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On the path towards a Metal Foil Pump – Latest results and new experimental facility

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The current design baseline for the EU DEMO implements the KALPUREX process for the fusion fuel cycle. This process aims to reduce the tritium inventory by separating hydrogen from other gases within the tokamak building and feeding it back to the matter injection system. The best candidate for the hydrogen separation unit close to the torus is a metal foil pump that relies on the effect of superpermeation. For a comprehensive investigation the dedicated HERMES setup at KIT was successfully exploited during the past years. This setup was used recently to demonstrate remarkable improvements in performance. However, due to the limits of operation of this setup a complete redesign was indispensable. Consequently, an improved facility was designed and assembled to overcome the previous limits. This HERMES plus facility allows an extended pressure range for operation due to a different plasma source as well as an advanced metal foil module. This modification aims to fill the missing gap between the operation pressure requirements for use in DEMO and the capability of previous setups at KIT and in literature.
In this paper two aspects will be presented. On one hand the latest results of superpermeation, achieved with the previous setup, will be shown, highlighting the progress in performance and understanding. On the other hand the new facility will be introduced, demonstrating the motivation of this evolution, the current commissioning status and finally the expected outcome.

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