

Installation of an electrolytical deuterium generator for the cluster targets at COSY

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For experiments at COSY two cluster targets have been built at the IKP of the University of Münster and installed within the internal experiments COSY-11 and ANKE in 1995 and 1999, respectively [1, 2, 3]. Due to the special design they allow to provide cluster beams of all gases except helium as targets for scattering experiments. For studies on elementary meson and hyperon production processes in the pp-, pn- and pd-scattering, hydrogen and deuterium gas is of special interest as target material.

In contrast to hydrogen, deuterium gas is comparatively expensive. Therefore, a regeneration system was built in order to reduce the consumption of deuterium gas by cleaning and compressing the used process gas available at the exhaust of the forepumps. By this only small deuterium gas losses have to be compensated by gas bottles in a gas cabinet. This system was successfully tested at a cluster target in Münster and installed at the COSY ring in summer 1999 [4].

To further reduce the cost for deuterium a electrolysis unit was installed and tested at the deuterium regeneration in 2005. With this unit the needed deuterium gas can be produced using comparatively cheap heavy water (D₂O).

A scheme of the regeneration with the new electrolysis unit is depicted in figure 1. Exhausted gas (1) is collected from the fore pump stages and feed into the regeneration. At this point the new unit is connected to the previously existing parts. The electrolysis (domnick hunter model 60H) provides deuterium with a pressure of 7 bar and volume flow of up to 500 ml/min. When one of the cluster targets is set into operation, a higher volume flow is needed for a short time. Therefore a buffer volume is connected to the electrolysis unit. The deu-

terium is then lead through a pressure reducer, which limits the overpressure to approximately 0.5 bar.

To automatically feed deuterium into the system when needed, a remote controlled pneumatic valve is used, placed between the electrolysis and the compression unit. The valve is controlled by a baratron at the gas cabinet. If the pressure drops below a certain value the valve is opened and deuterium from the electrolysis is feed to the compression unit. The first test operation of the electrolysis unit at COSY was performed during a ANKE beam time in February 2005. During this two weeks of beam time a stable cluster beam was produced solely using deuterium from the electrolysis of heavy water.

References:

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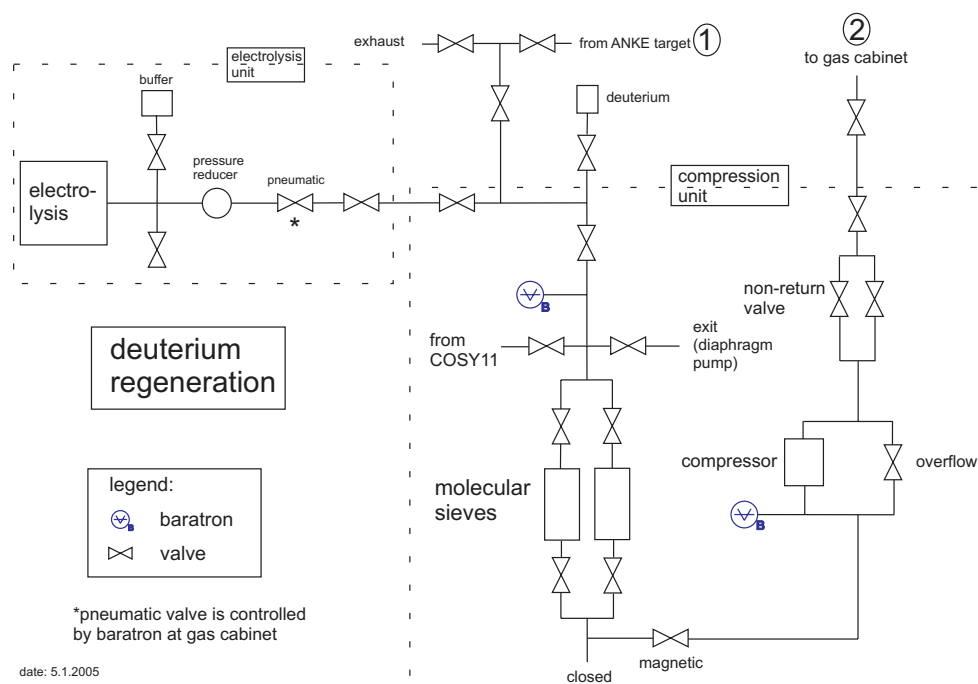


Fig. 1: Scheme of the deuterium regeneration system with the new electrolysis unit.