Design of steam generator BREST 1200. Reaching temperature of feed – water about 340° C

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Goals

- Engineering design (p = , t = , Q =) of steam generator
- Finding way to make temperature of feed – water stay at ≈ 340°C

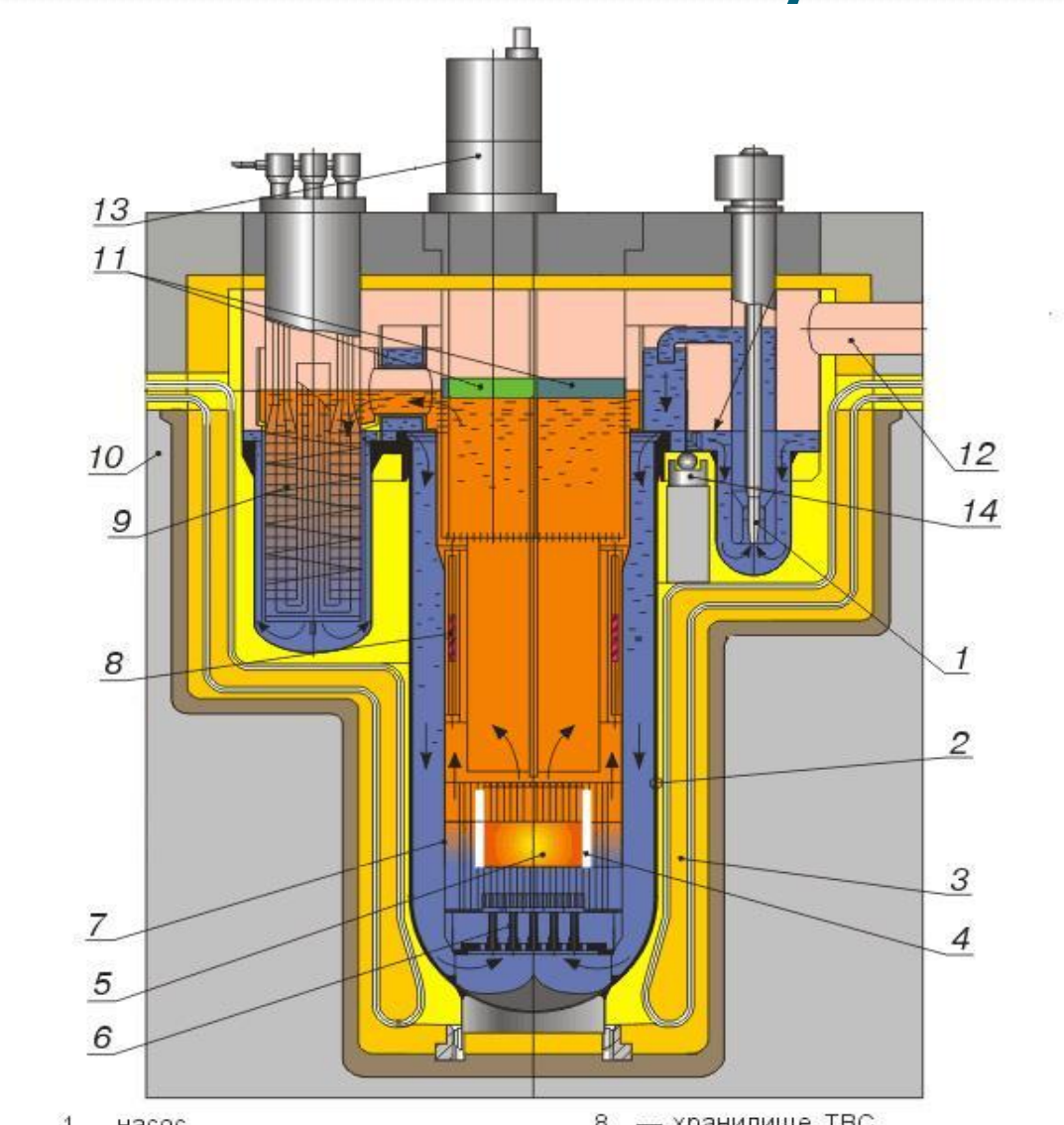
Objectives

- Study construction and operational principle of reactor facility BREST – 1200
- Make thermal, hydrodynamic, constructive design and mass calculation
- Solve the problem of exploitation of steam generator with Pb

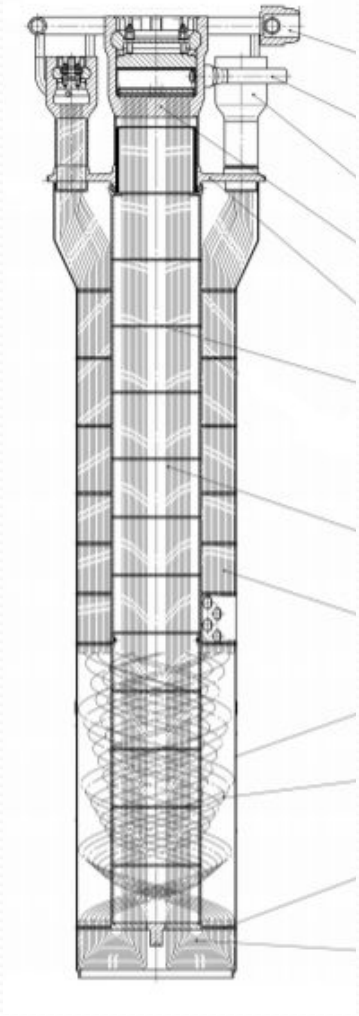
BREST -1200 – FBR

Coolant	**Pb**
Moderator	-
Fuel	(U+Pu)N
Compiling	Integrated

Design of reactor facility



Design of steam generator

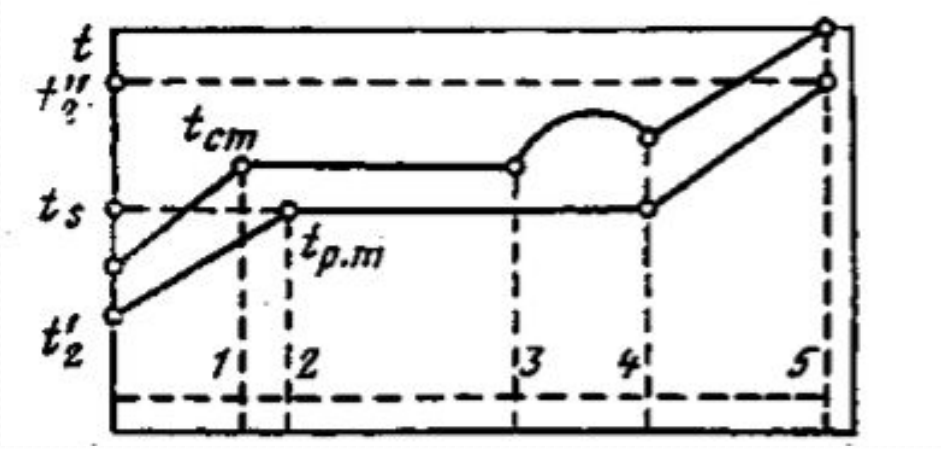


Feed data

Qпг	Thermal capacity	350
tпв, °C	Feed – water's temperature at entrance	348
tпп, °C	Steam's temperature at output	520
p0, MPa	Steam's pressure	17
	Coolant's temperature: entrance	
t1вх, °C	output	540
t1вых, °C		420

Thermal design. Method

1. Water's turbulent movement
2. Start of surface boiling
3. Developed boiling
4. Poor heat exchange
5. Steam's turbulent movement



Thermal design. Results

Value	Section				
	I	II	III	IV	V
Thermal capacity, MVt	4,344	4,356	60,2	116,12	164,3
	11,19	10,07	93,17	174,33	638,95
Length of heat exchange pipes, m	0,19	0,17	1,54	2,89	10,59

Hydrodynamic design. Results

	Section					
	1	2	3	4	5	6
ΔP, kPa			23,16	0,34	16,6	4,3
	7	8	9	10	11	12
ΔP, kPa	410,1	167	205,8	22,4	38,8	9,1

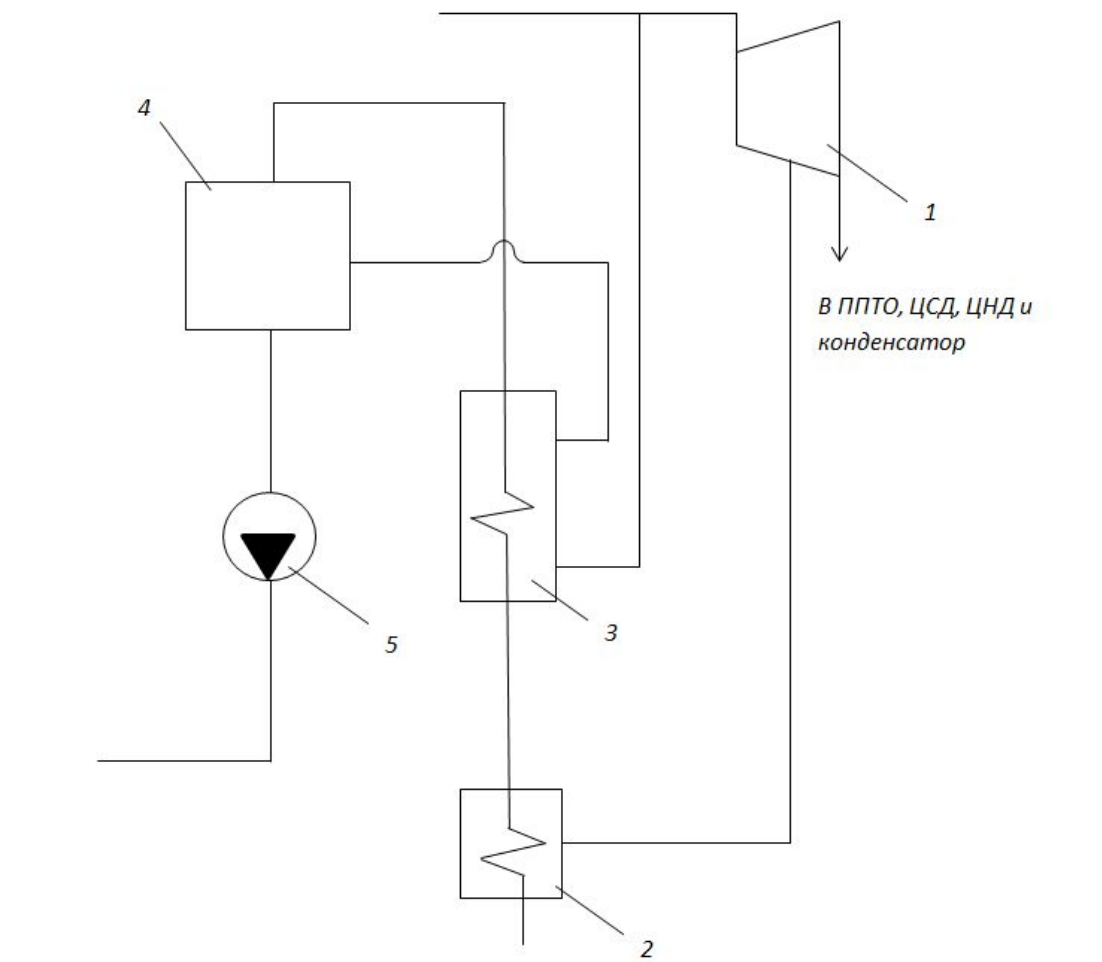
Reaching temperature of feed – water about 340° C

- Melting temperature of Pb

$t_{плPb} \approx 327{,}7°C$

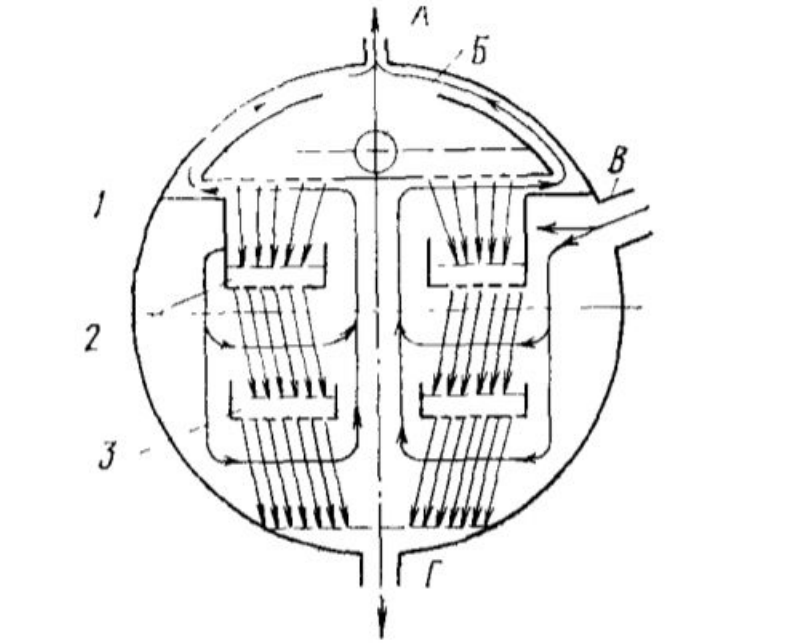
To make Pb stay in liquid form, we should hold up temperature of feed – water ≈ 340°C ⟶

⟶ MIXING HEATER



1 – HPC, 2 – HPP(preheater), 3 – steam desuperheater, 4 - mixing heater, 5 - pump

Design of mixing heater



Thank u for attention!