

# **Prospects for supporting systems improvement of BN reactors based on BN-600 and BN-800 engineering experience**

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# 1 Purposes of the Fuel assembly washing system

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Prospects for supporting systems improvement of BN reactors based on BN-600 and BN-800 engineering experience will be considered here on the example of the Fuel assembly washing system.

The Fuel assembly washing system is one of the typical for BN reactors only.

After spent fuel assembly retrieval from reactor it should be washed off the sodium. Then spent fuel assembly is putting into the water cooling pool.

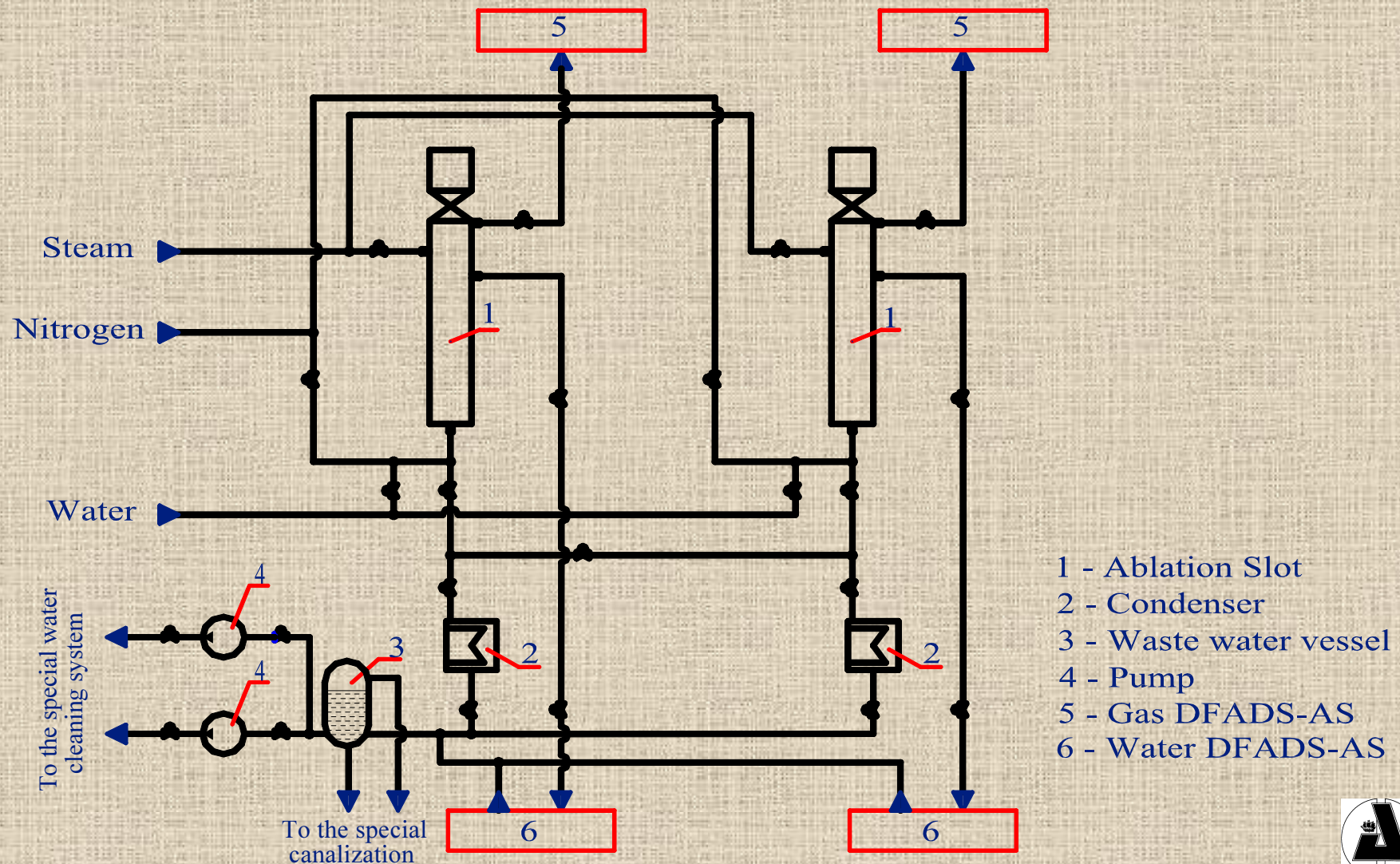
***Fuel assembly washing system is intended for two purposes:***

- ***Sodium elimination from spent fuel assembly;***
- ***Spent fuel assembly hermeticity control.***

Spent fuel assembly hermeticity control is taken in the defective fuel assembly detection system of the Ablution Slot (DFADS-AS).

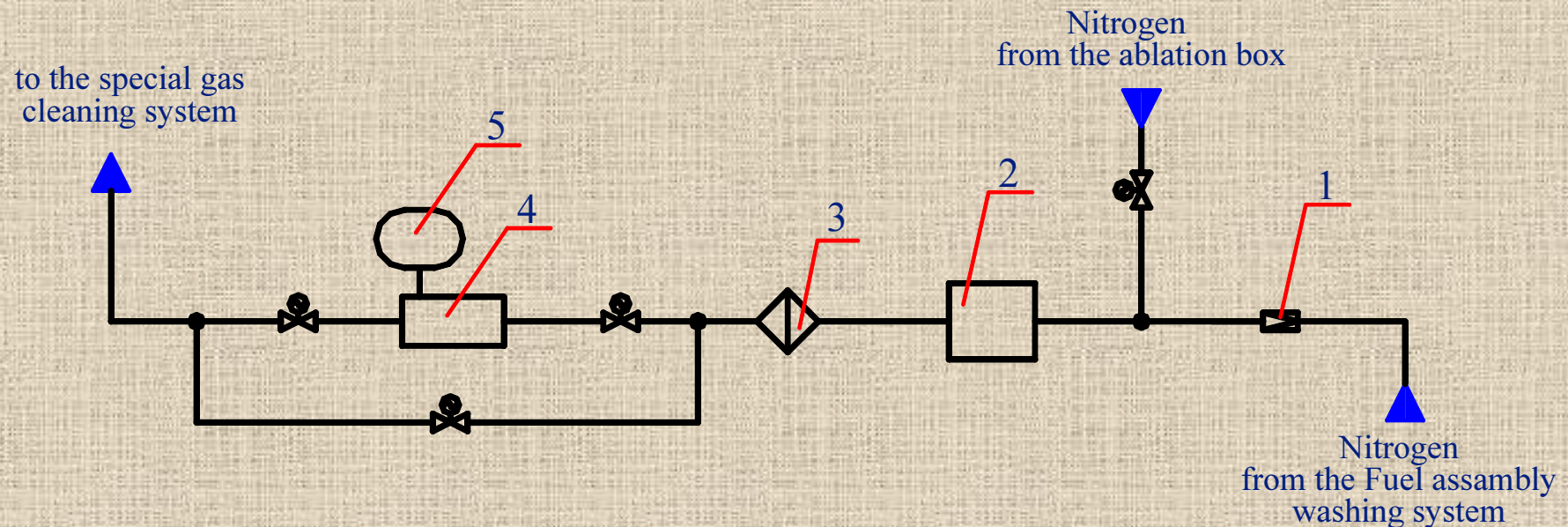


## 2.1 Principal scheme of the Fuel assembly washing system of BN-800



## 2.2 Principal scheme of the gas defective fuel assembly detection system of the Ablution Slot (gas DFADS-AS) of BN-800

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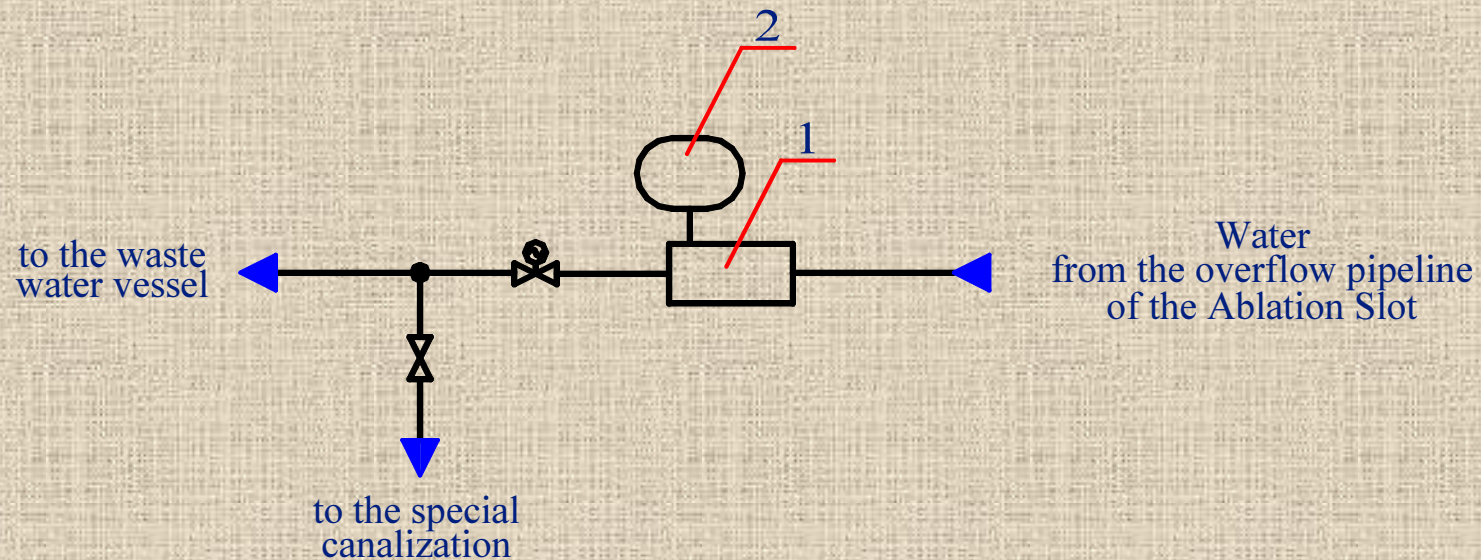


- 1 - Redactor
- 2 - Separator
- 3 - Aerosol filter
- 4 - Measuring container
- 5 - Radioactive sensor



## 2.3 Principal scheme of the water defective fuel assembly detection system of the Ablution Slot (water DFADS-AS) of BN-800

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- 1 - Measuring container
- 2 - Radioactive sensor



### 3 Summary of the Fuel assembly washing system work process

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DFADS-AS is as a part of the fuel assembly washing system as a part of fuel element cladding hermeticity control systems.

The work algorithm of the Fuel assembly washing system depends on other fuel element cladding hermeticity control systems rates.

*There are 3 types of verification results:*

- *leakage;*
- *leakage suspicions;*
- *hermeticity.*

**If leakage is found by any fuel element cladding hermeticity control system the fuel assembly is sent for lead washing into the Lead Slot.**

**In other cases fuel assembly is sent for steam-water washing into the Fuel assembly washing system.**



### 3.1 Ablution algorithm in case when there are no leakage suspicions based on fuel element cladding hermeticity control systems rates

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- The Ablution Slot (AS) is filled with nitrogen. Spent fuel assembly is placed into the AS.
- Steam ablation is conducted.
- After that the AS is filled with nitrogen again.
- Spent fuel assembly is kept into nitrogen for its self-heating.
- Then nitrogen is delivered from the AS to the gas DFADS-AS.
- In case of good DFADS-AS rates, spent fuel assembly washing conducted with water.
- This water is delivered for control to the water DFADS-AS.



## 3.2 Ablution algorithm in case when there are leakage suspicions based on fuel element cladding hermeticity control systems rates

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- The Ablution Slot (AS) is filled with nitrogen. Spent fuel assembly is placed into the AS.
- First of all the control is held into the gas DFADS-AS.

**If leakage is found the fuel assembly is taken out of the Ablution Slot and sent for lead washing into the Lead Slot.**

**If there is no leakage indication the ablution algorithm is the same as described above.**





## 4 Changes in the Fuel assembly washing system of BN-800 based on BN-600 exploitation experience

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- **Separation of pipelines for delivering of steam and nitrogen to the AS.**

This modification is caused by BN-600 exploitation experience and let us avoid the steaming of nitrogen pipeline. It will simplify the service of this system.

- **Possibility of separate delivery of abluton substance to each AS.**

The advantage of this modification is the possibility of two fuel assembly washing in two Ablution Slots at the same time without any washing process steps shift comparative each other.

- **There are two gas and water DFADS-AS, one gas and one water DFADS-AS for each AS.**

The advantage of this modification is the possibility of two fuel assembly washing in two Ablution Slots at the same time. In fact we have two self-sufficient Fuel assembly washing systems.



## 4 Changes in the Fuel assembly washing system of BN-800 based on BN-600 exploitation experience (conclusion)

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All performed changes in the current system make possible to hold ablution of spent fuel assembly in two AS simultaneously. It means that we will get double efficiency of this system.



## 5 Prospects for improvement of the Fuel assembly washing system

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The scheme of gas DFADS-AS requires the specific equipment due to characteristics of measuring containers and radioactive control sensors. For example, the pressure reducer, the aerosol filter and the separator.

**In case of sensors development that do not need so severe gas parameters, all enumerated elements can be excluded from gas DFADS-AS. It will improve reliability of the system.**

Thank you for your attention!

