

**ARC-N**  
NAVI MUMBAI-2025

**ASSOCIATION OF AMMONIA REFRIGERATION, INDIA**

Welcomes you all to

# ARC-N-2025

at  
**Nav Mumbai**

**Date : 31<sup>st</sup> January 2025**  
**Time : 9:00 am To 10:00 pm**

**Venue : Hotel Ramada by Wyndham**  
Millenium Business Park, Sector 2,  
Mahape, Navi Mumbai,  
Maharashtra 400710, India

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Asia's only convention on Ammonia Refrigeration

# ARC-N

31<sup>st</sup> JANUARY 2025 (9:00 AM TO 10:00 PM)  
Venue : Ramada by Wyndham, NAVI MUMBAI, Maharashtra, INDIA

**Technical Presentation and Panel Discussion:**

- Technical Presentation 1:** Pressure Vessel Design Based on ASHRAE 154.  
Dr. Anil Gulnikar, Senior Design Engineer, IIT
- Technical Presentation 2:** Process Safety Management: A necessity for Refrigeration Systems.  
Dr. Anand S. Gore, Technical Director
- Technical Presentation 3:** Reliability with Mechanical and Operational Safety of Liquid Ammonia Circulation Pump.  
Dr. Anand S. Gore, Technical Director

**Panel Discussion:**  
Hydrogen and Synthetic Refrigerants  
Dr. Anil Gulnikar, Senior Design Engineer, IIT  
Dr. Anand S. Gore, Technical Director

**Participation Fee and Membership Fee:** Non Member: Rs. 1500/-  
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100% Ammonia Refrigeration

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**PANEL DISCUSSION:**  
**Right Choice of Refrigerant for Cold Storage**

- Co-ordinator:** Mr. Anil Gulnikar
- Panelist:**
  - Mr. Haresh Rupchandani
  - Mr. Anand Joshi
  - Mr. Sudhir Kumar
  - Anish Simha

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**Anil Gulnikar – AAR President**  
**DAG-TECH Services**



**Introduction:**

- Anil D Gulnikar is currently President of Association of Ammonia Refrigeration (AAR) & Director of ammonia refrigeration consulting and auditing firm "DAG-TECH-SERVICES" based out of Pune, India.
- An Electrical engineer by profession, he has an industry experience spanning 37 years with leading multinationals such as Kirloskar, Sabroe / York, Allana, India /IFCCO, UAE.
- He has had exposure to various International and national industry sectors
- He has presented technical papers at IIR conference in year 2013/ 2015/ 2017 & 2019 at Macedonia, IIR conference at USA 2014, and 2016. He is a regular speaker/ Trainer in Indian refrigeration industry forums. He has also been speaker in Asia Cold Chain Show, Bangkok.
- He is member of AAR, ASHRAE, & ISHRAE.

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**Haresh Rupchandani – AAR President Elect**  
**Director – Fluidus Technology, Pune**



**Introduction :**

- Over 35 years of professional experience in Industrial Refrigeration covering Sales, Engineering, Customer Relationship, Product Management with technology leaders York, Frick, USA, Sabroe and Mayekawa.
- Continuing to serve the industry with an independent business venture and working towards benefit of ammonia refrigeration industry.

**Professional Experience**

- Sr. G.M. (LoB Head), Industrial Refrigeration, at Johnson Controls India P. Ltd.
- Senior Manager at Mycom Refrigeration India P. Ltd.
- Manager- Marketing at YORK India Limited (SABROE Refrigeration)


**Volunteer Experience**

- Past President at Association of Ammonia Refrigeration (AAR), India – 2015
- President Elect at Association of Ammonia Refrigeration (AAR), India – 2025

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**Anand Joshi- AAR Past President**  
**Manik Engineers**




**Introduction:**

- Working with Manik Engineers since 1991
- Designation- Sales and Marketing Global Head at Manik Engineers
- Past President Association of Ammonia Refrigeration
- Member of American Society of Heating Refrigerating and Air Conditioning Engineers (ASHRAE) USA
- Past President (2008-09) Indian Society of Heating Refrigerating and Air Conditioning Engineers, (ISHRAE) Pune Chapter
- Member of Indo German Chamber of Commerce
- Member Indian Institute of Electronic and Telecommunication Engineers
- Member Indian Dairy Association
- Member RATA
- Founder of ASHRAE Pune Chapter

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**Sudhir Kumar – AAR Past President  
Director – Marketing Frick India**



Mr. P Sudhir Kumar is a B.E. Mechanical from Bharathiyar University, Coimbatore, M Tech in Thermal Engineering from Indian Institute of Technology Delhi (IIT)

He is currently Director Marketing in FRICK INDIA LTD, one of leading Equipment Manufacturing Company and Turnkey Solution Provider for all Industrial Refrigeration Applications in Dairies, Cold Storages, Fish, Meat, Chicken Freezing Plant, Chilling plants, BOG and special application Projects. He has an Experience of 33 years in the field of Industrial Refrigeration and Air Conditioning, worked in various capacity in the organization at Delhi, Chennai and Mumbai.

He is the past president and founder member of Association of Ammonia Refrigeration. He is a regular Presenter for BEE, AAR, NHB, IACC, ICC and CII on Energy Efficient of Refrigeration System. He is also a member of the CII Southern Region Agriculture & Food Processing Subcommittee.

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**Anish Simha - AAR Past president  
Rinac India Limited**



Mr. Roddam Anish Simha -- B.E. Mech., based out of Bangalore.

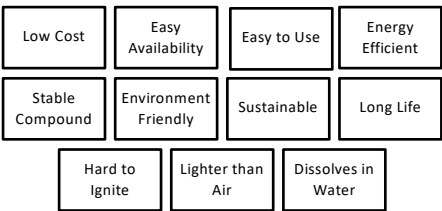
**Professional Experience**  
30 Yrs in Refrigeration and Cold Storage Industry, 25 years with Rinac India Limited., currently AVP and Head, Rinac Centre for Excellence and Training. Previous Experience in Business Development in field of Refrigeration and Cold Storages, Cold Warehouses, IQF, ASRS, turnkey solutions etc. Experience in Other Organization : ETA Engineers Pvt Ltd., Bangalore and Airtron Bangalore

**Past President – Association Of Ammonia Refrigeration**  
ASHRAE Bangalore Chapter - Past President.  
Past - National Chair, ISHRAE Refrigeration Committee  
ISHRAE Technical Committee Chair for Refrigeration  
Past Treasurer and Refrigeration Chair – ISHRAE Bangalore Chapter  
NSC Member for REFCOLD Ahmedabad, Hyderabad and New Delhi – ISHRAE HQ  
Member ISHRAE HVAC Data Handbook Committee, Second Edition  
Committee Member and Chair for Refrigeration ACREX 2018  
Conducted training programs for AAR, ISHRAE and ASHRAE Bangalore Chapters at One Day Seminar, ISHRAE School of Excellence, Engineering Colleges etc.

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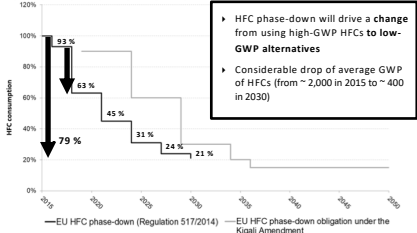
**Selecting appropriate Refrigerant**



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**HFC phase-down as core measure**



HFC phase-down will drive a change from using high-GWP HFCs to low-GWP alternatives  
Considerable drop of average GWP of HFCs (from ~ 2,000 in 2015 to ~ 400 in 2030)

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**Facts about Ammonia as a refrigerant.**

- GWP level

Refrigerant	ODP	GWP
Ammonia	0	< 1
R-22	0.055	1810
R-134a	0	1430
R-404A	0	3900
R -407 c	0	1650
R-410A	0	2100

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**Advantage ammonia**

- Ammonia has lower molecular weight and high evaporation enthalpy. This leads to smaller pipe size and much reduce cost of valves and fittings
- Example -20/40 evp / cond. temp. 509 kW capacity the pipe sizes are as below

item	Ammonia R- 717	R404a
Liquid line	50 NB	125 NB
Suc line	100 NB	150 NB
Discharge line	65 NB	100 NB

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The comparative refrigerant performance per of refrigerant @ -6.7/30 Deg. C EVP/Cond temp. (ASHRAE Fundamental 2013 table 8 page 29.8)

Refrigerant	Evp. Pr. MPa	Cond. Pr. MPa	Comp. Ratio	Ref. effect kJ/kg	Power consum kW	C.O.P.
<b>Ammonia</b>	<b>0.235</b>	<b>1.162</b>	<b>4.94</b>	<b>1103.1</b>	<b>0.210</b>	<b>4.76</b>
R-22	0.295	1.187	4.02	162.67	0.214	4.66
R134 a	0.163	0.767	4.71	148.03	0.216	4.6
R 410 A	0.478	1.872	3.92	167.89	0.222	4.41
R 404 A	0.365	1.42	3.89	114.15	0.237	4.21
CO2	2.254	7.18	3.19	133.23	0.192	2.69

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Refrigerant comparison

Sr. No	Item	R134a	R404a	R407c	Ammonia
1	Classification	HFC	HCFC	HCFC	
2	Composition	C2H2F4	R125 60% + R2902% + R-22 38%	R-32 23% + R-125/26% + R-134a 5%	NH3
3	GWP	1430	3900	1650	less than 1
4	ODP	0	0	0	0
5	Phase out status in Europe	2040	2030. In Europe already banned	2030	No phase out as natural refrigerant
6	COP compressor -4 evap. 52 condensing air cooled	2.4	2.1	2.3	3.9
7	Availability of Gas	will have scarcity	and cost will increase	due to phase out	ALWAYS AVAILABLE
9	+20 evaporation temp fall under operating envelop. (Yes/ NO)	Yes	No	No	YES
9	Gas top up in case of gas leak	Not blend so can be top up. Saves operating cost	Blend. Can not be top up. We have to remove entire gas in case of small refrigerant leak.		TOP UP POSSIBLE
10	Refrigerant cost INR /kg	400	355	330	75
11	Operating pressure kg/cm <sup>2</sup> g at 52 condensing temp	12.79	22.9	19.8	14.8

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Energy saving ammonia v/s R-404 for frozen store approx 10000MT . With Refrigeration capacity of 630 kW

Sr. No	Item	Unit	Ammonia water cooled . 5K suction super heat system C	Freon air cooled	Freon. two stage recip water cooled
1	Evp/Cond temp	Deg C	-25/40	-25/52	-25/40
2	COP		2.44	0.97	1.52
3	Assume 630 kW refrigeration capacity for a frozen CS . then shaft power will be	kW	258.70	648.06	414.55
4	Extra kW over ammonia	kW	0.00	389.36	155.85
5	% extra power for R-404a	%	0.00	80.08	37.60
6	Number of hr idlay	hr	15	15	15
7	No of days in a year	days	365	365	365
8	Electrical cost of unit	days	12	12	12
9	Total extra cost in year for R-404a	INR		2,55,81,249	1,02,36,627
10	Total extra cost in 20 years for R-404a	INR		51,16,24,974	20,47,92,544

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Refrigerant phaseout and new replacement refrigerants

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Applications of new synthetic refrigerant and Ammonia refrigerant

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Challenges

- Toxicity
- Flammability
- Chemical hazards
- Availability of refrigerant and Oil
- Type of oil used
- Ease of Oil separation
- Operator requirement
- Unmanned automatic operation

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### Economical consideration

- Cost of refrigerant & Oil
- CAPEX & OPEX & Life cycle cost

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### Myths regarding government regulations

- Government regulation and myths for use of Ammonia as a refrigerant for cold storage and food processing plant

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### Conclusion

- In India Ammonia refrigerant is the only refrigerant suitable from energy efficiency , sustainability, ease of operation, and considering life cycle cost for 20 years life of the plant

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**धन्यवाद**

**See You Soon at**

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