

# International Conference on Fast Reactors and Related Fuel Cycles: Next Generation Nuclear Systems for Sustainable Development (FR17)



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## Strategies of maintaining appropriate technology of heavy liquid metal coolants in advanced nuclear power plants

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Up to date, the following three main problems can be emphasized concerning technology of Pb-Bi and Pb coolants used in the civilian reactors:

- 1) maintaining high purity of coolant and cleanness of the surfaces of NPP circuits in order to assure design thermal-hydraulic performance of the plant operating on power up to 100 % during several decades;
- 2) long-term prevention of corrosion and erosion of structural materials (plant operating on power up to 100 % during several decades);
- 3) meeting of up-to-date safety requirements in the various stages of reactor operation (coolant preparation, reactor start-up, day-to-day operation, repair and refueling operations, loss of integrity, and abnormal operating conditions).

As follows from the above problems, up-to-date set of measures concerning Pb and Pb-Bi coolants technology should assure implementation of the following procedures:

- 1) preparation of coolant (Pb-Bi or Pb) and filling of NPP circuits;
- 2) preliminary passivation of reactor plant elements before their installation;
- 3) passivation of the inner surface of the primary circuit of the reactor plant;
- 4) coolant technology concerning repair and refueling procedures;
- 5) coolant purification and removal of impurities from the circuit surfaces during day-to-day operation;
- 6) control of coolant oxidizing potential during operation of NPP with HLMC;
- 7) purification of cover gas in the liquid metal circuit;
- 8) technological procedures under abnormal operating conditions;
- 9) technological procedures aimed at coolant reuse.

All necessary technological measures can be implemented using special equipment created on the basis of the modern realities, which would be the essential part of the plant safety system in all stages of its operation.

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