

***Research on Counter-Flow Heat Exchangers
of Space 2.5K Hybrid
Joule-Thomson Cryocooler***

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Heat exchangers are one of key components of hybrid Joule-Thomson (J-T) cryocoolers. Three tube-in-tube counter-flow heat exchangers were used in our hybrid J-T cooler. In this paper, the effect of heat transfer and flow resistance of the counter-flow heat exchanger are calculated. As the length of heat exchangers increases, the effect of heat transfer will be improved. Simultaneously the fluid resistance will also increase, which directly affects the pressure on both sides of the J-T valve. The 3rd stage counter-flow heat exchanger of J-T cycle has the important role in precooling high-pressure gas before throttling. According this calculation, a new 3rd stage counter-flow heat exchanger was designed and used in J-T cryocooler. This J-T cryocooler reached a no-load temperature of 2.51 K, supplying 3.0 mW cooling power at 2.55 K with 310 W electric power consumed.