Compressed Air Systems for Cheese Manufacturing

Frank Melch
Zorn Compressor & Equipment
Keynote Speaker

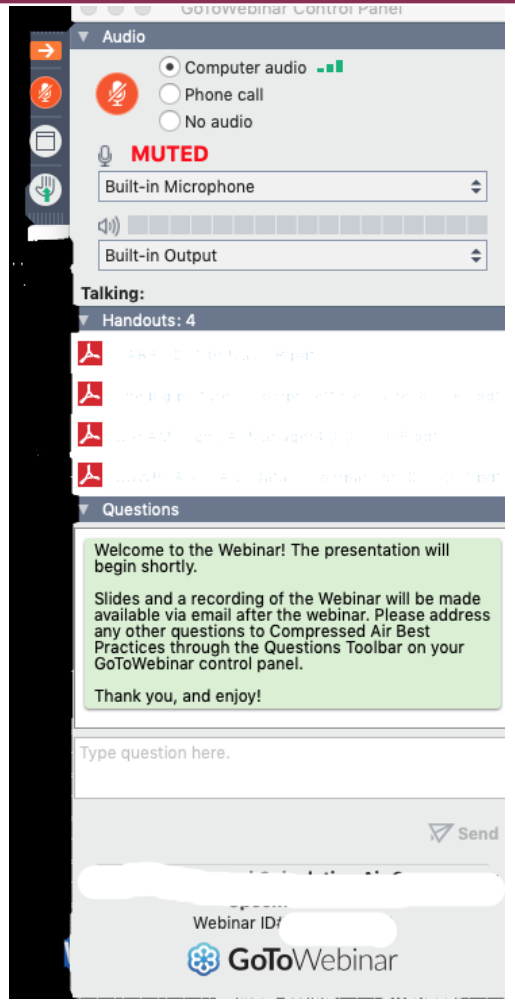
Sponsored by

Quincy COMPRESSOR
Performance You Demand. Reliability You Trust.

The recording and slides of this webinar will be made available to attendees via email later today.

PDH Certificates will be e-mailed to attendees within 2 days

Q&A Format



- Panelists will answer your questions during the Q&A session at the end of the Webinar.

- Please post your questions in the Questions Window in your GoToWebinar interface.

- Direct all questions to Compressed Air Best Practices® Magazine

Sponsored by

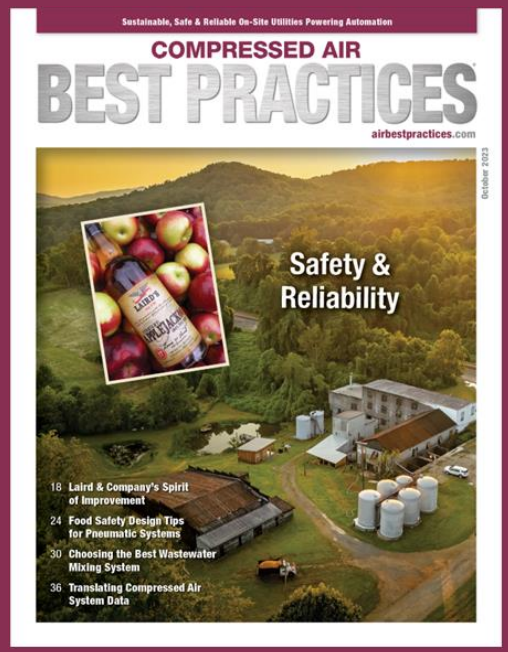
Quincy COMPRESSOR

Performance You Demand. Reliability You Trust.

COMPRESSED AIR BEST PRACTICES airbestpractices.com

BEST PRACTICES EXPO & CONFERENCE CABPEXPO.COM
COMPRESSED AIR / VACUUM / COOLING

Handouts



COMPRESSED AIR
BEST PRACTICES
airbestpractices.com

BEST PRACTICES
EXPO & CONFERENCE CABPEXPO.COM
COMPRESSED AIR / VACUUM / COOLING

Disclaimer

All materials presented are educational. Each system is unique and must be evaluated on its own merits.

CAGI CCASS Exam Offered at Best Practices EXPO!

ONLY $275 (discounted from $450) plus receive a discount code for $275 off a conference/expo hall pass!

At the end of the webinar, we are having a fun contest for a chance to win a free full conference pass valued at $675!

EARLY BIRD RATES END OCTOBER 2nd

cabpexpo.com

CAGI CCASS Exam Schedule at the Best Practices 2023 EXPO & Conference

Monday, October 23, 2:00 pm
Tuesday, October 24, 2:00 pm
Wednesday, October 25, 8:30 am & 2:00 pm

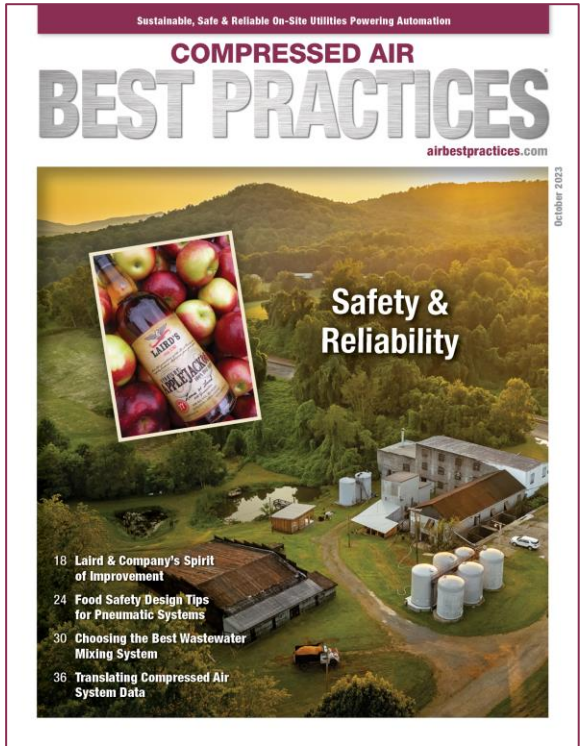
COMPRESSED AIR BEST PRACTICES airbestpractices.com

BEST PRACTICES EXPO & CONFERENCE CABPEXPO.COM
COMPRESSED AIR / VACUUM / COOLING

Compressed Air Systems for Cheese Manufacturing

Introduction by

Compressed Air Best Practices® Magazine



Sponsored by

Quincy COMPRESSOR

Performance You Demand. Reliability You Trust.

COMPRESSED AIR BEST PRACTICES airbestpractices.com

BEST PRACTICES EXPO & CONFERENCE CABPEXPO.COM
COMPRESSED AIR / VACUUM / COOLING

About the Speaker

Frank Melch
Zorn Compressor & Equipment

- Vice President of Sales & Marketing, Zorn Compressor & Equipment
- > 40 years of experience in the compressed air industry
- 24 years with Zorn Compressor & Equipment
- DOE Compressed Air Systems AIRMaster+ Qualified Specialist

Sponsored by

Quincy Compressor
Performance You Demand. Reliability You Trust.

COMPRESSED AIR BEST PRACTICES
airbestpractices.com

BEST PRACTICES EXPO & CONFERENCE CABPEXPO.COM
COMPRESSED AIR / VACUUM / COOLING

Cheese Industry

- Global revenues in 2022 were $184 Billion USD (Fortune Business Insights.com)
- US Production of cheese in 2022 was over 13 Billion pounds (Statista.com)
- There are 436 cheese businesses in the US (Ibis World.com)
- The market is varied with a handful of large corporations and many small to mid sized companies

We Like Cheese

Per Capita Consumption in US is 40.2 lbs (statista.com)












COMPRESSED AIR BEST PRACTICES airbestpractices.com

BEST PRACTICES EXPO & CONFERENCE CABPEXPO.COM COMPRESSED AIR / VACUUM / COOLING

Compressed Air Quality in Cheese Manufacturing

- **Internal Discussion Points – Production, Quality Control & Maintenance**
- - Understand your compressed air uses
- - Lubricated vs Oil Free air compressors
  - If lubricated – use food grade lubricant/ coolant
- - Compressed Air Treatment Level: dew point/ filtration/ monitoring
- - Compressed air piping material
- - Compressed air quality testing

- *These should lead to discussions with you Compressed Air Partner*

Compressed Air in Cheese Manufacturing

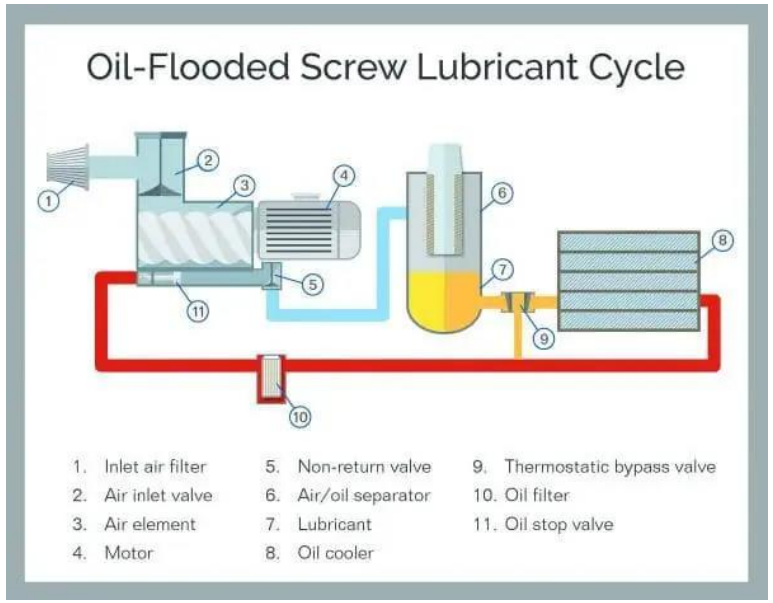
- General pneumatics on production lines: valves, cylinders, actuators
- Starter Tank application
- Bagging/ Prepackaging application
- Conveyor clearing
- Product/ packaging drying
- Brine removal
- In-Plant Nitrogen generation

#1 Examine/ Classify Compressed Air Applications

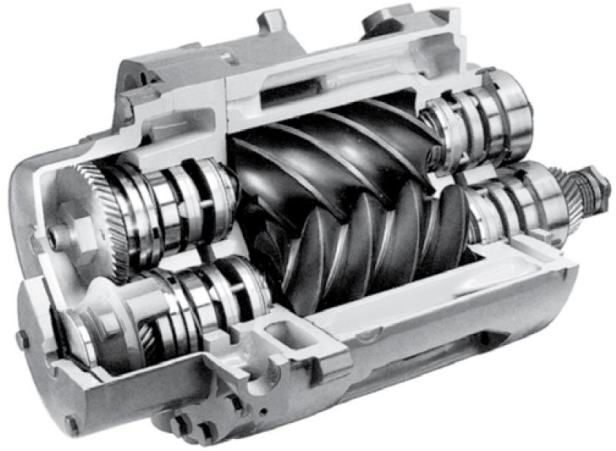
- DIRECT CONTACT with product
- INDIRECT (INCIDENTAL) CONTACT with product
- NO CONTACT with product
- These “traditional” interpretations are being challenged, what are your company’s standards and certifications
- *Compressed Air as a Food Ingredient by Rod Smith

#2 Lubricated (food grade) or Oil Free rotary compressor

- Lubricant is injected into the compression chamber separated, cooled, filtered and re-injected.

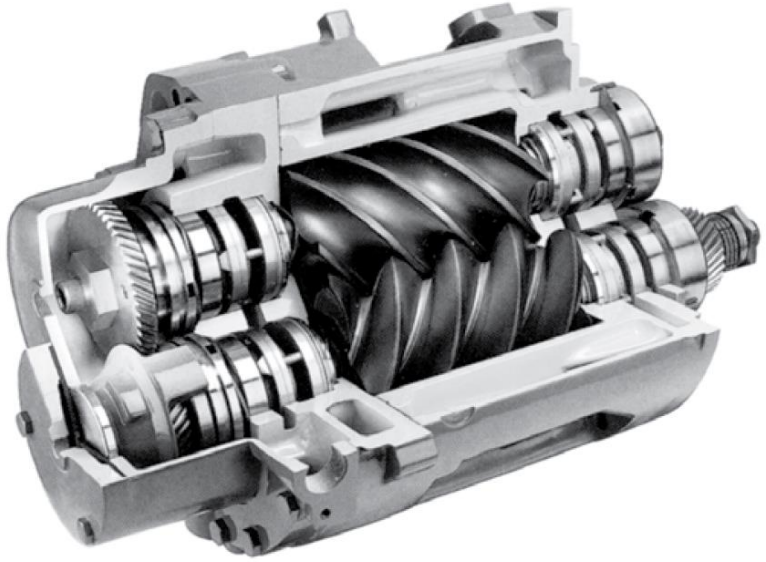


- Oil is used to lubricate bearings and gears but kept out of the compression chamber (air end)



Oil Free rotary air compressors

- Oil is used to lubricate running gear and bearings. Oil is kept out of the compression chamber with a series of seals.
- The rotors are coated to withstand heat
- Typically, hydrocarbon content would only come from ingestion by the air compressor or seal failure



Lubricated Rotary Air Compressor

- There will be oil in the compressed air leaving the compressor package
- The air/ oil separator is the key component for oil separation
- With proper operation, carryover rates are 2 ppm – 5 ppm
- Be aware of the oil scavenge line!

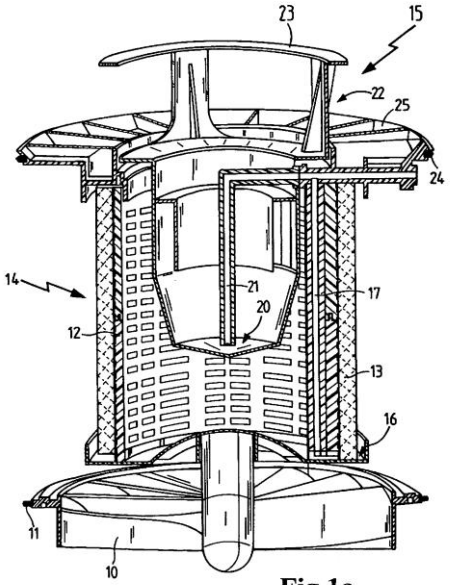
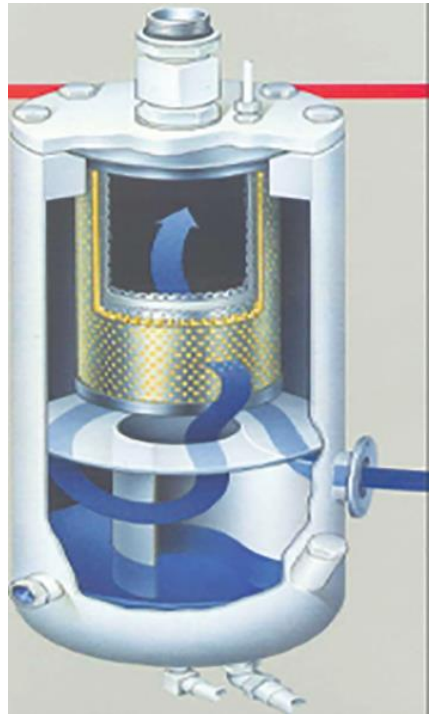


Fig.1a



Potential Oil Content in compressed air – lubricated compressor

Zorn Lubricant loss calculator		
Inputs		
Actual CFM	500	
Actual Hours	4400	
PPM	5	
Lubricant Loss per Year(in gallons):	6.66	

In Line Filtration

- Properly sized and maintained central coalescing filter
  - Typically rated .1 to .01 micron
  - Typically installed after a refrigerated dryer or before a desiccant dryer
  - Sized by expected CFM load
  - Properly operating auto drain on the filter
  - Point of use insurance?

Limiting oil carryover into the Plant – Lubricated air compressor

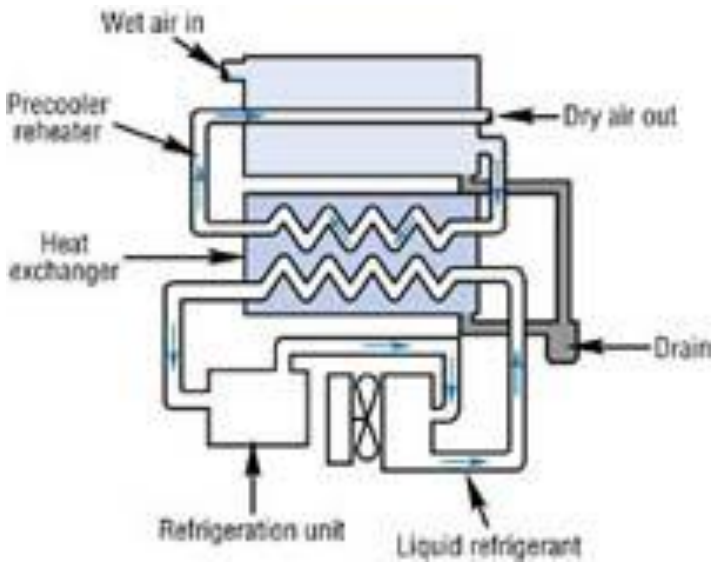
- Diligent maintenance on the air/ oil separator
- Diligent maintenance on the oil scavenge line
- Diligent maintenance on central coalescing filters
- Keeping operating temperatures within spec
- Proper sizing of the compressor – rapid cycling or extended low load run times increase oil carryover

Lubricated vs Oil Free Rotary Screw Air Compressors

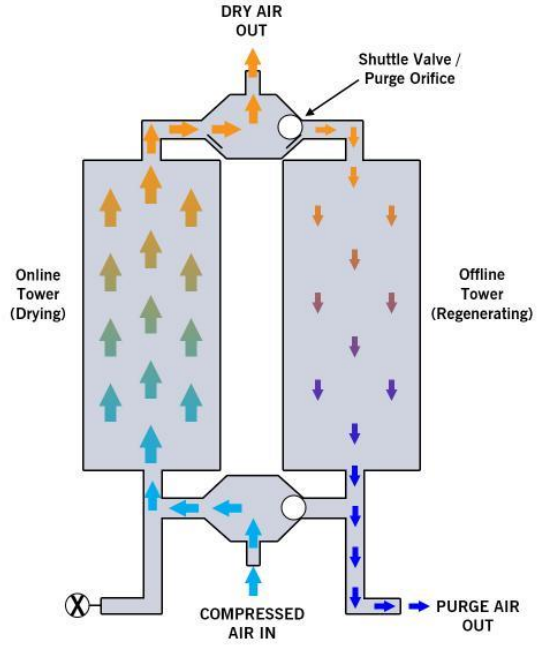
- Oil Free have a higher first cost (2X – 3X) over Lubricated
- Lubricated have higher “planned maintenance” costs
- Oil Free have slightly lower operating efficiencies
- Oil Free have higher air end replacement costs

#3 Refrigerated vs Desiccant compressed air dryer

- Refrigerated dryer cools the C/A condensing water vapor into liquid. The liquid is separated and drained automatically. Typical Dew Point is +40F



- Desiccant dryers use adsorption to “draw” moisture out of the C/A. The moisture remains in vapor state and discharged. Typical dew point is -40F.



Water content in compressed air

Water Content in Compressed Air

Data Input:	
SCFM:	500
% R.H.:	60%
Work Hours:	12
Work Days:	365

dryer type	No Dryer	Refrigerated ISO Grade 4	Desiccant ISO Grade 3	Desiccant ISO Grade 2
dew point (deg. F)	+100 Degree F.	+ 38 Degree F.	- 4 Degree F.	- 40 Degree F.
grains/ft^3 H_2O	19.77	2.657	0.3652	0.0521
gallons/day H_20	73.50	9.88	1.36	0.19
gallons/annum H_20	26,827.31	3,605.47	495.57	70.70

This calculator is provided to demonstrate the amount of moisture produced in a compressed air system at various dewpoints.

Desiccant Dryers Reliability

- Critical to have prefiltration to avoid oil contamination on desiccant beads
- Critical to have inlet temperature of 100F or lower
- Higher First cost than refrigerated dryers
- Higher operating costs that refrigerated dryers (purge)
- Several control methods available to reduce purge

Refrigerated Dryer Reliability

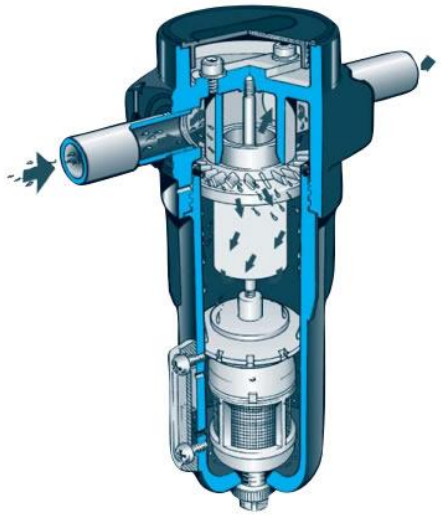
- Critical to maintain condenser and auto drain
- Critical to have inlet temperature of 100F or lower
- Lower First cost than desiccant dryers
- Lower operating costs that desiccant dryers
- Control methods available to reduce power consumption

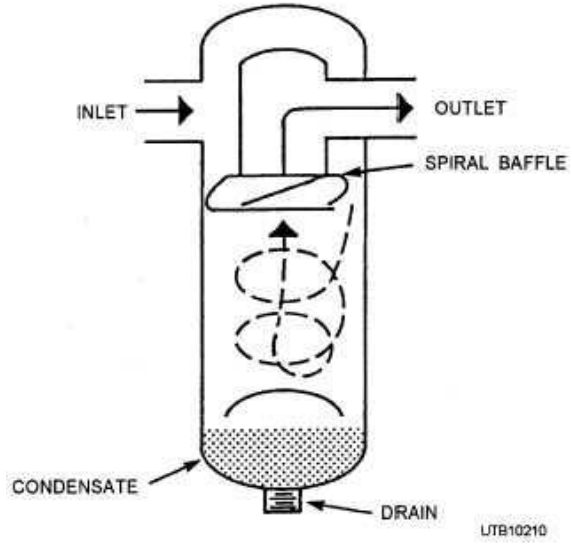
Aftercooler

- This is the highest moisture condensing component in the system with a Temperature reduction in the 90F to 130F range.
- The after cooler needs to be maintained and have a properly sized/ designed moisture separator and auto drain.
- Often located inside the compressor cabinet, this component can be ignored causing issues downstream.
- Contributes to oil removal

Moisture Separator & Auto Drain

- These two components are critical to keeping your plant dry and product safe.
- Air treatment equipment is designed for vapor loads and not liquid loads.





#4 Particulate (solids) Content in compressed air

Potential Sources:

- Corrosive metals in the system
    - “wet” storage tank
    - “dry” storage tanks that have gotten wet
    - Black iron piping – corrosion/ rust
    - Galvanized piping – flaking
- Desiccant dusting carried downstream

Particulate (solids) Content in compressed air

Potential Remedies:

- Wet storage tank – Particulate filter installed on inlet side of refrigerated dryer
- Desiccant dusting – Particulate filter on dryer discharge w/ maintenance
- Downstream contaminants from piping or tanks
    - Internal coatings on tanks
    - Point of use filtration
- Corrosion resistant piping material

Compressed air piping materials

- Black Iron
- Galvanized
- Copper
- Aluminum
- Stainless Steel

5. Compressed Air Quality

- Who is responsible for the compressed air quality in the plant?
  - Corroborative effort?
  - Clearly defined?

- How is the compressed air quality being monitored and verified?

Monitoring Contaminants in compressed air - options

1. Wait until there is contamination in the system, product is ruined and then react
2. Wait for your regular maintenance interval to check on compressors, dryers, filters, and drains ie quarterly/ semi annual/ annual
3. Proactively check the operation of compressors, dryers, filters and drains – daily/weekly/ monthly
4. Tap into monitoring/ alarm functions on dryers and drains – lowest temperature/ dewpoint/ failure
5. Invest in central monitoring and alarm systems for hydrocarbons and dew points

Particulate, Water & Oil (PWO)

AIR QUALITY STANDARDS
ISO 8573-1 CLASSES

Class	**A:** Solid Particle - Maximum number of particles per m^3			**B:** Pressure Dew Point F° (C°)	**C:** Oil (incl. vapor) mg/m^3
	0.1-0.5 micron	0.5-1.0 micron	1.0-5.0 micron		
0	As specified by the end-user or manufacturer, and more stringent that Class 1				
1	≤ 20,000	≤ 400	≤ 10	≤ -94° (-70°)	0.01
2	≤ 400,000	≤ 6,000	≤ 100	≤ -40° (-40°)	0.10
3	–	≤ 90,000	≤ 1,000	≤ -4° (-20°)	1.00
4	–	–	≤ 10,000	≤ 37.4° (3°)	5.00
5	–	–	≤ 100,00	≤ 44.6° (7°)	–
6	–	–	–	≤ 50° (10°)	–

6. Compressed Air Quality Testing - PWO

- Testing to a specific standard or to a baseline?
- Testing at central system point or specific Critical Connection Point?
- Following guidelines for collection of the sample?
- Following guidelines for transportation of the sample?
- Sample analyzed by an Accredited Laboratory?
- Written report provided?

- Do you need to test for Microbial contamination?

7. Direct Product Contact applications

- Discussion
- - Dedicated oil free/ oil less compressor system
- - Point of use filtration: Coalescing/ Odor Removal/ Sterile ??
- - Dedicated hydrocarbon removal system
- - Central/ dedicated hydrocarbon detection/ alarm system

We Like Cheese

THANK YOU FOR YOUR TIME AND ATTENTION












COMPRESSED AIR BEST PRACTICES airbestpractices.com

BEST PRACTICES EXPO & CONFERENCE CABPEXPO.COM COMPRESSED AIR / VACUUM / COOLING

About the Speaker

Chris Knuffman
Quincy

- Business Line Manager, Rotary and Quality Air Systems
- > 30 years of experience in the compressed air industry
- Bachelor's Degree in Industrial Engineering from Bradley University

Sponsored by

Quincy COMPRESSOR
Performance You Demand. Reliability You Trust.

Nitrogen Generation in Cheese Manufacturing

10/5/2023

Quincy COMPRESSOR

Performance you demand. Reliability you trust.™

Nitrogen Generation

- Cost of purchasing gasses like nitrogen can sometimes overwhelm the benefits of using them.
- Large packagers find themselves faced with bills in the 10’s and 100’s of thousands of dollars each year, just for N2.
- For those looking to extend shelf life and avoid succumbing to another hefty utility bill, nitrogen generators have become a welcome alternative.
- Since generators are simply separating oxygen from a stream of compressed air that’s already at the factory, a generator can supply a constant, clean supply of N2 as soon as it’s needed

MAP

- ***Modified atmosphere packaging – the key to fresh food***

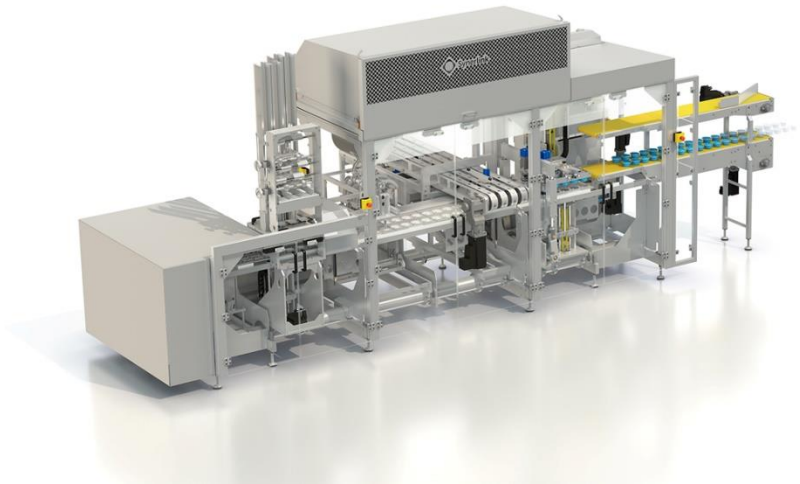
The makeup of the air that surrounds us.

- It mainly consists of nitrogen (78%) and oxygen (21%). That’s a perfect mix for breathing but not ideal for keeping food from spoiling.
- Oxygen is a highly reactive gas
- Nitrogen, on the other hand, is an inert gas.

How does modified atmosphere packaging work?

How do you make sure your food doesn't come into contact with oxygen?

- In this process, as soon as the food is placed in the container, the ambient air surrounding it is expelled. At the same time, it is replaced with a gas mix consisting largely of nitrogen.
- With a generator on site, you can produce an abundance of food-grade nitrogen. This ensures that you always have a supply for your food packaging needs.
- That nitrogen can also be used for pressurizing, purging, blanketing and sparging – all processes required to keep food fresh.



On-site nitrogen generation

While you could get the necessary nitrogen by having it delivered, generating your own has many benefits.

- First, on-site nitrogen generation costs much less .
- A generator allows you to produce exactly the purity you need, which saves energy.
- Eliminates various logistical challenges
- Being able to produce as much nitrogen you need for MAP at any time means you won't experience any supply bottlenecks.
- Easily scale up your operation at any time when you expand your business.

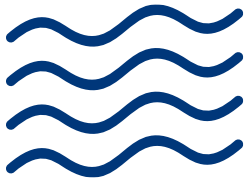
The right compressor for modified atmosphere packaging

- The last “ingredient” in this recipe for food-grade nitrogen is quality compressed air. Because the nitrogen you generate is only as good as the air you use to produce it.
  - That not just requires a compressor but also the right air treatment equipment like dryers and filters.
- You want to make sure that you can eliminate any of the contaminants that spoil the food. These include moisture, oil residue and small particles.

What are the N2 requirements for cheese production?

Pressure

The pressure may vary depending on the process, usually very low pressures can be used but a maximum of 85 psi will be sufficient to cover all processes within chesses manufacturing



Flow

The flow rates may also vary depending on the size of the facility and the processes in which nitrogen is used.

Quality/purity

The purity requirement that most cheese mfg. currently have food grade, between 99 and 99,9%, the usual is 99,5%.

Nitrogen Generation Summary

- Extend shelf life and avoid succumbing to another hefty utility bill, nitrogen generators have become a welcome alternative
- Work with your supplier to determine your pressure, flow and purity requirements.
- Take a system approach

Best Practices EXPO Contest

Play for a chance to win a **FREE Full Conference Pass** to the Best Practices 2023 EXPO & Conference!! This is a $675 value! This contest is open to factory personnel, compressed air distributors, utility incentive programs and engineering firms. Exhibiting and sponsor companies are not qualified. Winners will be randomly selected from those who submitted a correct answer and notified tomorrow via email.

Please submit your answer in the upcoming poll

How can you limit oil carryover from a lubricated air compressor?

A	• Undersizing the air compressor
B	• Oversizing the air compressor
C	• Diligent maintenance on the air/ oil separator

COMPRESSED AIR BEST PRACTICES airbestpractices.com

*By entering you are giving permission to announce your name if you are a winner

BEST PRACTICES EXPO & CONFERENCE CABPEXPO.COM COMPRESSED AIR / VACUUM / COOLING

Best Practices EXPO Contest

Play for a chance to win a **FREE Full Conference Pass** to the Best Practices 2023 EXPO & Conference!! This is a $675 value! This contest is open to factory personnel, compressed air distributors, utility incentive programs and engineering firms. Exhibiting and sponsor companies are not qualified. Winners will be randomly selected from those who submitted a correct answer and notified tomorrow via email.

Please submit your answer in the upcoming poll

How can you limit oil carryover from a lubricated air compressor?

A	• Undersizing the air compressor
B	• Oversizing the air compressor
C ✓	• Diligent maintenance on the air/oil separator

COMPRESSED AIR BEST PRACTICES airbestpractices.com

*By entering you are giving permission to announce your name if you are a winner

BEST PRACTICES EXPO & CONFERENCE CABPEXPO.COM COMPRESSED AIR / VACUUM / COOLING

Compressed Air Systems for Cheese Manufacturing

Q&A

Please submit any questions through the Question Window on your GoToWebinar interface, directing them to Compressed Air Best Practices Magazine. Our panelists will do their best to address your questions and will follow up with you on anything that goes unanswered during this session.

Thank you for attending!

Sponsored by

Quincy COMPRESSOR

Performance You Demand. Reliability You Trust.

Thank you for attending!

The recording and slides of this webinar will be made available to attendees via email later today.

PDH Certificates will be e-mailed to Attendees within 2 days.

November 2023 Webinar

Chiller Selections for Central Plants: Lowest Overall Costs for Process Cooling

Clayton Penhallegon, Jr., PE
Integrated Services Group*Keynote Speaker*

Sponsored by

Carrier

Thursday, November 9, 2023– 2:00 PM EST
Register for free at
www.airbestpractices.com/webinars

COMPRESSED AIR BEST PRACTICES
airbestpractices.com

BEST PRACTICES
EXPO & CONFERENCE CABPEXPO.COM
COMPRESSED AIR / VACUUM / COOLING