R717 System Energy Efficiency

This two day course covers the basics of energy efficient R717 systems.   It is suitable for refrigeration engineers who need a better understanding of the factors which commonly effect R717 system efficiency.   The first day is also a useful overview for end users of R717 equipment.

The following topics are included:

Day 1

- What is using the energy in an industrial refrigeration system.
- How to bring down the energy consumption and what is COP (Coefficient of Performance).
- What does 1°C higher suction pressure and 1°C lower condensing pressure mean for power consumption and COP.
- Air in the refrigeration system - what are the symptoms and what does it mean.
    - Energy saving potential with efficient air purging.
    - Where is the air in low pressure float valve controlled systems and in high pressure float valve controlled systems.
    - Air purgers, what is efficient where should they purge from and how.
    - Capacities and selection of air purgers.
- Correct piping around the condensers and receiver.
- Condenser size and what is good enough.
    - Can more independent systems be interconnected and what can be achieved.
    - What does it mean for the condensing pressure to have largest possible condensing surface available all the time.
    - Condenser control systems, how and why.
    - Frequency converter control of fan motors, how and what does it means.
- Water in ammonia systems - where is it and what does it mean.
    - The energy saving potential by removing the water from the ammonia.
    - How to make a reliable measurement of the water content in the ammonia.
    - How is the water removed from the ammonia efficiently.
    - Effective water purgers and how are they connected to a refrigeration system.
    - Water purger capacities and theoretical time to purge the water content out of a system.
- Oil in ammonia refrigeration systems what does it mean for the running conditions.
    - Where will the oil end up normally.
    - Why do reciprocating and screw compressors have an oil carry over to the system.
    - What can be done to bring down the oil carry over.
    - Can we avoid the oil reaching the low pressure side of the system.
    - The CPO system what can it do, advantages and disadvantages.

Day 2

Topics will be selected from the list below based on feedback from trainees and time available.

- Valves and pressure losses in suction lines what does it mean.
    - Which type of valves have pressure losses and why.
    - Can we smartly and cheaply make pressure loss free opening of differential pressure demanding valves.
    - Risers in suction lines and pressure loss.
    - Basis for calculations of risers.
- Hot gas defrost how do we do it energy efficiently.
    - Float valve controlled or backpressure controlled hot gas defrost, what is the difference.
    - How can you save energy when hot gas defrosting instead of using energy.
- Closing times for hot gas operated solenoid valves, why and what to be aware of.
- What is liquid hammer, why is it so dangerous and what can it do to valves, pipes and assemblies.
    - When can we create liquid hammer and why can hot gas defrost be so dangerous.
    - How do we avoid liquid hammer during and after hot gas defrost.
    - Control of valve stations with hot gas defrost so liquid hammer is avoided and energy optimized.
- How do you control the evaporators to energy optimize the system.
    - Air coolers and VSD on the fan motors.
    - What is "floating" suction pressure, how can it be made and what is the savings.
- Can the systems be divided into more different and more effective temperature levels.
- When are Screw compressors most efficient and when are reciprocating compressors.
    - COP for screw compressors and reciprocating compressors at part load.
    - What is Vi (internal volume ratio) on screw compressors and what does it mean.
    - Correct Vi on screw compressors, why is it important and what does it mean to energy consumption.
    - When is manual Vi regulation fine and when should it be automatic regulated.
    - What is min. allowed differential pressure on screw compressors and what can it mean to the systems energy consumption.
    - What is an economizer on a screw compressor and what will it do to the COP.
    - How can economiser connections be used in a smart and efficient way on systems.
    - Compressor control systems, what should we pay attention to and what should we do.
    - The use of VSD on compressors how to do it and when is it a good idea.
    - What should we be very careful with when using VSD on compressors.
- Heat recovery by using a desuperheater, water cooled oil coolers and water cooled condensers - what is possible and where to be careful.

- Ammonia heat pumps on ammonia refrigeration systems, how can it be done.
    - When are heat pumps on refrigeration systems a good idea.
    - What should not be done with heat pumps on refrigeration systems.
    - Why are ammonia heat pumps complicated and difficult to run trouble free in practice.
    - What is and how to calculate total COP value for a refrigeration system with heat pump.

Cost

The cost of this two day course is £545 plus VAT.   This includes comprehensive course notes, and tea / coffee / lunches.

Trainer

The training is carried out by Per Nielsen – a highly experienced ammonia refrigeration engineer.   He has worked with the Danish Technology Institute and Danish Maintenance Society providing training in Denmark. He does similar training elsewhere, for example in Vietnam and Mexico for local industrial refrigeration engineers in how to save energy and reduce CO_2 emissions in industrial refrigeration systems.

He has worked with a large dairy food processor in Denmark to provide savings of up to 60 % energy on their installations.