framatome

NAS

Nuclide Activation System for Medical Isotopes Production

Production of radionuclides for healthcare applications via adaptation of existing in-core measuring systems in nuclear power plants (NPPs)

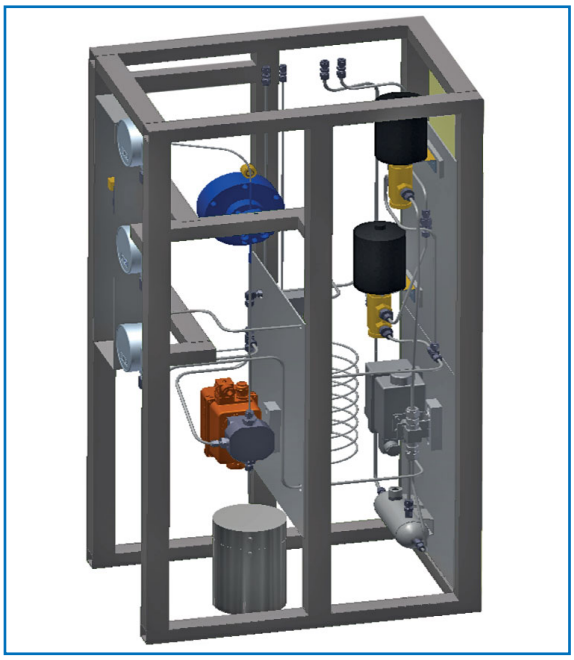
Challenge

Radionuclides have come to play an increasingly important role in medical diagnostics and therapy. These radionuclides can be produced by neutron capture in nuclear power reactors, if the neutron flux inside the core is accessible during operation. Currently, only specialized research reactors have this kind of access through irradiation chambers. Thus, the radionuclides are very precious products as no known nuclear power reactor has such a pathway in and out of the core for the production of radionuclides.

Solution

Framatome's Nuclide Activation System (NAS) enables target irradiation and, thereby, radionuclide production in all pressurized water reactors equipped with an Aeroball Measuring System (AMS) like KONVOI plants and EPR reactors. Other reactor types can also be prepared for NAS using different pathways, e.g. for CANDU-type reactors the use of a view port is possible. The basic principle is the use of existing aeroball tubes (so-called "fingers") for insertion of targets into the core. The targets are irradiated in the core via neutron capture and afterwards automatically extracted directly into transport containers.

Framatome possesses unique know-how in ceramics and sintering techniques as well as radiochemistry. These aspects are essential for the creation of suitable targets for the NAS, by managing the entire lifecycle of the radioisotope, from the raw targets to the irradiated radionuclide. Using Framatome's NAS you can become a vital part of the ever-growing market for industrial and medical isotopes produced by neutron activation.



3D model of the NAS module

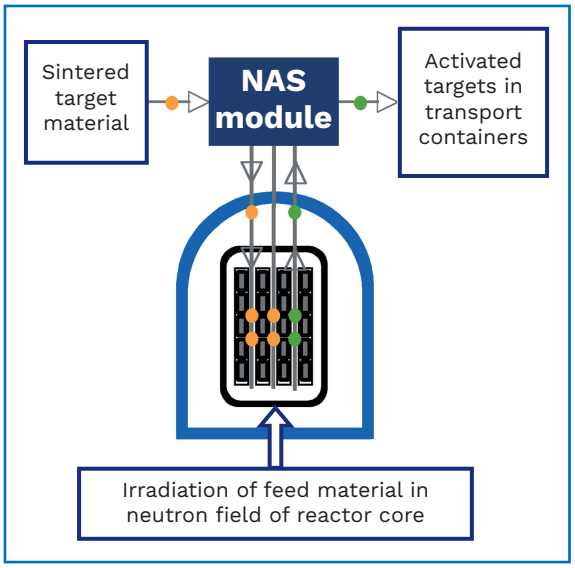
Customer benefits

- No changes or adaptations in the reactor itself are necessary and therefore quick approval and installation periods
- Stable irradiation process due to NPP base load power generation
- High radionuclide purity due to neutron capture route
- Very limited radioactive waste and post processing efforts compared with the fission route
- Complete material recycling and therefore low material costs
- Flexible to react to market requirements
- Cost-efficient process in total with low capital expenditure and operating expenses

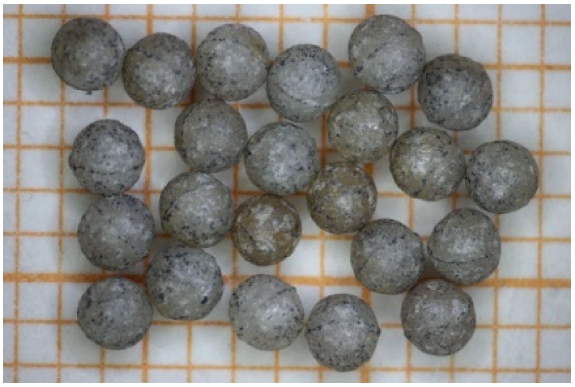
Your performance
is **our** everyday **commitment**

Technical information

- Several AMS fingers can be used and loaded with different target material by means of carrier gas and will be controlled individually
- One finger can be loaded with up to 50 g target material
- The production of Lu-177 and Mo-99 has been tested so far; other isotopes can be produced from powdery raw material
- Irradiation time between one and three weeks depending on the isotopes to be produced
- Unloading of the activated targets directly into transport containers without the use of hot cells
- Several modules can be installed depending on available space and market requirements (one control unit for all modules)
- Module dimensions approximately 1,500 x 500 x 600 mm with 100 kg and control unit dimensions approximately 600 x 800 x 400 mm with 80 kg
- Installation of the NAS can easily be performed during a regular outage
- The NAS can be connected to the on-site core computer for further optimizations (loading amount and irradiation time) according to the actual neutron flux and probable core load sequence



NAS block diagram



Sintered NAS targets (boxes measure 1 mm)

References

Successful test runs with different isotopes have already been performed in a European NPP.
The produced radionuclides were analyzed and positively rated by the pharmaceutical industry.

Contact: integrated-systems@framatome.com
www.framatome.com