

NC style storage refrigeration with DX Coils (direct expansion coils) Vs. Unit Coolers (forced air coolers).

Benefits of DX coils in North Carolina Storage with mini fan house over unit coolers (50k Bu storage).

- 1) All air goes thru the DX coils providing more efficient cooling (unit coolers use part air usually at 30-50% of air being cooled)- effect is lower cooling rate
- 2) DX coils use 6 fins per inch spacing without plugging up evaporator coils, this design has been used in sweet potato storage for number of years (unit coolers ideally need 4 fins per inch so they do not plug up with dirt and flies, common is 6 fins per inch, they also hard to inspect)
- 3) DX coils are located in extended fan house measuring usually 16-30' in width and 4-5' in depth to pull air from the return and feed it to the top fans along with intake louvers (unit coolers need to be mounted usually in the middle of the bay hanging above the bin stacks)
- 4) DX coils are easier to clean and access for servicing due to their location (unit coolers generally cannot be cleaned with product underneath them and may be very hard or even dangerous to access during storage season)
- 5) DX coils are away from dirt being stirred up in the bay during loading and unloading which keeps them cleaner thru the storage season (unit coolers are fully exposed to the environment) please remember DRITY COOLING COIL REDUCES COOLING CAPACITY AS MUCH AS 50%, VERY DIRTY COIL CAN CAUSE COMPRESSOR FAILURE SINCE REFRIGERANT CANNOT EVAPORATE IN THE COOLING COIL AND LIQUID COMES BACK TO THE COPRESSOR (oil failures of the compressor are common symptoms of a dirty cooling coil with poor heat exchange)
- 6) DX coils drain down to the fan house floor and to the outside (unit coolers require drain lines runs to the outside, those can be damaged or can get plugged up and cause unit cooler to overflow its drain pan and flood product underneath it causing losses)
- 7) DX coils use less refrigerant due to their proximity to the outdoor condensing units (unit coolers require lines to be 30-50% longer lines that can be damaged in storage by bin stackers)
- 8) Mini fan house can be built for any storage at any time with product in it so refrigeration can be added as needed (unit coolers cannot be installed with product in storage due to their location)
- 9) **Additional cost of mini fan house to accommodate DX coils in 50k Bu storage is offset by (cost benefit of DX coils surpasses initial mini fan house cost):**
 - a) Lower installation cost - less refrigerant, refrigeration piping and no drain lines - \$2000.00 value
 - b) DX coils cost less than unit coolers – 50k Bu storage DX is \$15,000 Vs. unit coolers at \$40,000
 - c) No additional electrical needs to be run to the center of the bay for unit coolers and liquid line solenoid valves, no additional switch gear, smaller el service required - \$3000 value
 - d) No unit cooler fan maintenance will be required since DX coils use circulation main fan air to draw air thru it for cooling, main fans are also VFD driven (fans require min design of .5" sp)
 - e) DX coils will last longer in fan house (unit coolers are harder to clean and more exposed to environment – those two factors will reduce unit cooler life expectancy)
 - f) **One of the biggest advantages is that we use much less electricity using DX coils, typical 50k Bu storage would save about \$4,000-6,000 in energy annually in long term storages since we do not have additional 10hp in unit cooler fans calculated at 0.1\$/kWh annually.**