Recent progress in the development of a 10 kW Brayton cryocooler is presented for HTS cable systems under installation in Jeju Island, Korea. The role of this cryocooler is helium, whose operating pressure and flow rate was determined earlier from a thermodynamic study on reversed-Brayton cycle. As main components, heat exchangers and turbo-expanders are designed and fabricated by custom orders. The heat exchangers are made of aluminum-brazed plate-fins, and the coldest part brakes. The assembly is completed and the refrigeration capacity will be shortly measured with a dummy thermal load on the liquid-nitrogen stream. Details of thermal performance and short-term plans are reported towards and immediate application to the HTS Cable systems.

### Design and Fabrication of Turbo Expanders

- **Lab test data**
  - **Date** Inlet Exit Speed
  - **2013 11.9 80.9 5.76 65.4 180,000 He 0.75
  - **2014.01.17 1.70 321 1.10 298 97,000 Air 0.61
  - **2014.09.23 5.40 376 1.02 290 100,000 Air 0.61

### Summary and Future Plans

- Korean ongoing HTS power cable project is underway to develop a 10 kW Brayton cryocooler for 1 km HTS transmission cable.
- Assembly is completed, but additional jobs are needed, including the oil removal system(ORS), the safety valve, and a control system.
- The cooling performance will be tested shortly, and the cryocooler will be moved to Jeju Island for installation and demonstration by 2016.

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