

Fig. 13 SEM images of product microstructure obtained as a result of random **a** and ice-fog-induced **b** nucleation. *SEM scanning electron microscope* (Note the reduced surface area in **b**)

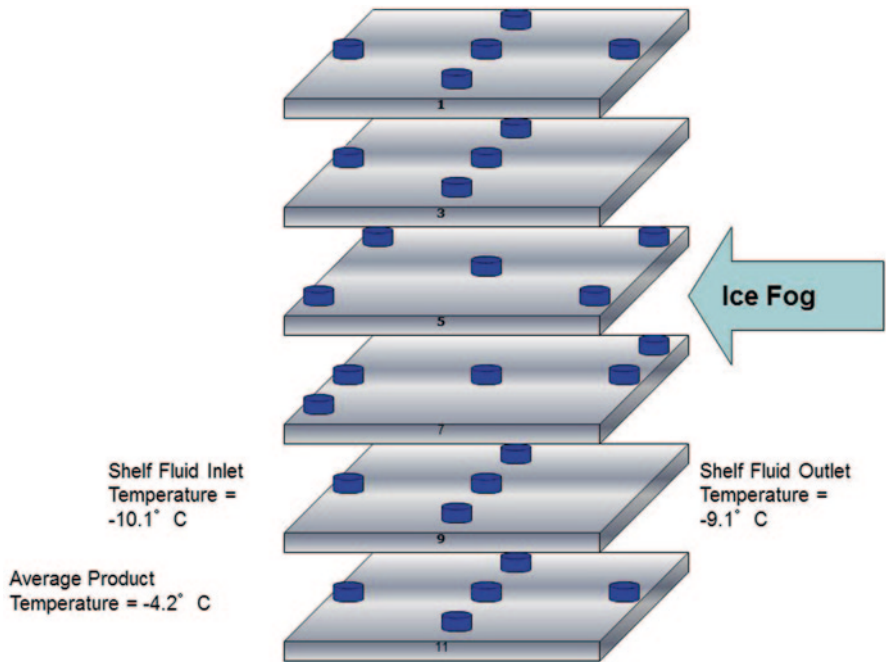


Fig. 14 Thermocouple locations for maximum load study in 28 m² freeze-dryer

Conclusions

Thus, it is shown that ice nucleation during freeze drying (lyophilisation) is an important process parameter that needs to be controlled. The described scalable cryogenic ice-fog technology known as VERISEQ[®] Nucleation can be used in laboratory-, pilot-, and production-scale lyophilizers to induce uniform ice nucleation at