

## Improvement of Ultimate Pressure of Oil-free Reciprocating Pump for Tritium Service

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Oil-free reciprocating pump has been developed for tritium services at Tritium Process Laboratory (TPL) in Japan Atomic Energy Agency. A large pump, which the pumping capacity was 54m<sup>3</sup>/h of H<sub>2</sub> at 5 Torr suction and 875 Torr discharge pressures, had been demonstrated with tritium gas<sup>[1]</sup> and used for a part of ITER roughing pump system design<sup>[2]</sup>. Smaller pump, which is 10m<sup>3</sup>/h at the same pressure conditions, has been used as a house vacuum pump at TPL for almost 20 years without any big trouble.

One disadvantage of the above type of reciprocating pump is rather high ultimate pressure about 1 Torr with drastically decreasing of the pumping performance. The main reason why is the lack of opening of check valves at lower suction pressure, which are installed in the piston of the pump. In order to improve this disadvantage, solenoid valves option was tested instead of the check valves. Intentional opening & closing of the solenoid valves, linked with reciprocating motion cycle of the pump, improved more than one order of the ultimate pressure drastically.

This paper summarizes the above test trial with solenoid valves and discusses the improvement of evacuation performance.

[1] T. Hayashi, M. Yamada, et al., "Tritium evacuation performance of a large oil-free reciprocating pump", *Fusion Engineering and Design*, 28 (1995) 357-361.

[2] ITER EDA Documentation Series No.24, "ITER Technical Basis", IAEA, Vienna, 2002.