



Contribution ID: 22

Type: POSTER

## Safety of the Dry Spent Nuclear Fuel Storage in Ukraine: Scientific Approach and Results

More than 250 tons of spent nuclear fuel is produced by Ukrainian NPPs each year. Currently the problem of spent nuclear fuel storage in Ukraine is under process of solving. The temporary storage of SNF until accepting decision about disposal or reprocessing today is used for six WWER-1000 reactors of Zaporizhska NPP.

The Dry Spent Nuclear Fuel Storage Facility (DSNFSF) on Zaporizhska NPP is operated more than 10 years. The safety of DSNFSF consists of three main components –Nuclear Safety, Radiation Safety and Safe Thermal Condition. Therefore the problem of determination of safe thermal condition for the storage facility is one of main problems at operation. Usually in engineering calculations is used conservative approach which doesn't allow identifying detailed processes in equipment and gives approximate results. But for the increasing safety level on DSNFSF it is necessary to know all details and features of equipment operation especially in field of thermal processes. So scientific approaches are extremely necessary on all stages of facility operation: from construction to decommissioning. The long and the safe operation of DSNFSF on Zaporizhska NPP can be ensured only with full scientific support also and it is requires the developing new methods and methodologies for calculations.

For detailed definition of thermal state of spent fuel assemblies during all period of storage the multi-stage approach was developed. On each level of multi-stage approach the solving of conjugate heat transfer problems were used. This approach was used for:

1. The definition of thermal state of containers with spent nuclear fuel with taking into account the outer factors influence and spent fuel assemblies heat generation capacity changing.
2. The definition of containers group's thermal state on open storage platform with taking into account their mutual influence, the influence of outer factors and heat generation capacity changing.

In addition all calculations which are mentioned above required solving the inverse heat transfer problems. In particular the inverse heat transfer problems were used for:

1. The placement of spent fuel assemblies in storage basket for minimization of maximal temperatures.
2. The identification of equivalent thermal physical properties of compound bodies (storage basket, spent fuel assemblies, fuel rods) for using its in simplified models.

The results which were presented in this work are used for estimation and the improving of safety level of DSNFSF on Zaporizhska NPP.

### Country/ int. organization

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