



RM-Invest



TECHPROMARMA  
confidence in safety

# EMERGENCY PROTECTION OF PIPELINES AND EQUIPMENT



**Gastech**  
EXHIBITION & CONFERENCE

30TH EDITION

17 - 20 SEPTEMBER 2018  
BARCELONA, SPAIN



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## The main causes of accidents in pipeline systems are:

- Vibrations and water hammers
- Fabrication defects
- Installation errors
- Corrosion and wear



### Water hammers



### Fatigue failure of pipelines



### Seal failure



**Necessity to provide of effective  
means of suppression**



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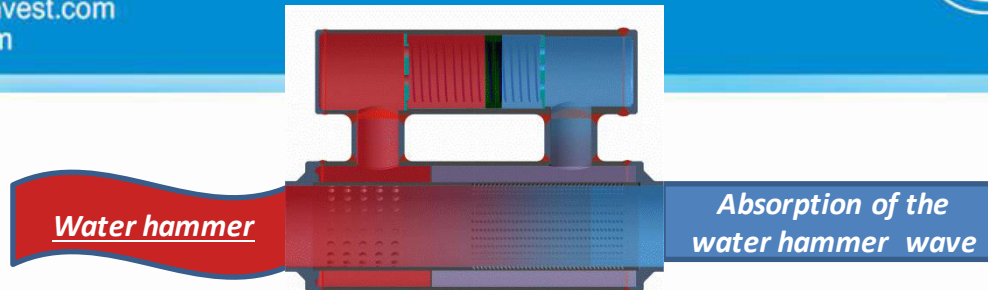
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**Water hammer** is *pressure jump that occurs at sudden stop of flow and it's spread with transonic speed in pipelines*

**Water hammer is the most dangerous:**

- at the places of installation of valves and gate valves
- during irregular work of the pumps and their abrupt shutdown
- at the places of the pipelines' sharp turns
- in rigid pipes
- at sharp narrowing of diameter
- at high flow rates



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## Several ways of suppression of water hammers and vibrations:

~~External  
chambers with  
resilient  
membranes~~



Short term of  
operation and rapid  
wear of membranes,  
limitation of the  
frequency range.

~~The systems of  
automatic  
regulation~~



Limitation in frequency  
of flow pulsations, need  
for energy consumptions  
to maintain the activity  
of the system.  
The unit is likely to fail.

**Pressure  
autostabilizer**



- ✓ **a passive system**
- ✓ its damping elements **don't wear out**
- ✓ there are **no limits** in the frequency range





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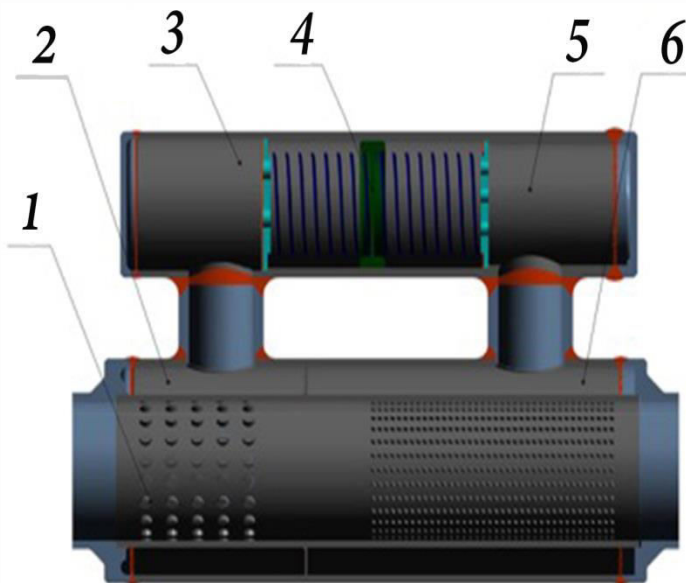
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## Principles of operation



(1) body (containing perforated pipeline)

(2) and (6) expansion chambers

(3) and (5) damping chambers

(4) spring-loaded piston/ball



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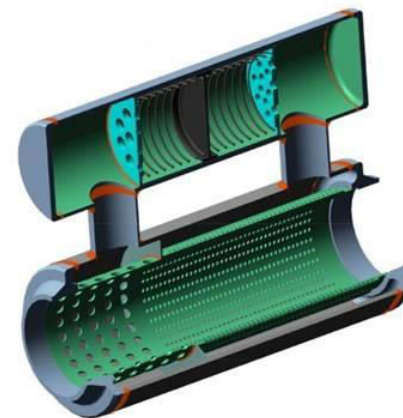
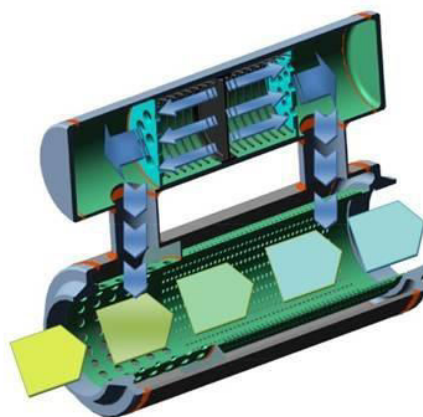
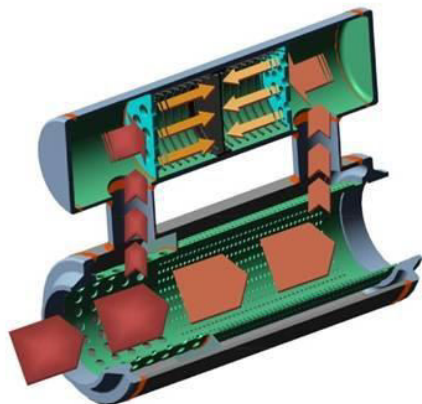
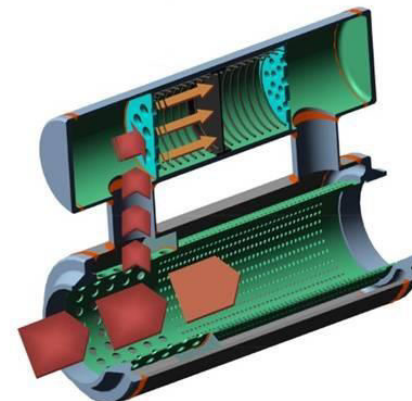
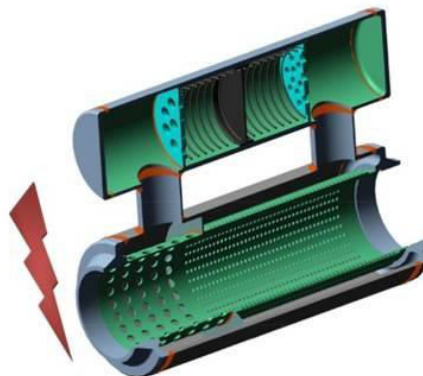
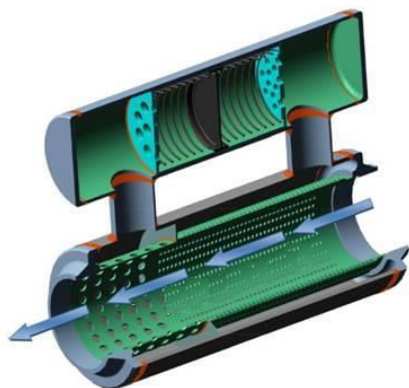


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## PRINCIPLE OF OPERATION





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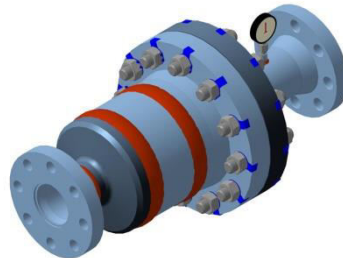
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## Pressure autostabilizer



### ***Pipe type***

Diameter: 6 - 300 mm



### ***Chamber type***

Diameter: 100 - 2000 mm



Pressure: ***up to 45 MPa***  
Working temperature: ***up to 550°C***  
Minimal service life: ***30 years***



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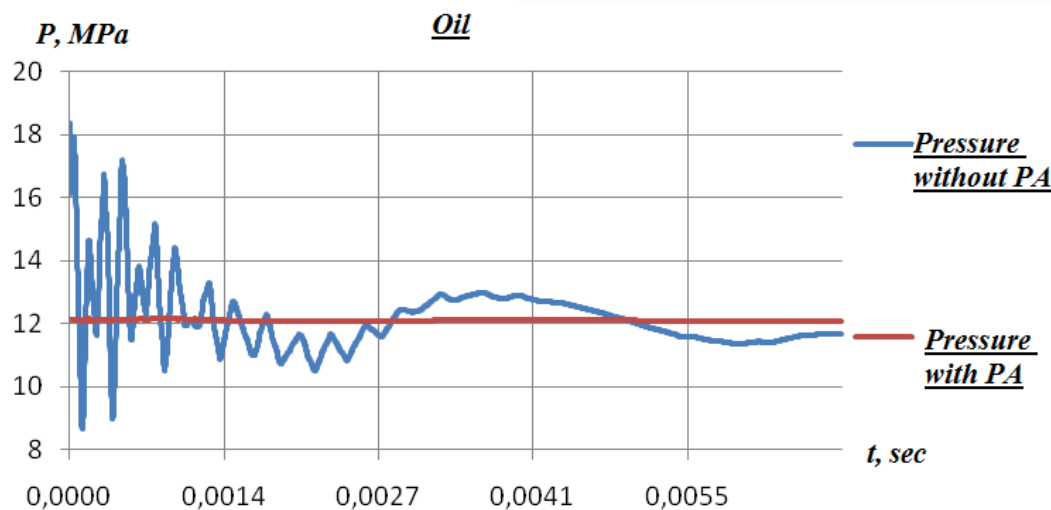
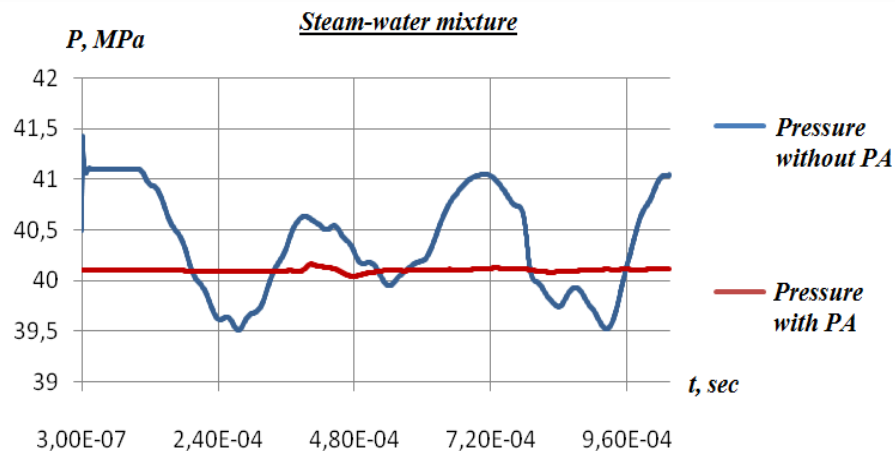
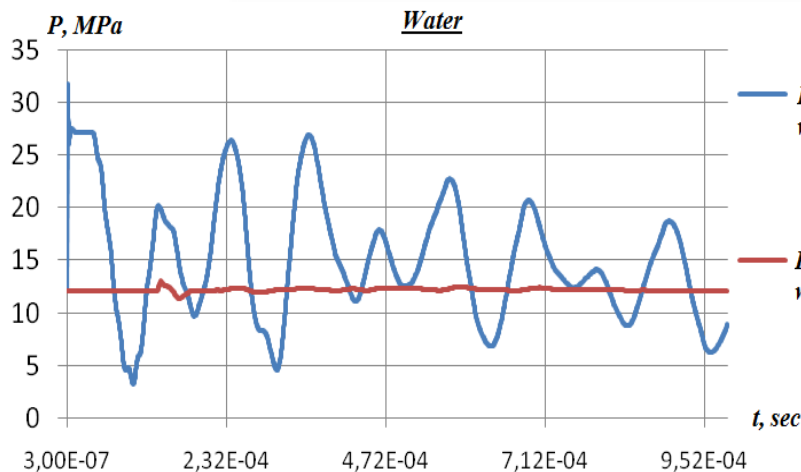
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## DIAGRAMS OF PRESSURE SURGES DUE TO VIBRATIONS AND WATER HAMMERS







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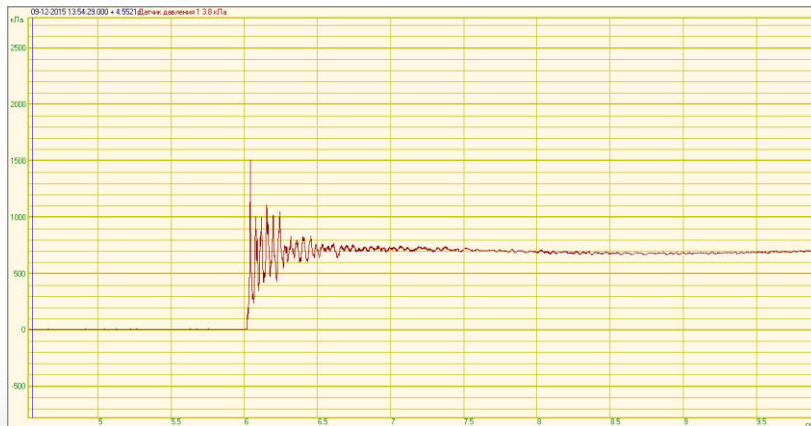
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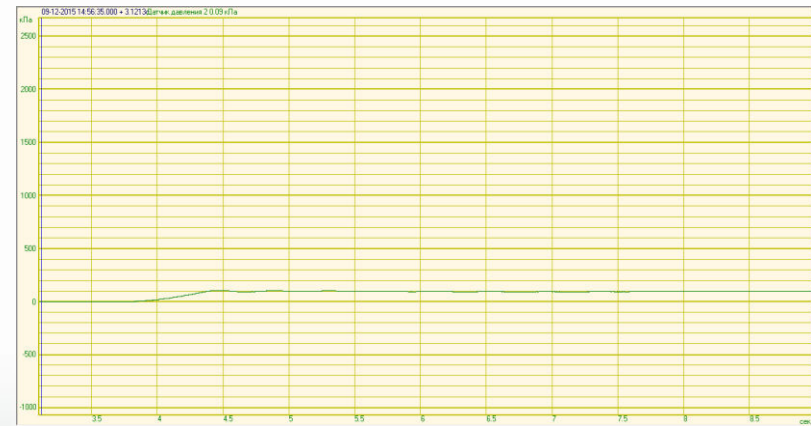
## PA TESTING AT «NUCLEAR POWER PLANT TESTING AND RESEARCH CENTER» (MOSCOW)



Field testing was carried out by TechPromArma using specialized measuring equipment



Picture 1 – Water hammer without PA  
(Dn 80)



Picture 2 – Water hammer with PA  
(Dn 80)



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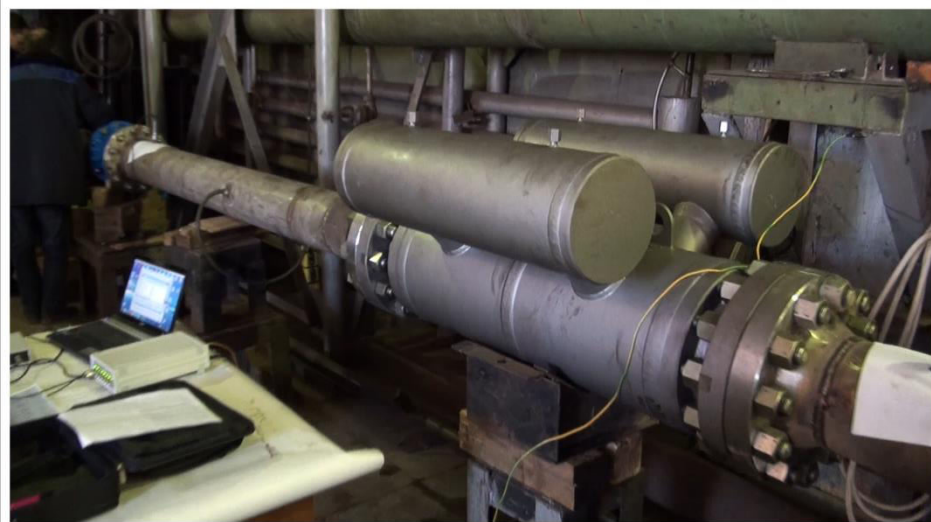


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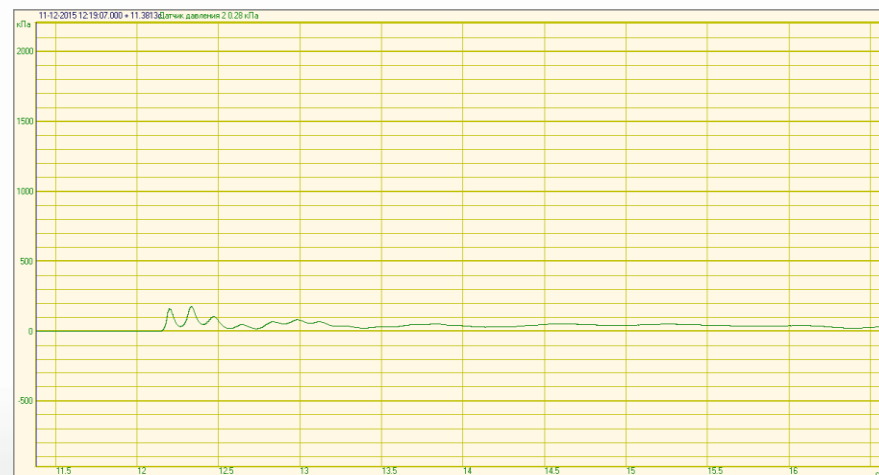
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## PA TESTING AT «NUCLEAR POWER PLANT TESTING AND RESEARCH CENTER» (MOSCOW)



Picture 1 – Water hammer without PA (Dn 200)



Picture 2 – Water hammer with PA (Dn 200)



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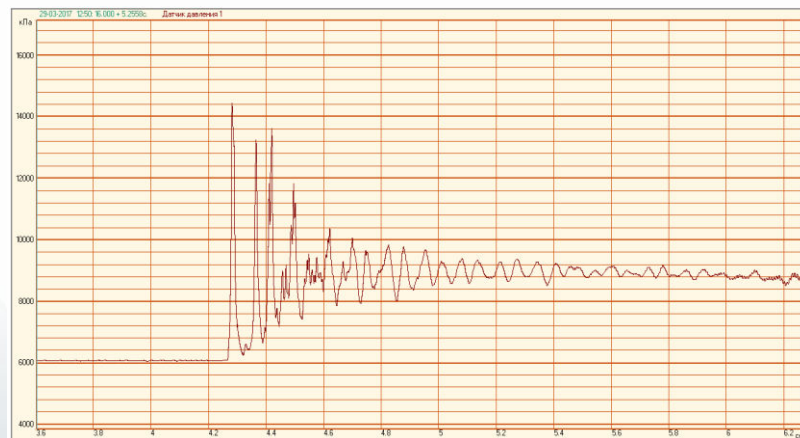
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## PILOT TESTING AT PJSC «LUKOIL» 29.03.2017

without PA installation



with PA installation







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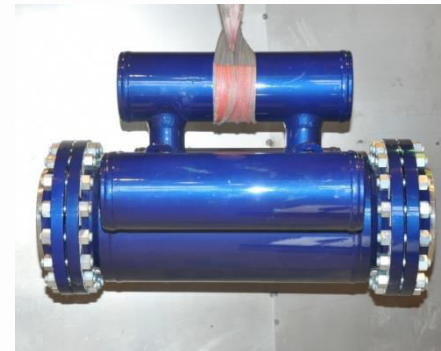
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## DELIVERY OF PA FOR PJSC «LUKOIL»

**Subsurface area for injection of  
stratal water “Yareganef”**

**Varandei oil field  
Water pipe**



1. PA Dn 350  
Pn 1.6 MPa
2. PA Dn 300  
Pn 16 MPa

PA Dn 300  
Pn 4.0 MPa







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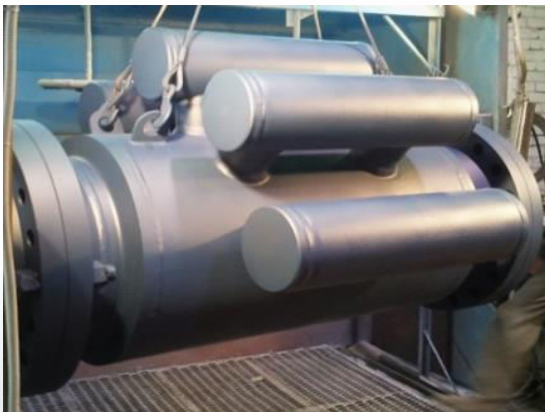
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## PA APPLICATION ON POWER ENGINEERING FACILITIES



- Smolensk NPP
- Kalinin NPP
- Rostov NPP
- Leningrad NPP
- BELARUSKALI;
- Borisov CHPP
- etc.





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## REPORT ON STRENGTH ASSESSMENT OF PIPELINES

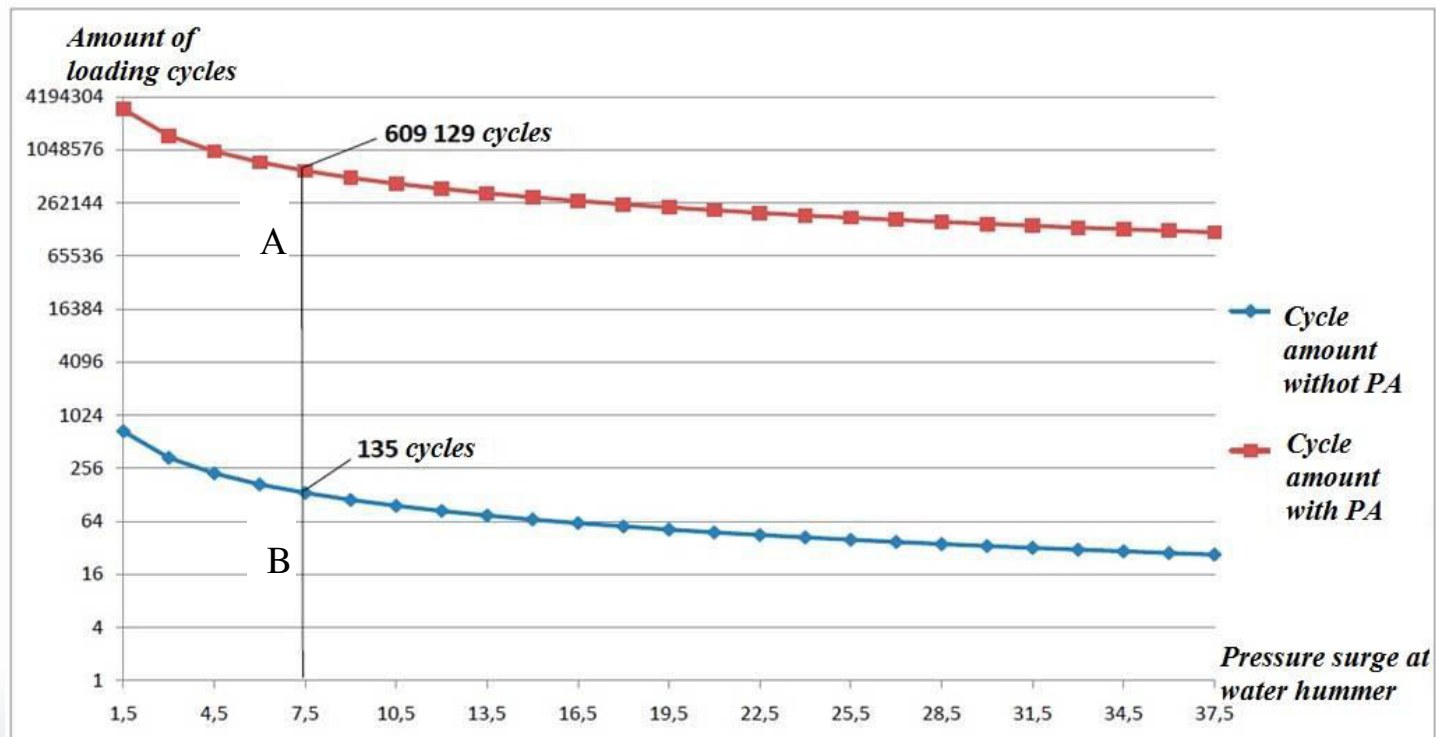
### Cases under consideration

*Pipelines without PA*

**135** Water hummers

*Pipelines with PA*

**609 129** Water hummers



Pipeline with PA withstands **4500 times** more of water hammer cycles!





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## PRACTICAL RESULTS OF PRESSURE AUTOSTABILIZER OPERATION

Reducing accident  
rate of pipelines and  
their equipment

Increasing residual life  
operation of pipeline  
systems 1,5-2 times

Reducing operating  
costs of pipelines  
and equipment

Reducing direct and  
indirect costs on  
preventive, accidental  
and recovery works

## Application fields of pressure autostabilizer

At pipelines in different systems such as:

- Power industry (Nuclear Power Plant, Thermal Power Station, Hydroelectric Power Stations of different types, Hydropower Plant)
- Municipal water and sewage systems
- Oil and Gas industry
- Metallurgical engineering
- Chemical industry





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## **Advantages of the PA**

- water hammer amplitudes and pressure pulsation in pipelines are mitigated to a safe level
- instant response (up to 0,003 seconds)
- unlimited range of damped frequencies
- dampening of noise and acoustic disturbances in the flow
- pressure stabilisation is independent of changes in process fluid temperature
- no loss of process fluid
- fighting transient pressure droops
- no need for operational maintenance
- no need for additional tuning during installation
- autostabilizers are self-contained, self operated, energy-independent devices
- no additional flow resistance
- environmentally friendly





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## CERTIFICATION

### International Certificate ISO 9001 Quality Management System



### Certificates of Compliance Technical Regulations of the Customs Union RU C-RU.MX12.B.00003, TC RU C-RU.MX12.B.00004



### International Certificates CE- marking



### Certificates of Compliance at Nuclear Power Plants





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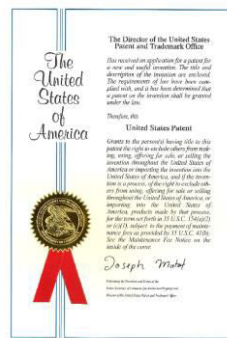
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## PATENTS

**European Patent Organisation  
makes a decision to grant the  
European Patent**



**The USA Patent  
Method of damping pressure  
fluctuations in main delivery pipelines  
**Invention Patent****



**EA. Method of damping pressure  
fluctuations impulses of transported  
medium in main delivery pipelines  
**Invention Patent**  
№ 026034 of 28.02.17.**



**Method of damping pressure  
fluctuations in main delivery pipelines  
**Invention Patent**  
№ 2531483 of 31.07.13,  
expires 31.07. 2033.**



**Device for damping pressure fluctuations in  
main delivery pipelines  
**Utility Model**  
№ 135427 of 10.12.13, expires 31.07.2023.**



**Pressure stabilizer  
of transported medium with external  
impulse relieves  
**Utility Model**  
№138548 of 31.07.13, expired 31.07.2023.**



**Collapsible autoreliever of pressure  
surges in process medium in  
main delivery pipelines  
**Utility Model**  
№ 136523 of 31.07.13, expired  
31.07.2023.**





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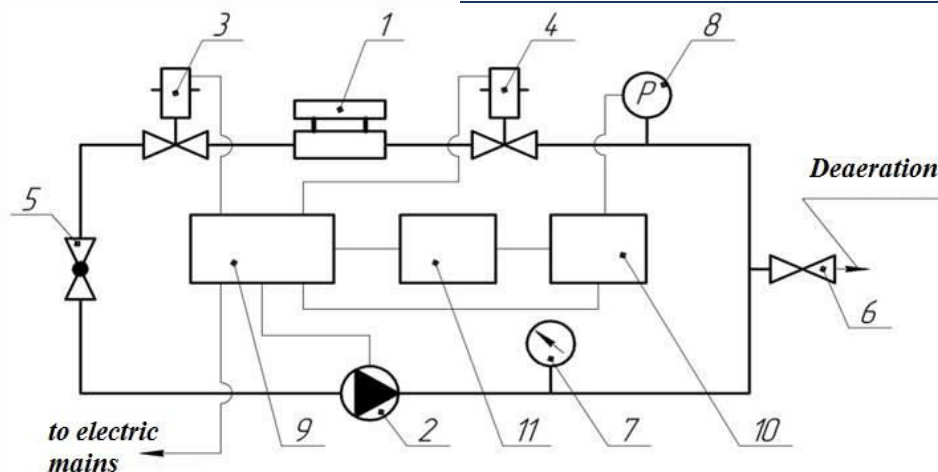


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## HYDRAULIC TEST STAND OF PA PERFORMANCE





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## GUIDELINES FOR PA INSTALLATION

Installation site	Diagram installation
Under pipe restrictor	
In case of lining-up of pipes $D_1 > D_2$ .	
After check valve	
On vertical section with possibility of circulation backflow, after check valve (in the direction of working fluid)	





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**Thank you for your attention**