FDF
FREEZE DRIED FOODS

Freeze Dried Foods

New Zealand Ltd

OUR JOURNEY TO NATURAL REFRIGERANTS.

AUSTRALIA ATMOsphere

Business Case for Natural Refrigerants

02/05/17 - Sydney

Introduction.

- Freeze Dried Foods Started production in 1999 after 4 years development of our continuous freeze drying system.
- Largest toll Freeze Drier in Southern Hemisphere. 8,000 tonnes capacity per year.
- We design and build Continuous Freeze Driers to use in our factory in Hastings.
- We have just finished building our latest freeze drier the FD Continua series 12, which we intend to market internationally to customers requiring a high capacity lower cost per kg FD solution.

Our Journey with Refrigerants

- We started with an existing installed R22 system comprising a single stage intercooled Hall screw compressor, feeding high pressure liquid to electronic DX valves on the evaporator coils of our first FD Continua drier. COP around 0.8.
- Our next two FD Continua driers were designed for R717 pumped Ammonia. This offered the following advantages:
  - Natural refrigerant as R22 was to be phased out.
  - Pumped refrigerant to allow better control and efficiency of the evaporator coils.
  - The use of compound screw compressors to improve COP to 1.4.
  - Factory wide system incorporating blast freezers and cold store.

The move to CO_2 as an alternative to Ammonia

- There has been a significant increase in installation costs for Ammonia, especially around seismic and safety requirements.
- The latest FD Continua driers take advantage of the increased efficiency of CO_2 at -40^0 to -45^0 Celsius at the evaporator coils, and achieve a COP of 1.5.
- Safety, CO_2 is odourless and non explosive. Though monitoring and alarm equipment is installed to detect a drop in oxygen levels in case of a leak.
- Most of the main component suppliers now offer parts rated for the pressures required by CO_2 systems.
- The Capacity of the refrigeration equipment to run the FD Continua drier required a cascade NH_3 / CO_2 system, however the Ammonia is restricted to a small 60 kg charge in the plant room.

The future

- Efficiency and safety are paramount in the future development of our FD Continua driers.
- Two main areas we are looking at are:
  - Transcritical CO_2 Systems, as we anticipate a lot of our FD Continua systems will be installed in temperate climates allowing sub critical operation for extended periods of time.
  - Condensing technology, as cooling towers and plate heat exchangers are expensive to run and high maintenance.
- We have another FDContinua Drier starting construction after commissioning our latest Drier. (2 months).