

# CAYLOR ENGINEERING & ASSOCIATES, PLLC

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## JIM CAYLOR, PE SUMMARY

I am an independent consulting mechanical engineer specializing in NH<sub>3</sub> and CO<sub>2</sub> refrigeration systems used in process and cold storage applications. My areas of emphasis are:

- System design and design review (owner's agent).
- Code review (IIAR, IFC/IMC, ASME B31.5, ASHRAE Std 15, OSHA and EPA).
- Forensic analysis and expert consultant/expert witness.
- Operational analysis.

I spent my first 15 years in the refrigeration business as a service and startup technician, including a UA steamfitter apprenticeship, 11 years in the industrial field and the final 8 years self-employed as Caylor Refrigeration. I then returned to college and graduated from Arizona State University in 2000 with a BSME. I worked as a project engineer for two design/build contractors and became a PE before moving to 'Tyson Foods' corporate design group in 2005. I joined Jacobs Engineering's Food and Beverage Group in 2007 as a senior project engineer, finished there in 2013 as Deputy Director over all refrigeration projects and opened my consulting firm in 2014.

Clients include Leprino Foods, Safeway, Dreyer's, Tyson, ConAgra, Unilever, Nestlé, Imperial Irrigation District, Lineage Logistics and Grupo Kuo (Kekén).

- I designed a dedicated refrigeration system for Leprino Foods that served a process granulated cheese freezer operating at -63°F, a spiral freezer and high temperature loads.
- Tyson work included process freezer design/analysis, par-fry-to-cooked plant conversions, vessel certification negotiations, internal code reviews and specification revisions.
- Principal Nestlé projects included:
  - A design package for a 2,000 TR -45°F recirculator of 14' Ø x 58' OAL, existing equipment demolition and LTRS/LSS branch relocation to new 24" vessel mains.
  - A new NH<sub>3</sub>/CO<sub>2</sub> cascade refrigeration system serving a 400 TR variable retention time freezer, 600 TR of other freezers and multiple hygienic process HVAC units.
- The Imperial Irrigation District project was a joint effort with another engineering firm to improve performance of a 4,500 TR gas turbine inlet air cooling plant. The design involved suction protection vessels, S&T chiller liquid control revisions and air-cooled condenser modifications to handle 115°F ambient air design conditions.
- I reviewed the design of a 3,800 TR pork processing plant in Mérida, Yucatán, MX for Kekén (Grupo Kuo), created an overall BFD and MEB and provided recommendations concerning a 725 TR Snap-Chill carcass chiller by Danish Meat Research Institute, a 500 TR carton freezer and multiple evaporative condensers' SRV protection.

I have been retained in nine expert consultant cases, including two depositions. Six of these were resolved to my clients' satisfaction and three are currently preparing for trial. Their issues have included OSHA and EPA citations, OEM and contractor deficiencies, refrigerant explosion and personnel fatality.

## EDUCATION

- **BSME, Arizona State University** 1992 – 2000

## EXPERIENCE

- **Caylor Engineering & Associates, PLLC** 2014 – present
  - Industrial refrigeration consulting engineer & principal
  - Design and design review
  - Code review
  - Forensic expert witness
  - Operational analysis
- **TranSystems** 2013 – 2014
  - Refrigeration Team Leader
- **Jacobs Engineering Group** 2007 – 2013
  - Deputy Director, Food & Beverage Group
  - Refrigeration Discipline Leader
- **Tyson Foods, Inc.** 2005 – 2007
  - Corporate Sr. Project Engineer
- **Applied Process Cooling Corp (APCCO)** 2001 – 2005
  - Project Engineer
- **Caylor Refrigeration** 1984 – 1992
  - Industrial refrigeration service technician
- **Hussmann Refrigeration** 1979 – 1984
  - Commercial & industrial refrigeration service technician
  - UA steamfitter apprenticeship

## ASSOCIATIONS

- **ASHRAE** 2000 – present
  - Standard 15, TC 10.1, TC 10.3 (chair) & TC 10.5 committees
- **ASME** 2019 – present
  - B31.5 Refrigeration Piping committee
- **IIAR** 1984 – 2020
  - Standards, Code & Government Relations committees
- **IIR** 2020 – present
- **RETA** 1983 – present
  - VP of SF Bay chapter (1985), President of Phoenix chapter (1991)
  - *Evaporator Leaks & Suction Control Valves*, 2018 conference

## REGISTRATION

- AR, AZ, CA, CO, GA, IA, IL, MS, NC, OK, TN, TX; NCEES Record 2005 – present

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## JIM CAYLOR, PE

### EDUCATION & TRAINING

Salinas Valley Ammonia Safety Day	2020
IRC Research & Technology Forum, Madison, WI	2006, 2011, 2018, 2019
York Industrial Refrigeration School, York, PA	2003
BSE in Mechanical Engineering, Arizona State University, Tempe, AZ	1992 – 2000
IIAR/RETA Industrial Refrigeration School for Users, San Jose, CA	1986
IIAR Industrial Refrigeration Workshop, Urbana, IL	1984
Steamfitter apprenticeship, UA Local #342, Concord, CA	1978 – 1982
Welding and machine tool courses, Diablo Valley College, Pleasant Hill, CA	1974 – 1976
Liberal arts courses, University of California, Riverside and Santa Cruz	1969 – 1971
National Merit Letter of Commendation, Riverside Polytechnic High School, CA	1968

### EXPERIENCE

#### **Caylor Engineering & Associates, PLLC, 2014 – current**

##### **Principal**

- Consulting mechanical engineer specializing in industrial refrigeration
  - Confidential – Design consultant for OEM low-charge packaged split refrigeration system, 2021
  - Confidential – Design revisions for OEM 0.5 MW liquid-cooled vehicular battery charging cable, 2021
  - Global Cooling – Expert consultant for OEM in Stirling cycle -80°C lab freezer manufacturing process, Athens, OH, 2020
  - Confidential – Expert consultant for contractor in ammonia fatality, 2020
  - Kekén – Design review of 3,800 TR pork process facility, Mérida, Yucatán, MX, 2019
  - Confidential – Expert consultant for contractor on cooler condensation issues, Huntsville, AL, 2019
  - Ticonderoga GC – Expert consultant on refrigerant fire, Ticonderoga, NY, 2019
  - Anheuser-Busch – Expert consultant to Arent Fox LLP in EPA citation case, 2019
  - Superior Catfish – New NH<sub>3</sub> refrigeration system design for plant conversion from cryogenic process, Macon, MS, 2018
  - Doerle Foods – Consultant for facility MI review, Broussard, LA, 2018
  - Confidential – Expert consultant on freezer coil ruptures, north TX, 2017
  - Peco Foods – Expert consultant for EPA excessive NH<sub>3</sub> usage citations at multiple AL and MS processing plants, 2017
  - CBRE – Consulting engineer for packaged and field constructed ammonia systems in multiple Mondelez plants, 2016

- Arctic Glacier – Expert consultant to Arent Fox LLP in OSHA citation case, 2016
- OK Foods – 10,000 LBH fully cooked spiral freezer and consolidation of existing machinery rooms, Oklahoma City, OK, 2016
- Cargill – Beef process line engineering, Fort Morgan, CO, 2016
- Pilgrim's Pride – PSM task review, Mt. Pleasant, TX, 2015
- Global Foods – Expert consultant in arbitration for Baker Refrigeration, Russellville, AR, 2015
- IID – Engineering partnership to resolve reliability issues on 4,500 TR R-22 GTIAC project, Niland, CA, 2015
- CODA – Assessed 300,000 ft<sup>2</sup> refrigerated warehouse for real estate consulting firm, Riverside, CA, 2014

### **Tyson Foods**

- Sedalia, MO – -60°F spiral freezer operations review, 2017
- San Diego, CA – NH<sub>3</sub>-CO<sub>2</sub> system MEB & SRV-MRV design review, 2017
- Rogers, AR – LTRL liquid transfer issue, CNQ, 2017
- Springdale, AR – Berry St plant-wide SRV-ADT design, 2017
- New Holland, PA – RTE area process HVAC unit, 2017
- Waldron, AR – Ammonia inventory, 2016
- Tarboro, NC – Ammonia inventory and MEB, 2016
- Sanford, NC – HPR SOP, 2016
- Haltom City, TX – Ammonia inventory and MEB, 2016
- San Diego, CA – Owner's expert in cascade HX failure analysis, 2015
- Dallas, TX – Modified HT recirculator suction piping, 2015
- NRH, TX – Plant operations review and MRV, 2015
- Springdale, AR – NH<sub>3</sub> pipe wall loss resolution, 2015
- Carthage, MS – SRV & MRV redesign, 2015
- Vicksburg, MS – Ammonia inventory, 2014

### **Rich Products**

- Hilliard, OH – Bakery ventilation study, 2017
- Brunswick, GA – Bakery ventilation study, 2017
- Crest Hill, IL – Evaluated spiral freezer refrigeration system, 2014
- Brunswick, GA – Designed (3) process fryer ventilation systems, 2014

### **TranSystems Corporation, Fort Worth, TX, 2013 – 2014**

#### **Refrigeration Team Leader, MEP Division, MS 40**

- Discipline SME
  - Unilever – Refrigeration system modifications for dual-circuit scraped surface heat exchangers (SSHE), Chicago, IL, 2013

### **Jacobs Engineering, Fort Worth, TX, 2007 – 2013**

#### **Deputy Director & Refrigeration Discipline Leader, Food & Beverage Group**

- Supervise F&BG refrigeration personnel for a global A&E firm
- Presented review of IIAR 2-2008 piping requirements for IRC, Madison, WI, 2011

### **Nestlé USA**

- Springville, UT – Led -35°F and -45°F LTRL redistribution design, 2012
- Laurel, MD – Led south machinery room redesign, 2012
- Danville, VA – Led heated glycol heat exchanger design, 2012
- Modesto, CA – Led sterilizer cooling water, MRV and SRV replacement design teams, 2012

- Cleveland, OH – NH<sub>3</sub>/CO<sub>2</sub> machinery room design, 2012
- Haverhill, MA – Led chilled glycol process HVAC utility design, 2011
- Gaffney, SC – Led 14' Ø x 58' OAL -45°F NH<sub>3</sub> recirculator design, 2011

#### **Kellogg's**

- Memphis, TN – Led plant-wide air balance pilot project and full scale design project, 2011
- Rome, GA – Assisted in plant-wide process area HVAC ventilation design, 2010

#### **ConAgra**

- Batesville, AR – Led Takeoff Cooler HVAC design, 2011
- Batesville, AR – Led design of North Machinery Room SRV discharge piping and ventilation, 2010
- Marshall, MO – Assisted ConAgra process engineer in process design of 6,000 LBH sauce kitchen, 2008

#### **Miller-Coors**

- Fort Worth, TX – Led Kathabar design project, 2010

### **Tyson Foods, Springdale, AR, 2005 – 2007**

#### **Sr. Project Engineer**

- Design engineer in Tyson Engineering Services, Poultry Refrigeration Design
  - Code review – Led review of Tyson refrigeration code compliance, 2007
  - Dardanelle, AR – Design and installation for (2) Aerofreeze 6,600 LBH sequential defrost spiral freezers, 2006
  - Gadsden, AL – Design for replacement of (8) blast cell and (4) spiral freezer piping mains, 2006
  - Monett, MO – Design for 340 TR process area air conditioning unit, 2006
  - Carthage, MS – Redesigned booster compressor discharge piping and Skaginn process freezer LTRS piping, 2006
  - Pine Bluff, AR – Design for engine room upgrade to (7) 10,000 LBH spiral freezers, 2006
  - Pine Bluff, AR – Design and installation for (1) Aerofreeze 10,000 LBH sequential defrost spiral freezer, 2006
  - Vicksburg, MS – Design for Frigoscandia 8,000 LBH spiral freezer, 2006

### **Applied Process Cooling Corporation, Modesto, CA, 2001 – 2005**

#### **Project Manager/Project Engineer**

- Project manager/project engineer for design/build industrial refrigeration contractor
  - Dreyer's – 700 TR NH<sub>3</sub> ice cream storage, Manteca, CA, 2005
  - Bayer – 240 TR R-407C process glycol chillers, Berkeley, CA, 2004
  - ConAgra – Safety and compliance upgrade, Modesto, CA, 2004
  - E & J Gallo – Operations/energy engineering survey for 4,500 TR NH<sub>3</sub> winery, Modesto, CA, 2003
  - Hershey – 200 TR NH<sub>3</sub> process glycol chiller, Oakdale, CA, 2003
  - Ratto Bros – 1,600 TR NH<sub>3</sub> produce facility, Modesto, CA 2003
  - Leprino Foods – 700 TR two-stage NH<sub>3</sub> system for cheese plant, Ravenna, NE, 2002
  - Safeway – Repiping and restarting of existing NH<sub>3</sub> engine rooms, Denver, CO, 2002
  - Safeway – NH<sub>3</sub> King Air units on mixed load and produce area docks, Denver, CO, 2002

## **Industrial Refrigeration & Boiler Company, Phoenix, AZ, 2001**

### **Project Manager**

- Supervised shop and field crews in piping prefabrication and installation
- Performed material takeoffs and labor estimates from engineering drawings
- Devised Excel spreadsheet to calculate pipe pressure drop
  - Northwind – Piping contractor for 4,000 TR R-22 district cooling plant, Phoenix, AZ, 2001

## **Arizona State University, Tempe, AZ, 1992 – 2000**

### **BSME**

### **Instructor, GateWay Community College, Phoenix, AZ, 1991**

- Designed and taught semester-length industrial refrigeration course to 30 students for Phoenix RETA chapter at GateWay Community College, Phoenix, AZ, 1991

## **Caylor Refrigeration: CA, 1984 – 1989; AZ, 1989 – 1992**

### **Owner and operator**

- Licenses: AZ #087918-006 (L-49); NV #0033215 (C-21a)
- Performed industrial refrigeration service and startup for end users and an OEM, including screw and reciprocating compressor teardowns
  - Smith's Foods – Started 2,000 TR NH<sub>3</sub> ice cream plant, Layton, UT, 1990
  - Mike Yurosek – Started 800 TR NH<sub>3</sub> hydrocooler, Lamont, CA, 1989
  - CSULB – Started 350 TR R-22 TES plant, Long Beach, CA, 1988
  - Chef America – Started 1,500 TR NH<sub>3</sub> food processing plant, Chatsworth, CA, 1987 - 1988
  - M&M – Startup of OEM screw compressor packages, 1987 - 1991
  - Fleming Foods – R-22/R-502 distribution centers in Milpitas/Fremont, CA, 1984 - 1986
  - Rich Pik'd Rite – R-22 fruit processor with seasonal 500 TR R-22 blast freezer and cold storage, Escalon, CA, 1984 - 1986
  - Seven-Up – 500 TR NH<sub>3</sub> bottling plant, San Jose, CA, 1984 - 1986

## **Hussmann Refrigeration, San Jose, CA, 1979 – 1984**

### **Industrial mechanic**

- Performed service and startup on market and industrial refrigeration systems
  - Fleming Foods – R-22/R-502 distribution centers in Milpitas/Fremont, CA, 1982 - 1984
  - Mrs. Smith's – NH<sub>3</sub> food processor with 500 TR blast freezer, San Jose, CA, 1982 - 1984
  - Rich Pik'd Rite – R-22 fruit processor with seasonal 500 TR R-22 blast freezer and cold storage, Escalon, CA, 1982 - 1984
  - Seven-Up – 500 TR NH<sub>3</sub> bottling plant, San Jose, CA, 1982 - 1984
  - Select-Sysco – Started new 200 TR NH<sub>3</sub> plant for existing cold storage, Hayward, CA, 1981
  - TD system – Two-stage R-22 market system with intercooling, liquid subcooling and HG defrost; end users included Lucky Stores, Raley's Markets and Safeway; 1979 - 1982
- Advanced to industrial work and foreman's pay scale (110% of journeyman) in 1982
- Advanced from 50% to 100% of journeyman pay scale after 1 year (1980)

**UA Steamfitters' Local Union #342, Concord, CA, 1978 – 1982**  
**Steamfitter apprenticeship**

**Contra Costa Welding Supply, Concord, CA, 1976 – 1979**  
**Inside sales and machine repair**

- Ran sales counter and maintained all cylinder inventory records
- Repaired electric and gas welding equipment
- Performed annual cylinder inventories at Shell Oil, Shell Chemical, Dow Chemical, Exxon and various PG&E power plants

**Diablo Valley College, Pleasant Hill, CA, 1974 – 1976**  
**Welding and machine tool courses**

**Kenney Refrigeration Service, Riverside, CA, 1972 – 1974**  
**Serviceman**

- Serviced residential and commercial A/C and refrigeration systems
- Installed commercial refrigeration equipment at military bases across the USA

**ASSOCIATIONS**

**ASHRAE** **2000 – present**

- SSPC15 Safety Standard for Refrigeration Systems 2008 – 2019
- CIS Code Interaction Subcommittee 2008 – 2012
- TC10.1 Custom Engineered Refrigeration Systems 2008 – present
  - *Refrigeration Handbook* chapter 2 revisions 2014
- TC10.3 Refrigerant Piping, Controls and Accessories 2015 (chair 2019) – present
  - *Refrigeration Handbook* chapter 2 revisions 2018, 2021
  - *Refrigeration Handbook* chapter 3 revisions 2018, 2021
- TC10.5 Refrigerated Distribution & Storage Facilities 2014 – present
- SPC 64 ...Laboratory Testing...Evaporative Refrigerant Condensers 2009 – 2010

**ASME** **2019 – present**

- B31.5 Refrigeration Piping Committee 2019 – present

**IIAR** **1984 – 2020**

- Standards Review Committee 2005 – 2013; 2018 – 2020
- Standards Review Code Subcommittee 2017 – 2018
- Code Committee 2009 – 2019
- Government Relations Committee 2015 – present

**IIR** **2020 – present**

**RETA** **1983 – present**

- National Conference – *Evaporator Leaks & Suction Control Valves* 2018
- San Joaquin chapter – RETA Book I & II instructor 2004 – 2005
- Consortia trainer – Bakersfield, CA 2002
- Phoenix chapter – First President and founding member 1991
- SF Bay Area chapter – Vice-President 1985
  - RETA Region II conference, Sunnyvale, CA 1985

## REGISTRATION

	<u>PE</u>	<u>COA</u>	<u>Year</u>
• AR	16107	2772	2014
• AZ	67219	21302	2018
• CA	M33246	N/A	2005
• CO	50969	---	2016
• GA	PE039079	PEF006577	2014
• IA	24268	---	2017
• IL	062066107	---	2014
• MS	26121	26219	2014
• OK	28721	7577	2016
• NC	50532	---	2020
• TN	117602	---	2014
• TX	116556	17189	2014
• NCEES Record	57647	---	2014