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MINOR ACTINIDE BEARING BLANKET MANUFACTURING PRESS

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This study concerns the Advanced Processes of Conversion and Manufacturing of fuels for transmutation. One of the fuel manufacturing processes arises from the conventional process of the powder metallurgy industry and enables pellet shaping in dies and sintering. The shaping of the MABB pellets is currently done manually in hot cells. In this study, automation for this manufacturing and a better control of the shaping parameters were tested in order to prepare the way for a new automatic nuclear press. Collaboration has been set up between the CEA (ATOMIC ENERGY COMMISSION) and the CHAMPALLEALCEN Company for the construction of the new press. The minimization of criticality risks is an important goal for the manufacturing of the AMBB pellets, and is the main reason why the press is being built to function without oil and is completely electromechanical. It's a uni-axial, automatic press, mono-punch, single effect apparatus with a displacement-piloted die. Its capacity is 10 tones, the maximum height is limited to 1200 mm and the production rate is 1 to 5 cylindrical annular pellets per minute. Installing the apparatus in a hot cell for nuclear fuel production required simulation studies which were carried out using the STUDIO MAX 3D software. The objective was to validate the modular units'ability to be assembled, dismantled and maintained by remote handling techniques, using LACALHENE-MT120 equipment. The thirty separate units making up the press had to go through a 240 mm diameter air-lock to enter the hot cell. To be sure the remote handling scenarios were appropriate, virtual reality simulation studies were carried out, taking into account force feedback and the inter-connectability of the different units. In parallel, MERCURAD and MCNP5 software checked that the press components' radiological dimensioning would ensure its radiation resistance during operation in a hostile environment. A mock-up simulating the future hot cell and equipped with the MT120 was built in the CEA/Marcoule HERA facility technological platform in order to physically test press unit assembly by remote handling, and the apparatus operations. This press adapted to nuclear conditions has a patent pending.

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