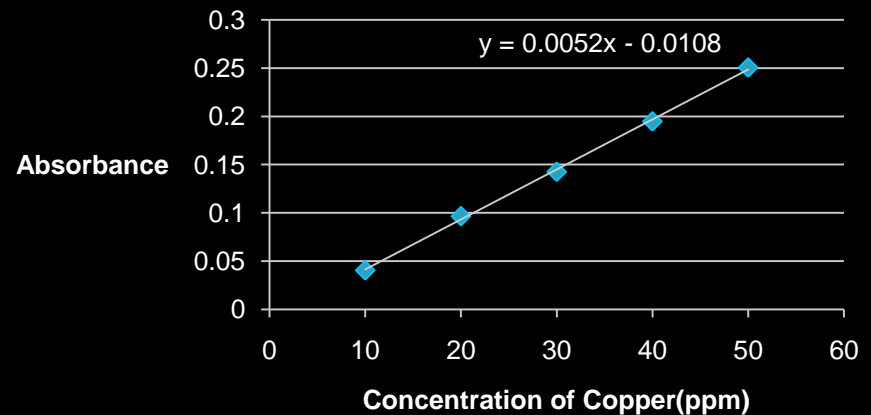
- Process of disintegrating a sample and passing light through the molecules of the sample to show the amount of a certain chemical in the sample
- Limit of Detection 10ppm

⦿ Results

- The Absorbencies from the samples were negative, which meant that the samples either contained copper that was below the limit of detection or had no copper in it at all.



Absorbance vs Concentration of Copper(ppm)



Sample Testing

● Bacterial Analysis

- Gram Stain analysis was performed of the condensate sample in Trypticase Soy Agar (TSA) medium and Yeast Extract medium to test for common bacteria found in AC unit water.

Eg Legionella, Aspergillus



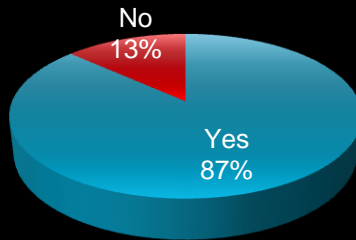
Maintenance of HVAC Units

- Regular inspection of cooling coils to check for refrigerant leaks and external corrosive damage
- Periodic cleaning/ disinfecting of A/C coils and condensate catch pan.
- Assure that the condensate collection unit does not have leaks

Survey Data

A survey was taken of 30 various businesses and commercial sites to determine the public's awareness of condensate collection and use.

Do you know about HVAC Condensate?



Interested in harvesting condensate?



Opportunity to save on utilities?

