

Overview of AHRI Certification Programs and Research Activities

*Karim Amrane, Ph.D.
Vice President, Regulatory and Research
Air-Conditioning, Heating, and Refrigeration Institute*

Who is AHRI?

- Air-Conditioning, Heating, and Refrigeration Institute (AHRI)
- One of the larger trade associations in U.S.A.
 - Representing over 300 HVACR and water heating manufacturers
- Establishes **standards** used globally
 - Over 90 industry standards and guidelines
- Administers rigorous **certification programs**
 - 37 Certification Programs
- **Advocates** policies beneficial to industry
- Represents the industry domestically & globally

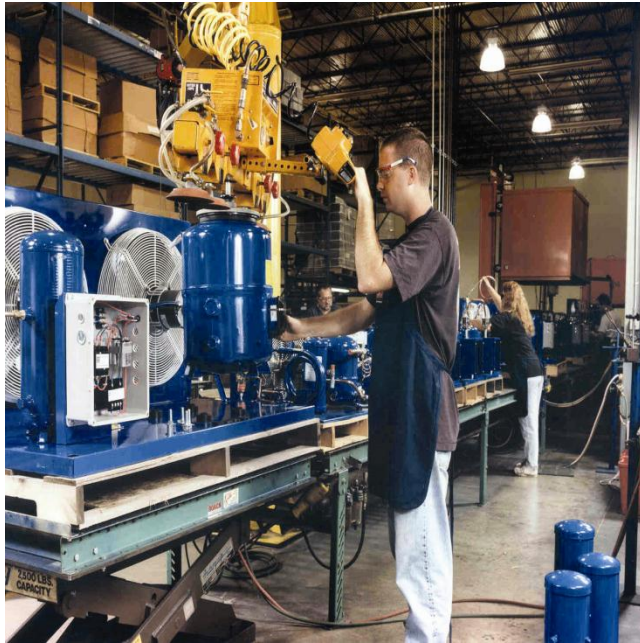


What are AHRI Standards?

- Establish rating criteria for measuring product performance
- Allow products to be rated on a uniform basis
- AHRI standards and guidelines are FREE to download at www.ahrinet.org



What is AHRI Certification?



- A 60 year old program
- AHRI certification programs provide an unbiased assurance of product performance
- Rigorous testing by an independent, third-party laboratory verifies performance ratings



Air-Conditioning, Heating,
and Refrigeration Institute

Independent Laboratories Contracted by AHRI



**Underwriters
Laboratories**



AHRI Certification



- 37 Certification programs
- More than 500 licensees
- More than 3,000 tests per year
- Over \$10 million budget



Equipment Certified By AHRI

- Air-Heating and Air-Cooling Coils
- Central Station Air-Handling Units
- Chillers
- Commercial Refrigerators
- Gas Purge Equipment for Use with Chillers
- Geo-Exchange Heat Pumps
- Energy Recovery Ventilators
- Ice-Makers/Ice Bins
- Liquid-to-Liquid Heat Exchangers
- Pool Heat Pumps
- PTAC/PTHP
- Reclaimed Refrigerant
- Refrigerant Recovery/Recycling Equipment
- Residential & Commercial Furnaces
- Residential & Commercial Water Heaters
- VRF Equipment
- Room Fan-Coils
- Refrigerant Testing Laboratory Certification
- Single Package Vertical ACs and Heat Pumps
- Truck/Trailer Refrigeration Units
- Unit Ventilators
- Residential ACs and Heat Pumps
- Large Commercial ACs and Heat Pumps
- Variable Air Volume Terminals
- Water Source Heat Pumps
- Residential & Commercial Boilers
- Finned Tube Radiators
- Baseboard Heaters
- Indirect Fired Water Heaters
- Direct Heaters

Performance Certification Programs

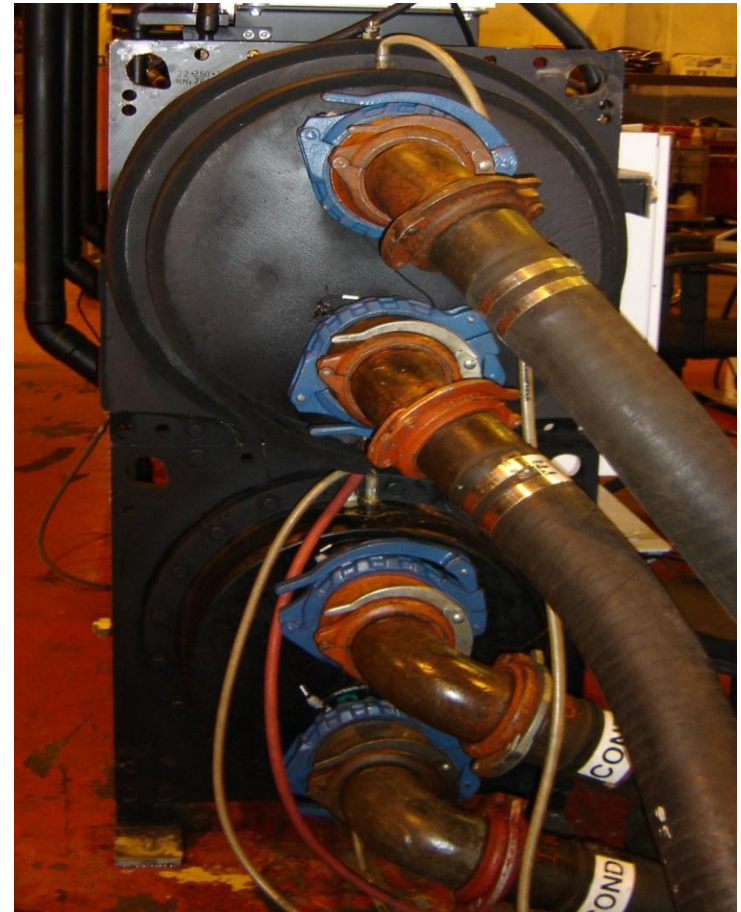
- Certify descriptors like:
 - Capacity
 - Power Consumption
 - Energy Efficiency
 - Pressure Drop
 - Purity of refrigerants
- Use recognized industry test standards
- Verify manufacturer's performance ratings through extensive and continuous testing



Globally Recognized. Industry Respected.

Certification: a Rigorous Process

- Companies submit certifiable ratings
- AHRI randomly selects units
- Certification tests performed by independent lab
- Results compared to submitted data
- Results Published in Directory
- www.ahridirectory.org



Important Provisions of a Credible Program

- Independent Testing
- All Eligible Products Certified
- Basic Model Groups
- Random Selection Process
- Test Failures and Revised Ratings
- Challenge Testing
- Qualification Process

Maintaining Program Integrity

- Certifying body accredited to ISO Guide 65 “*General Requirements for Bodies Operating Product Certification Systems*”
- Open and transparent process
- Regular process improvement



Value of AHRI Certification to Manufacturers

- Provide level playing field for manufacturers
- Voluntary participation
- Facilitate compliance with government efficiency standards



Value of AHRI Certification to Governments and Regulatory Agencies

- Performance certification is key to ensuring accurate manufacturers' data
- Global economy makes certification programs more important
 - Allows closer review of imported equipment
- Vital part of Energy Efficiency Policy
 - Increasingly demanded by regulators, policy makers, and consumers concerned about performance



Value of AHRI Certification to Specifying Engineers/Consumers

- Assurance that steps have been taken in the interest of performance and energy efficiency
- Enable fair product comparisons
- Verify compliance with design or performance criteria
- Provide consumers confidence



Certificates of Performance

- Proof of the performance of a product
- Assurance of compliance with building codes and LEED specifications
- Guarantee to building owners



AHRI CERTIFIED
www.ahrincert.org

Certificate of Product Ratings

AHRI Certified Reference Number: 3016870 Date: 05/2010 Status: Active

Product: Forced Circulation Air-Cooling and Air-Heating Coils
Coil Type or Line Designation: ZCHW13.ZCHW15.ZCHW12
Manufacturer: ZECC AIRCOIL INDUSTRIES PVT. LTD.
Trade/Brand Name: ZECC

Rated as follows in accordance with AHRI Standard 415-2001 for Forced Circulation Air-Cooling and Air-Heating Coils and subject to certification of rating accuracy by AHRI approved, independent, third party testing:

Fluid(s) Used: Cooled Water: Hot Water:
Catalog Number: Catalog Issue Date/Code: Software Version Number: Coil Area (square ft):

AHRI CERTIFIED

I Model(s) with an "Active" status are those that are currently in production. Model(s) with a "Discontinued" status are those that the manufacturer has elected to stop producing, yet stock is still available. Model(s) with an "Obsolete" status are those that the manufacturer is required to stop manufacturing due to an AHRI certification program requirement.

DISCLAIMER
AHRI does not express the product rating on this Certificate and makes no representation, warranty or guarantee as to, and declines its responsibility for, the product's value or this Certificate. AHRI expressly disclaims its liability for damage of any kind arising out of the use or performance of the product, or the unauthorized alteration of data used on this Certificate. Certificate ratings are valid only for models and configurations listed in the directory of data accompanying this Certificate.

TERMS AND CONDITIONS
This Certificate and its contents are property of AHRI. This Certificate and its contents may be used by individuals, persons and companies without payment. The contents of this Certificate may not be used in any way to promote, advertise, or otherwise claim, in any form or manner or by any means, except for the user's individual, personal and confidential references.

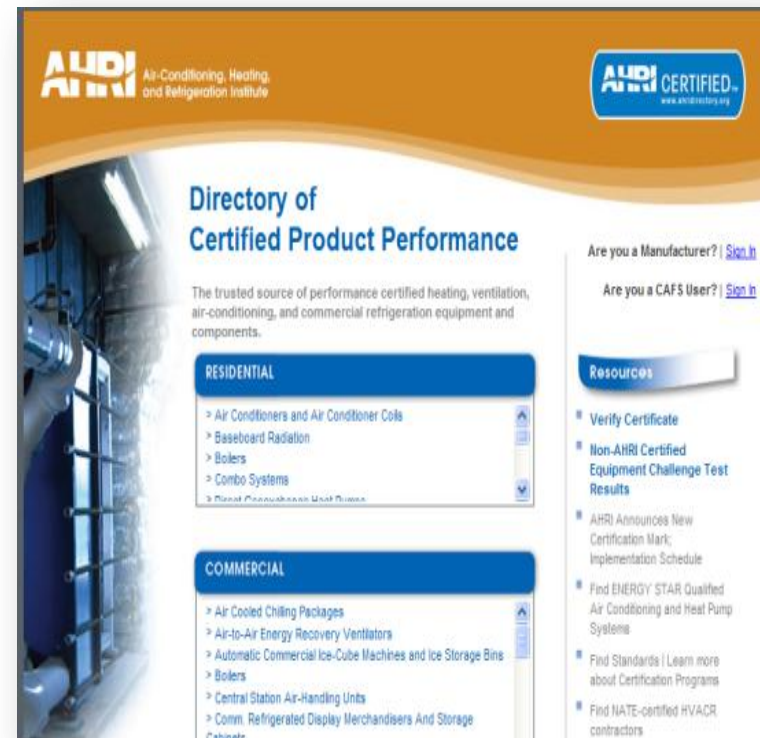
CERTIFICATE VERIFICATION
The information for the model data on this Certificate can be verified at www.ahrincert.org click on "Verify Certificate" link and enter the AHRI Certificate Reference Number and the date on which the certificate was issued, which is listed above, on the Certificate No. - which is listed below.

AHRI Air-Conditioning, Heating, and Refrigeration Institute

2010 Air-Conditioning, Heating, and Refrigeration Institute CERTIFICATE NO.: 1320H0094-0103

AHRI Directory of Certified Products

- Provides over 500,000 certified performance ratings for 37 products
- Real-time data
- Identifies tax credit eligibility
- Facilitate utility company's rebate programs
- Source of data for DOE, CEC, ENERGY STAR, NRCan, CEE
- Official CEC directory for mini split central AC & HP with multi- or variable-speed compressors



www.ahridirectory.org



Air-Conditioning, Heating,
and Refrigeration Institute

AHRI Research

Research Programs

- AHRI Programs - Private Sector Research
 - Projects funded by AHRI members
 - Supports AHRI core function

- AHRTI Programs - Public Sector Collaborative Research
 - Projects co-funded with state or federal “public” funds

AHRI Research Program

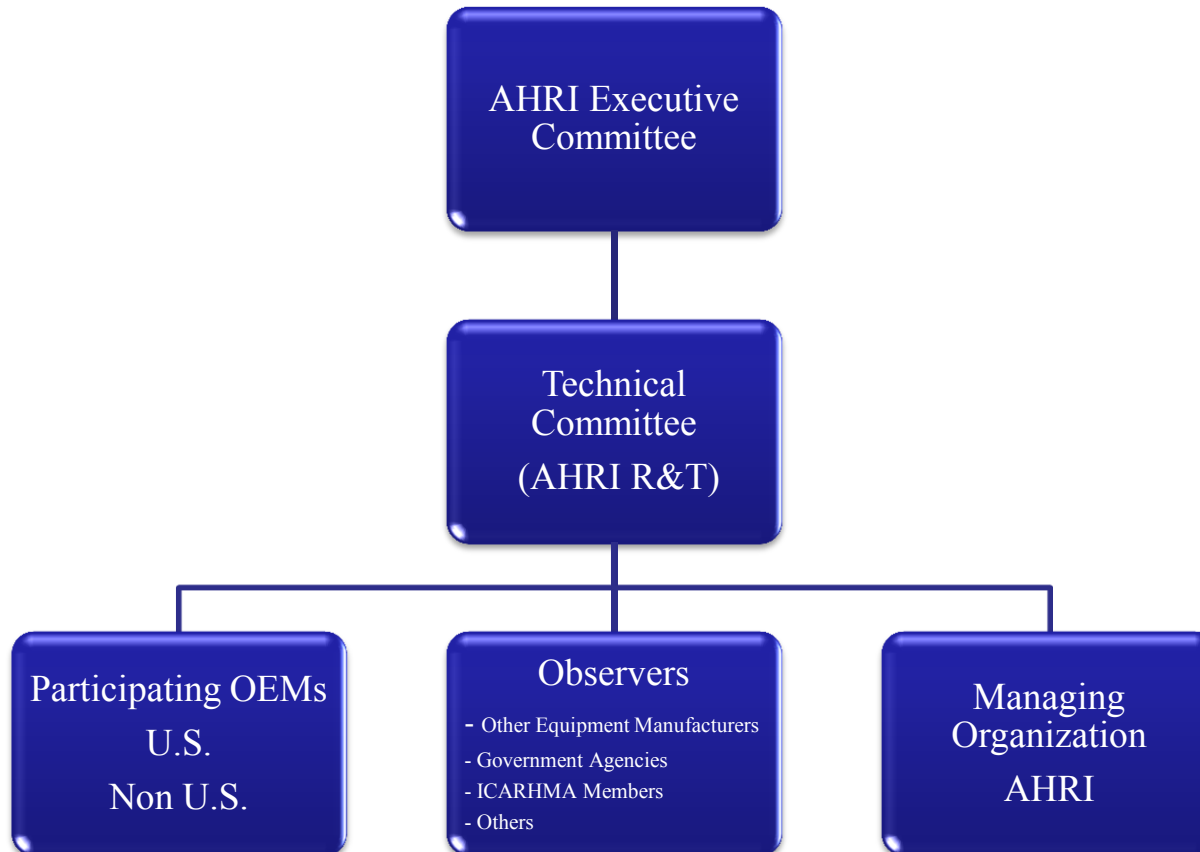
- Established in 1989 (by ARI)
- Focuses on pre-competitive research
- Supports AHRI advocacy positions, standards, and certification
- Past programs
 - Materials Compatibility and Lubricant Research (MCLR)
 - 1991-2001; 47 projects; \$10.8 million
 - Alternative Refrigerant Evaluation Program (AREP)
 - 1992-1997; managed by ARI; In-kind contributions
 - Total of 39 North American, European and Japanese equipment manufacturers participated
 - HVAC&R Research for the 21st Century (21CR)
 - 1999-2007; 45 projects; \$8.7 million

Low-GWP Alternative Refrigerant Evaluation Program (Low-GWP AREP)

- Cooperative research program to identify suitable alternatives to high GWP Refrigerants
- Research strongly desired by OEMs
 - Assess research needs
 - Accelerate industry's response to environmental challenges
 - Avoid duplicative work
- Objectives
 - Identify low GWP alternative refrigerants
 - Establish testing protocols
 - Conduct tests
 - Publish results



Low-GWP AREP – Management Structure



Proposed Refrigerant Candidates for Testing

Baseline	A1 Choices	A2L Choices	A3 Choices	Other
134a	ARM41a, D4Y, N13a, N13b, XP10, AC5X	R1234yf, R1234ze, ARM42a, AC5	40%290+60%600a 600a	
404A	ARM32a, N40a, N40b, DR-33	ARM31a, ARM30a, D2Y-65, DR-7, L40, 50%R32+50%134a, R32,	<u>R290</u>	<u>R744</u>
410A		R32, ARM70a, D2Y-60, L41a, L41b, 95%R32+5%134a, 95%R32+5%R152a, DR-5, HPR1A		R744
22/407C	N20, <u>ARM32a</u> , LTR4X	L20, D52Y, LTR6A	R290	R1270, R717

Note: Underline means candidates apply to multiple baselines. The Low-GWP AREP TC invites submission of existing test results or test plan to fill known gaps for the refrigerants listed in “Other” category.

Low-GWP AREP Testing Program

- Establish standard test protocols and conditions for comparative performance testing
 - Compressor calorimeter test
 - Drop-in system test
 - Soft optimization test
 - Heat transfer test (at a later stage)
- Participating equipment manufacturers
 - Divide up performance testing workload for candidate refrigerants in various types of equipment
 - Conduct in-house testing
 - Share performance data with other participants using standardized data summary formats

Test Plans Submission (21 companies)

U.S. Companies

- Carrier Corporation
- Climate Master
- Emerson Climate
- Follett
- Hussmann
- Johnson Control, Inc.
- Lennox International
- Manitowoc Ice, Inc.
- McQuay International
- ORNL
- Tecumseh Company Co.
- Thermo King/Ingersoll Rand
- Trane/Ingersoll Rand
- University of Maryland

International Companies

- ARMINES-MINES ParisTech
- Daikin Industries Ltd
- Embraco (Brazil)
- Embraco (Slovakia)
- Friterm
- Midea
- Shanghai Hitachi

Program Timeline

- Receive proposed refrigerants information by 6/15/2011
- Completion of handbook by 6/15/2011 via teleconference
- Review a draft letter for solicitation for testing by 6/15/2011 via teleconference
- Selecting refrigerants by 7/20 via face-to-face meeting
- Solicitation for testing by mid August
- Submission of testing schedule and plan by 9/30
- Review testing plans 9/1~11/1 (on a rolling basis)
- Completion of selecting testing companies, prioritize the test and refrigerant samples by 11/30 via face-to-face meeting
- Notification of selected testing companies, by 12/15
- Sign NDA and Start testing by 1/15/2012
- Release interim reports by 7/1/2012
- Completion of first round testing and releasing report, by 11/15/2012

Recently Completed Projects

- *Low Global Warming Potential (GWP) Alternative Refrigerants, Phase I: Review of Regulations and Standards for the Use of Refrigerants with GWP Values less than 20 in HVAC&R Applications (AHRTI-9001)*
 - Comprehensive review of the regulatory issues in the United States (US), European Union (EU), and Japan that are relevant to the application of emerging low-GWP refrigerants.
- *Technical Feasibility Study on Carbon Sensing Systems for Appliances (AHRI-8001)*
- *Thermal Stability and Chemical Compatibility of R-22 Service Replacement Refrigerants (AHRI-8003)*
 - Five potential R-22 service replacement refrigerant blends (R-417A, R-422D, R-424A, R-434A and R-438A) were tested in sealed tubes.

Ongoing Projects

- *Study of Impact of Duct Design on Life Cycle Cost of Residential HVAC Systems (AHRI-8002)*
 - The project is to determine the optimal duct design that minimizes life-cycle cost for a residential air flow system.
 - The project is planned to start early 2012.

- *Risk Assessment of Residential Heat Pump Systems Using 2L Flammable Refrigerants (AHRI-8004)*
 - The project is to use fault tree analysis to conduct risk assessment for residential heat pump systems that use 2L flammable refrigerants.
 - The project is ongoing at Gradient, and expected to be completed in March 2012.

Ongoing Projects

- *Performance Standards for Walk-in Refrigerator and Freezer Systems (AHRTI-09002)*
 - This project is to conduct an in-depth study of the AHRI Standard 1250 and to collect field data to understand the walk-in box load characteristics.
 - The project is expected to be completed in early 2012.

- *Life Cycle Climate Performance (LCCP) Model for HVAC&R Systems (AHRTI-09003)*
 - This project is to establish a standardized methodology to calculate the LCCP of HVACR products and to create a user-friendly calculation tool.
 - The final report and the simulation tool is in review, and will be published at the AHRI website soon.

Ongoing Projects

- *Material Compatibility and Lubricants Research (MCLR) Program for Low GWP Alternative Refrigerants, Phase I (AHRTI-9004)*
 - The study is to focus on thermal and chemical stability test under the scope in the Table.
 - A draft report is currently under review.

Low GWP Refrigerant	HFO-1234yf	Lubricants: <ul style="list-style-type: none"> • POE#1 • POE#2 • PVE with additives 	Sample Conditions: <ul style="list-style-type: none"> • dry condition • air present • water present • both air and water present
	HFO-1234ze		
	R32/HFO-1234yf (50/50 by weight)		
Baseline Refrigerant	R-410A		
	R-134a		

Ongoing Projects

- *Fractionation Apparatus Evaluation (AHRTI-09005)*
 - This project is to assess the usability of a prototype test apparatus and study lab-to-lab variability of measurement results for the proposed ASHRAE Standard 177, Method of Testing for Measuring Fractionated Compositions of Refrigerant Blends.
 - The project is to be completed by December 15, 2011.
- *Novel Materials for Heat Exchangers, Phase II (AHRTI-06030)*
 - The project is to conduct lab measurements to collect the thermal hydraulic performance data of prototype foam heat exchangers.
 - The contractor is working on a draft report.

Projects to be Launched in 2012

- *Material Compatibility and Lubricants Research (MCLR) Program for Low GWP Alternative Refrigerants, Phase II*
 - The Phase II study is to focus on material compatibility test for low-GWP refrigerants.
 - Materials in the following categories may be tested in Phase II.

•Varnishes	•Elastomers	•Iron Phosphatizers
•Sheet Insulations	•Engineering Plastics	•Rust Inhibitors
•Lead Wires	•Desiccants	•Rust Preventatives
•Tapes	•Brazing Fluxes	•Magnet Wires
•Tie Cord	•Coolants	•Sealants

Projects to be Launched in 2012

- *Low Global Warming Potential (GWP) Alternative Refrigerants, Phase II: Defining the Configurations of Residential Air-Conditioning and Heat Pump Systems Using Hydrocarbons, Ammonia, Carbon Dioxide and HFO-1234yf as Refrigerants and Meeting Previously Defined Safety Requirements (AHRI-8006)*
 - The study is to summarize the configurations of air-conditioning/heat pump systems using low GWP refrigerants which can meet regulations, codes and standards' safety requirements, and to explore the feasible design options which allow the safe use of the above-mentioned low GWP refrigerants.

Projects to be Launched in 2012

- *Jointing Techniques Assessment (AHRTI-09006)*
 - This project is to develop a standard method of rating the tightness of different types of joints based on laboratory data and to provide guidelines so manufacturers can reduce leaks from their products by selecting high performing joints.

Current Co-funded Project with ASHRAE

- *Waterside Fouling Performance of Brazed-Plate Type Condensers in Cooling Tower Applications (ASHRAE-1345-RP)*
 - The project is to determine the impact of water-side fouling for brazed-plate heat exchangers (BPHEs) and to develop the correlations of fouling data for BPHEs.

- *Energy Efficiency and Cost Assessment of Humidity Control Options for Residential and Small Commercial Buildings (ASHRAE-1449-RP)*
 - The objective is to assess the humidity control approaches for residential buildings by developing appropriate simulation tools.

Current Co-funded Project with ASHRAE

- *Balancing the Latent Heat Load between Display Cases & Store Comfort Cooling (ASHRAE-1467-RP)*
 - This project is to provide a comprehensive assessment of energy savings potential in supermarkets by optimized design and operation of the combined HVAC and refrigeration systems.
- *Binary Refrigerant Flame Boundary (ASHRAE-1507-RP)*
 - The project is to develop a data base of pertinent binary flammability results and predictive methodology.

Current Co-funded Project with ASHRAE

- *Study of Input Parameters for Risk Assessment of 2L Flammable Refrigerants in Residential Air Conditioning and Small Commercial Refrigeration Applications (ASHRAE-1580-RP)*
 - The project is to develop critical input data for 2L refrigerants which can be used in risk assessments.

- *Assessments of Burning Velocity Test Methods (ASHRAE-1583-RP)*
 - The project is to critically evaluate two different burning velocity test methods to determine the precision and accuracy, to simplify test method and to reduce cost without sacrificing quality.

Current Co-funded Project with ASHRAE

- *Assessment of Alternative Approaches to Predicting the Burning Velocity of a Refrigerant (ASHRAE-1584-RP)*
 - The objective of this project is to determine if there are less expensive but reliable alternative methods to calculating refrigerant flame speeds to direct measurements.

Thank you for your attention!

