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Commercialisation of pulse tube cryocoolers to produce 330 W and 1000 W at 77 K for liquefaction.

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Fabrum Solutions in collaboration with Callaghan Innovation has been developing large pulse tube cryocoolers based on Callaghan Innovation's diaphragm pressure wave generators (DPWG). The pulse tube's lack of moving parts in combination with the DPWG's metal diaphragms produces a cost-effective, long life and robust cryocooler. The DPWG has had 10 years of development, resulting in a series of DPWGs ranging in input powers from 0.5 kW to 30 kW that have been coupled to a variety of in-line and coaxial pulse tubes. Two DPWGs have had in excess of 7000 hours running to date. The PT330 cryocooler is based on a new 330 cc DPWG and has produced over 400 W of cooling at 77 K during testing. The PT1000 combines three such pulse tubes on a single 1000 cc DPWG to produce over 1000 W at 77 K. This paper details the development of the PT330 and PT1000 cryocoolers from initial lab prototypes through to commercial products, integrated into liquefiers and ready for use in applications such as: Nitrogen liquefaction, re-liquefaction of boil-off from storage tanks, or cooling of cryostats for High Temperature Superconductor applications.

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