OPERATION AND MAINTENANCE OF THE 250 kW TRIGA MARK II REACTOR AT THE J.STEFAN INSTITUTE

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ABSTRACT

Over the last two years the TRIGA Mark II reactor in Ljubljana has been operated at an energy release of about 2250 MWh or about 4200 hours per year. In this period, about 2000 samples were irradiated. Since the last TRIGA Owners' Conference there has been an increase in all operational data because of a very extensive programme of irradiation of molybdenum for the everyday production of technetium-99 m by a solvent extraction method.

Because of its age and absolencence replacement of the console electronics was considered some time ago. Therefore, partly new instrumentation was installed this year. A new console is under construction.

Furthermore, a new core configuration was established after 7 fresh FLIP fuel elements were delivered by GA. At this time it was noticed that 2 dummy elements are stuck in the upper grid plate. They will be exchanged during the regular maintenance work in August this year.

During the last two years the reactor has been operated without any longer shut-down due to technical difficulties.

1. Reactor operation

The TRIGA Mark II reactor in Ljubljana with a steady state power of 250 kW has been in succesful operation since 1966. During the year 1981 operation time at full power was 4230 hours or an energy release of 1056 MWh. Until September 1, 1982, the reactor operated 2812 hours (696 MWh). It is still one of the most utilized reactors in the European TRIGA community because of a very extensive programme of irradiation of molybdenum oxide for the everyday production of technetium-99 m by a solvent extraction method. At the last TRIGA Conference we reported that the method for a solvent extraction had been developed, but during the last year routine production was introduced. The medical staff in our hospitals are more satisfied with technetium produced by the solvent extraction method (compared to technetium generators) because the technetium produced by our method is very clean and we are sending it in a form ready for injection.

Four years ago we reported on the construction and installation of a new pneumatic facility for loading and anloading the samples in the rotary specimen rack or central thimble. It was already mentioned that to a great extent the reactor is utilized for irradiation services, e.g. activation analysis, radionuclide production, irradiation of semiconducting diodes, etc. Without this pneumatic sample lifting dedevice , it would be very difficult to perform this extensive programme of irradiation. The operators are not now exposed to radiation when lifting irradiated samples, because of the remote control mecahnism. The system is closed but not sealed. Air is pumped out throught the argon system with a two stage air pump designed for use in vacuum cleaners. Argon is exhausted through the chimney. On the top of the reactor tank only a slight increase of argon concentration is noticed, so that argon-41 generation is not a problem. Therefore we recommed the introduction of this system in all TRIGA reactor where an extensive irradiation programme is performed.

During regular inspection of the fuel it was noticed on trying to remove the upper grid plate that 2 dummy elements in the F ring were stuck. The reason for this is that the aluminum cladding was badly damaged owing to the poor quality of the aluminium. It seems that during the production of dummy elements in a factory the quality control was not strict enough. A few years ago we also found another damaged dummy element. This summer both elements where taken out of the core, but for this reason the reactor was out of the operation for three weeks.

2. Modernization of the instrumentation

Since 1972 we have gradually substituted some of the original instrumentation of the reactor because of ageing. The main modernization was done this year when instrumentation from the Hartmann and Brawn company was delivered as a part of the technical assistance of the IAEA. The following new instruments are already in operation:

- 3 fuel temperature meters coupled to the instrumented fuel elements. There is an additional safety channel which is very useful;
- a conductivity meter for water quality measurements;
- a water temperature meter (inlet and outlet);
- a water level indicator, including an alarm, when the water level sinks below a specified limit. In addition, a simple and reliable water level switch will be installed, which will automatically scram the reactor if the water level sinks far below normal;
- a new scintilation counter for measurment of the activity of the water in the secondary circuits, with parallel indication at the TRIGA control console;

- a new compensated ion chamber and fission chamber for reactor power measurement.

Also, the area monitor system was partly renewed with Geiger-Müller or ionization counters.