



TECHPROMARMA  
confidence in safety

# EMERGENCY PROTECTION OF PIPELINES AND EQUIPMENT





## Water Hammer Disasters

### SAYANO-SHUSHENSKAYA HPP

RUSSIA – 2009

AFTERMATH: 75 KILLED,  
LOSSES \$550 MILLION



### THE THREE MILE ISLAND

US – 1979

AFTERMATH: \$ 3.5 BILLION  
DAMAGES

### OLYMPIC PIPELINE EXPLOSION

US – 1999

AFTERMATH:  
3 CHILDREN KILLED  
\$112 MILLION SETTLEMENT.

### BP'S TEXAS CITY REFINERY

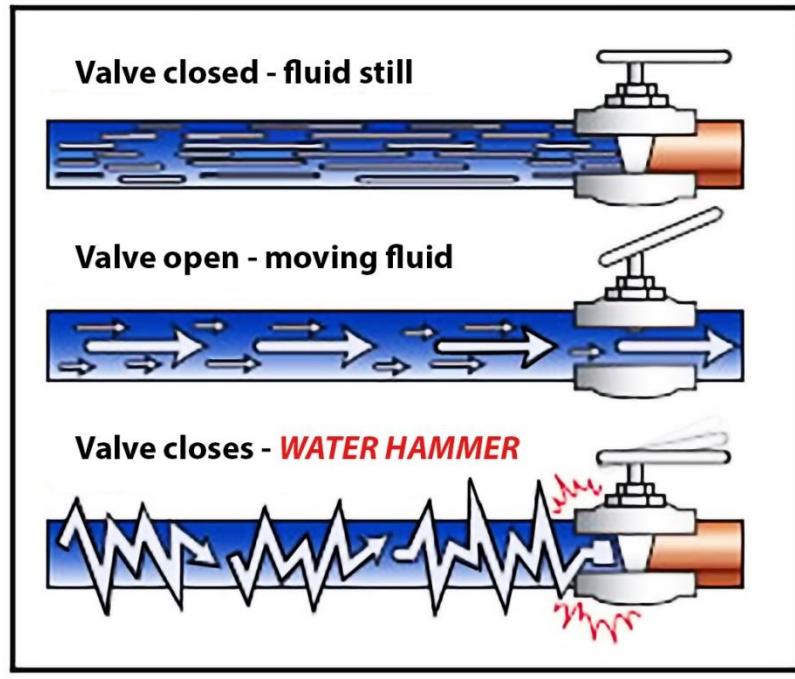
US – 2005

AFTERMATH:  
15 KILLED, 170 INJURED  
\$70 MILLION DAMAGES



## Water Hammer Disasters

Transients and surges, leading to pipe rupture and equipment collapse are a worldwide problem with enormous consequences.



**Water hammer** is a shock wave that is transmitted through the fluid in a pipe.

In simple words water hammer occurs when a moving fluid suddenly stops or changes direction.

### Consequences:

- fluid loss
- disruption of service
- maintenance
- legal settlements
- environmental disasters
- injuries
- casualties



**Vitaly Pestunov**  
is the founder of the company  
TechPromArma and  
the main developer of the device  
concept  
for damping water hammer  
and pressure pulsations.





## OUR TEAM



National University of  
Science and Technology

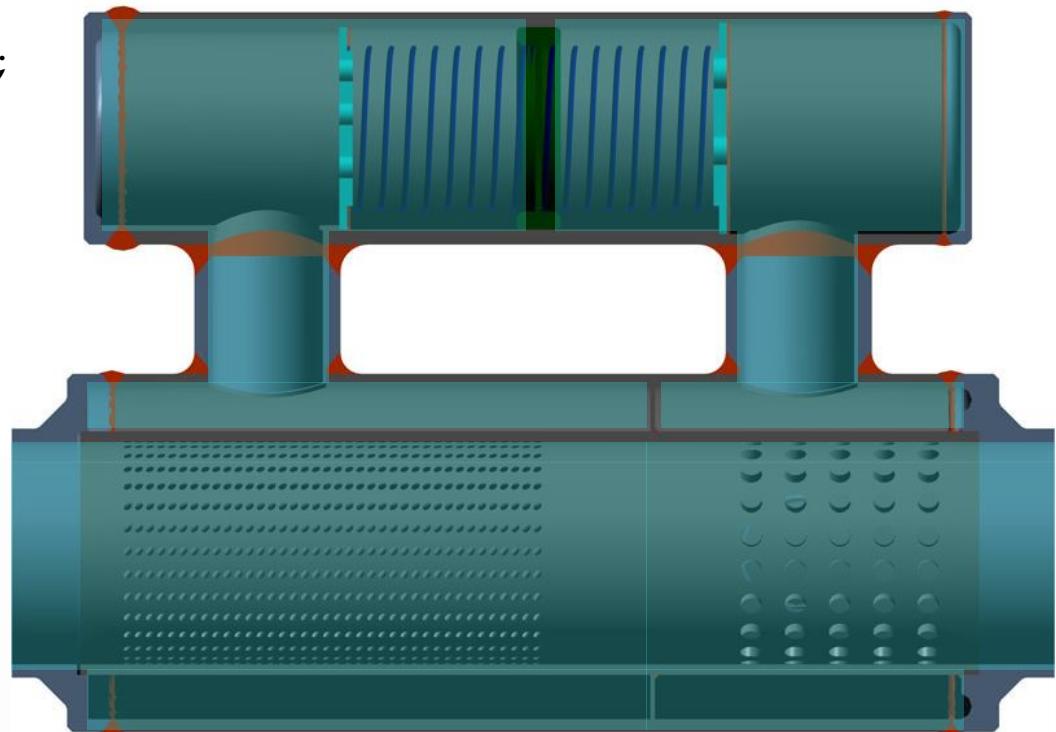


## PRESSURE AUTOSTABILIZER DESIGN

- Central perforated insert;
- Big and small expansion chambers;
- Damping chambers;
- Free movement pistons;

### PRINCIPLES OF OPERATION

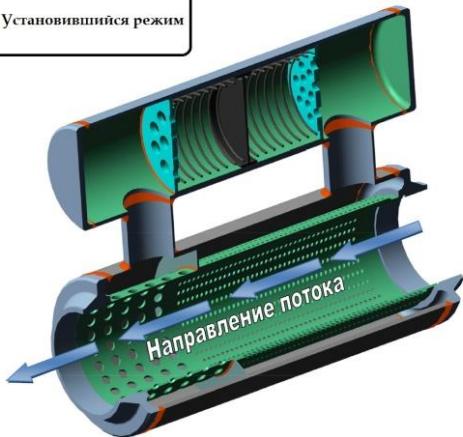
- Water hammer dispersion in special holes;
- Separation of shock wave;
- Medium compressible with free movement pistons – is one of the main damping elements! (auto stabilizing effect);
- Pressure Autostabiliser operation doesn't depend on temperature or working pressure in system.



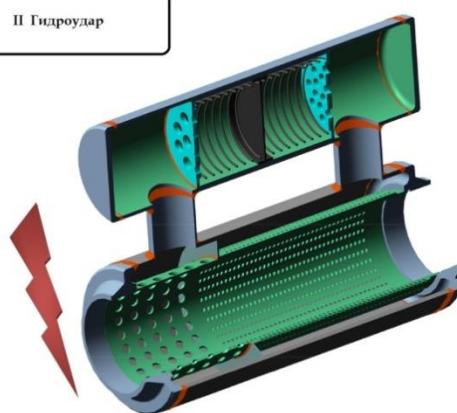


## PRINCIPLES OF OPERATION

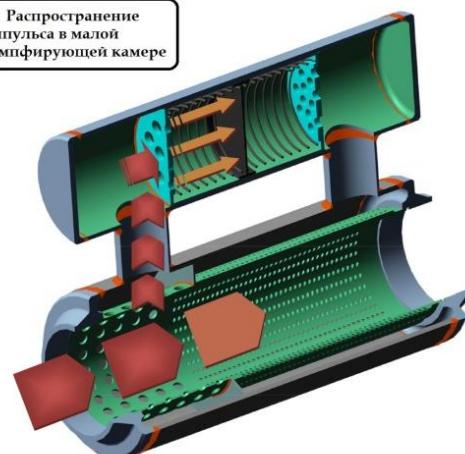
I Установившийся режим



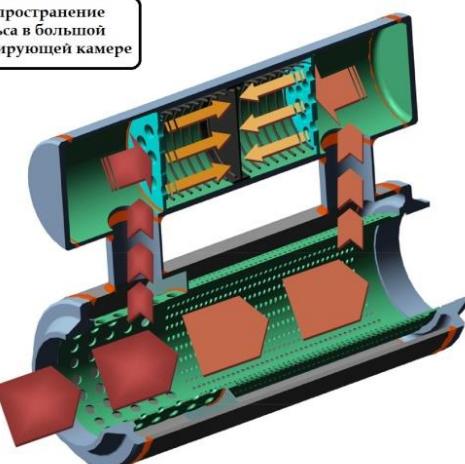
II Гидроудар



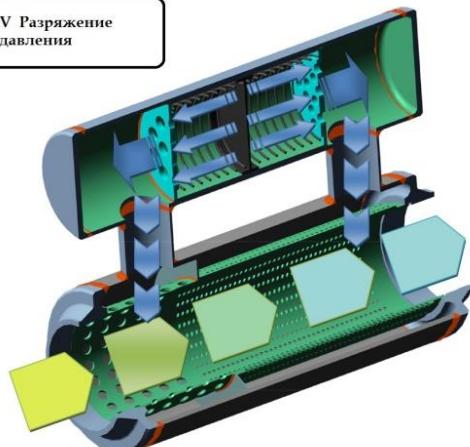
III Распространение импульса в малой демпфирующей камере



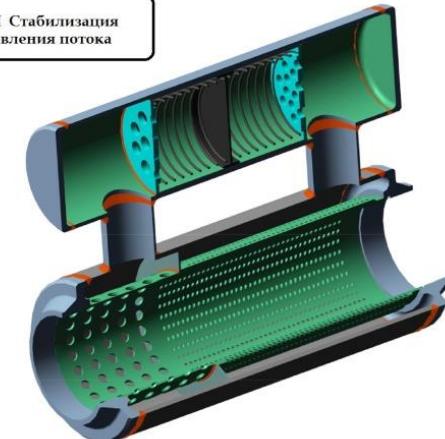
IV Распространение импульса в большой демпфирующей камере



V Разряжение давления



VI Стабилизация давления потока



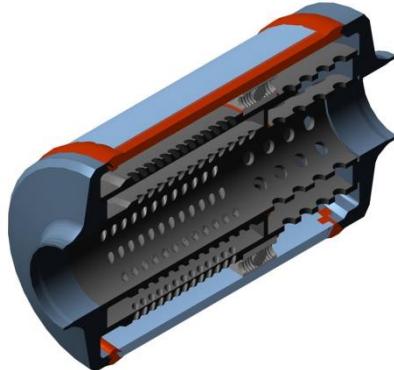


## PRESSURE AUTOSTABILISER



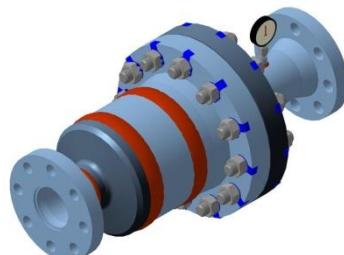
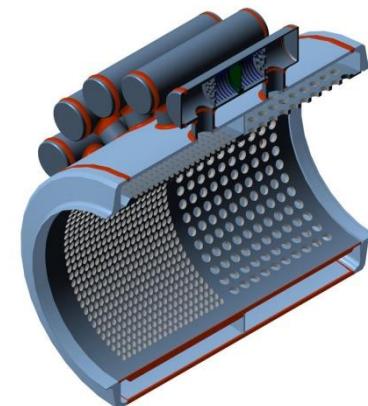
### **TUBE TYPE**

DN: from 6 to 300 mm



### **CHAMBER TYPE**

DN: from 100 to 2000 mm

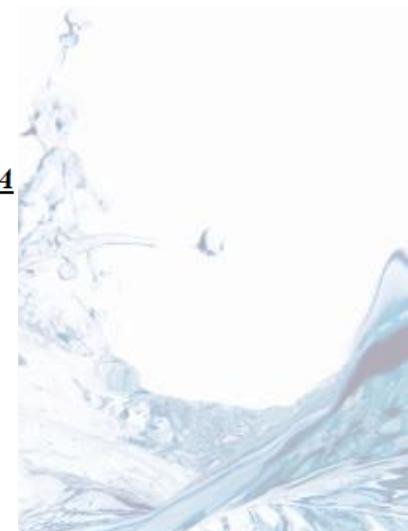
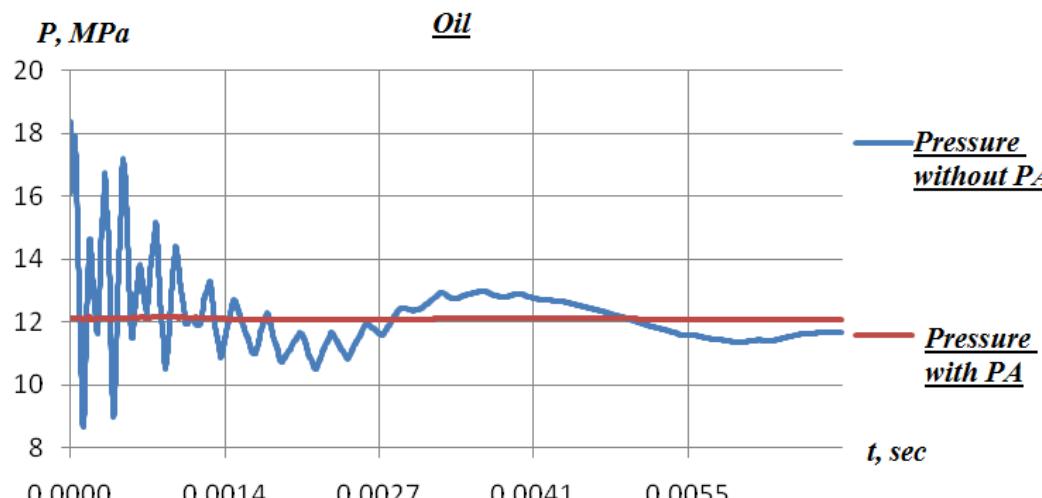
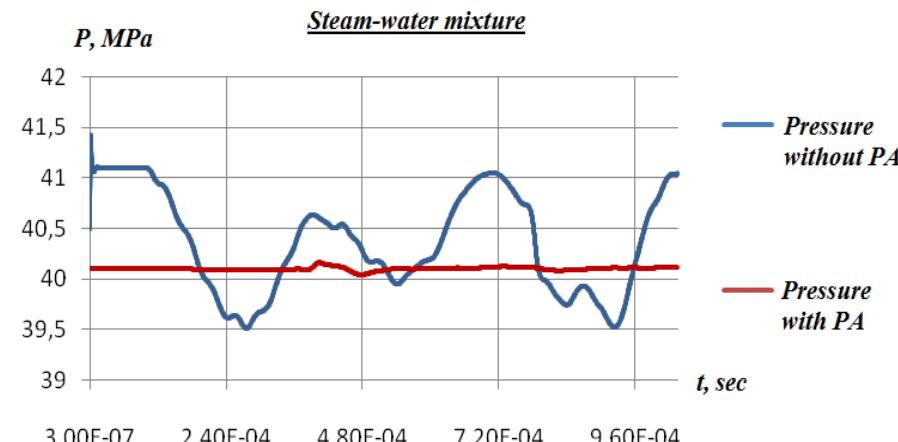
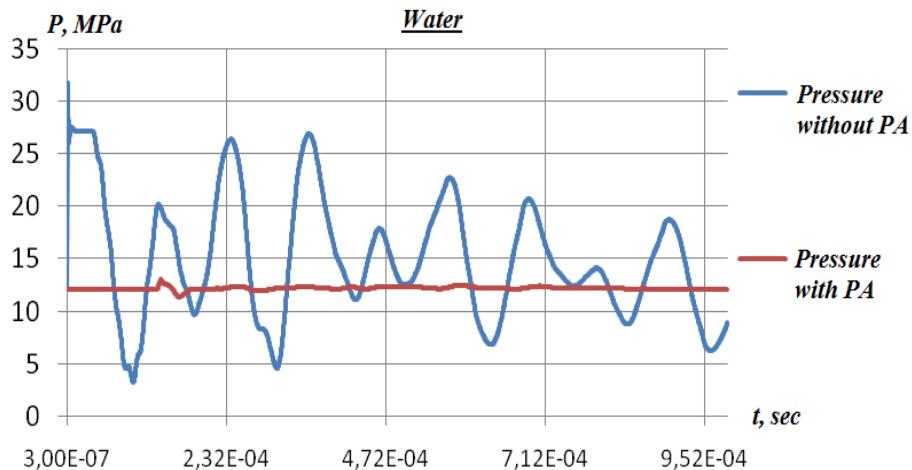


Working Pressure: *up to 40 MPa*;  
Working temperature: *up to 550°C*;  
*According to the customer's request, the design can be changed and the product can be manufactured according to needed technical parameters*



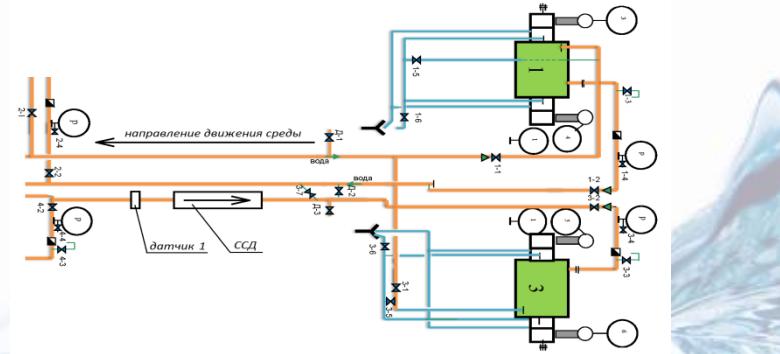
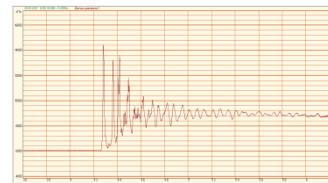
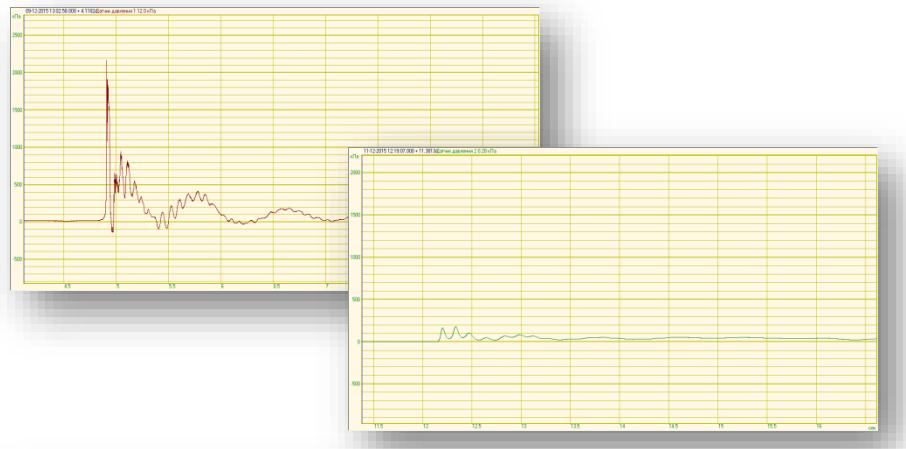


## DIAGRAMS OF PRESSURE SURGES DUE TO VIBRATIONS AND WATER HUMMERS





## EXPERIMENTS, VERIFICATION AND SERTIFICATION





## PROJECT IMPLEMENTATION

Pressure Autostabilizer are extensively used at:

### Nuclear Power Plants



Kalinin NPP



Leningrad NPP



Rostov NPP



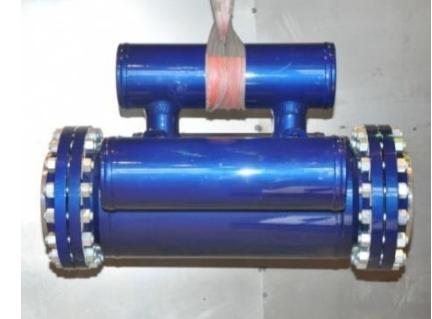
Smolensk NPP

### Oil and Gas Industry



LUKOIL facilities

### Production Facilities



Raspadskaya coal  
company

### Municipal water and sewage systems





## Reference from Borisov CHPP



Наставляем сообщаем, что в соответствии с договором поставки № 19530 от 21.03.2013 г. между РУП «Минскэнерго» и ИПП «Торговый Дом Энергомакомплект» в адрес филиала «Жодинская ТЭЦ» для объекта «Реконструкция котельного цеха №3 (РК-3) Жодинской ТЭЦ в г. Борисове со строительством парогенераторной установки. Вспомогательные объекты» производится поставка ССД для ГПР №3 Ростовской АЭС.

Даный самодизайнер давления поставлен в срок и в соответствии с договорными обязательствами. Поставленное оборудование поставлено в комплексе с сопроводительной документацией (паспорт завода изготовителя и руководство по монтажу и эксплуатации). По качественным характеристикам претензий не было.

За время эксплуатации ССД на трубогенераторах и эффективность ССД сохранилась полностью. В процессе эксплуатации к ССД никаких нареканий в качестве и надежности вышеуказанного оборудования не возникло.

Заместитель директора филиала  
А.С.Закревский

## Reference from Rostov NPP

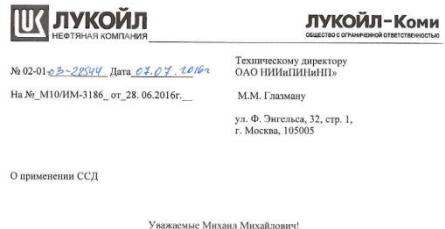


Уважаемый Дмитрий Анатольевич!  
В ответ на письмо № ИП-17/588 от 21.03.2017 г. сообщаю, что до проведения ППР-2016 отсутствовало колебание в системе ГПР. В период проведения ремонта были установлены самостабилизаторы давления (ССД) 3SC909B01, 3SC91B01, 3SC92B01 в количестве трех штук. После установки ССД колебаний давления в системе ГПР не зафиксировано. ССД полностью соответствует заявленным требованиям.

С уважением  
А.Б.Горбунов  
А.Б.Горбунов  
Кравцов  
297225

О работе ССД в системе ГПР  
зарегистрировано 05.04.2017

## Reference from LUKOIL



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Факс:(82144) 41-3-38  
E-mail:us\_posman@ukoil.com



## REPORT ON STRENGTH ASSESSMENT OF PIPELINES

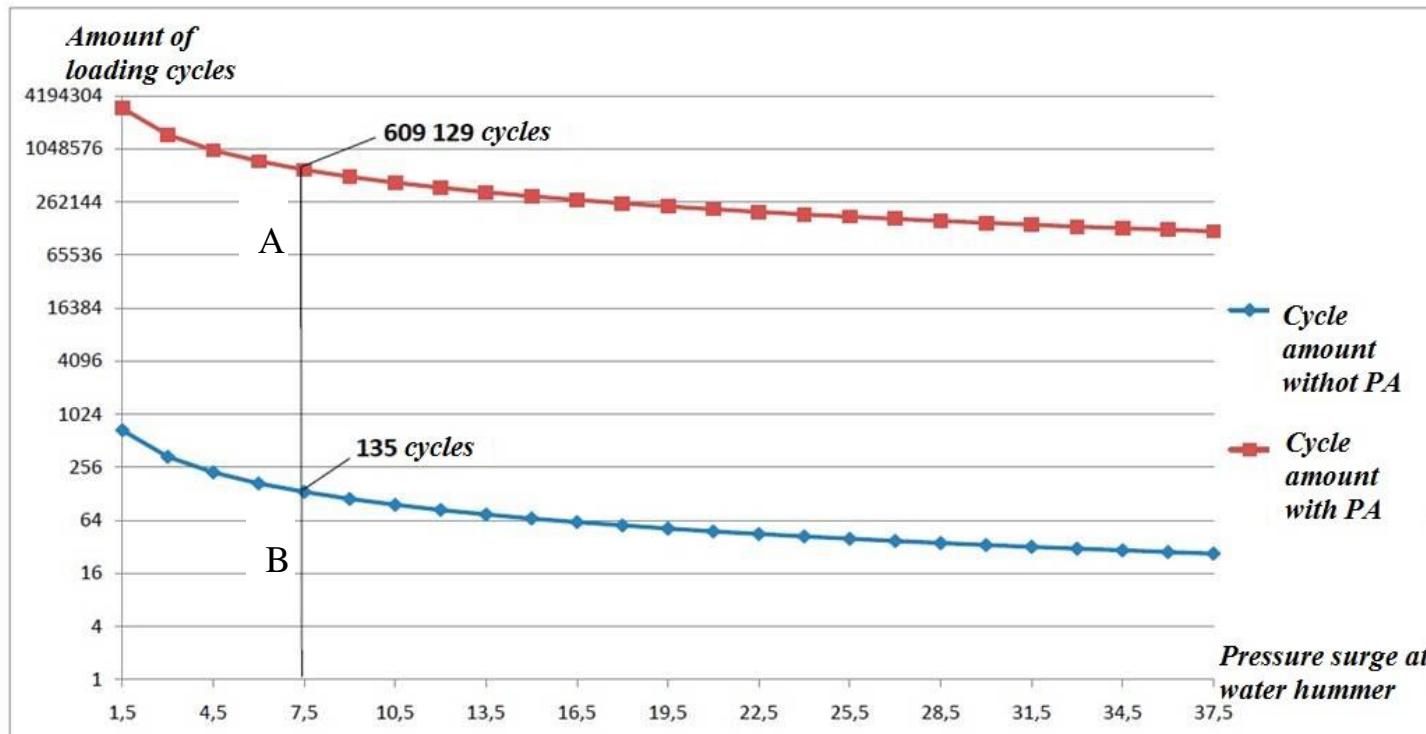
### Cases under consideration



*Pipelines without PA*  
**135** Water hummers



*Pipelines with PA*  
**609 129** Water hummers



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



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

## ADVANTAGES

<b>MAINTENANCE</b>	MAINTENANCE-FREE
<b>RECHARGING</b>	SELF-CONTAINED DEVICE
<b>INSTALLATION</b>	EASILY MOUNTED PIPE-INSERTS
<b>SIZE</b>	NO ADDITIONAL SPACE REQUIRED
<b>RESPONSE TIME</b>	ALMOST INSTANTANEOUS
<b>FLOW RESISTANCE</b>	NO ADDITIONAL RESISTANCE
<b>Reliability</b>	100 %

## 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)
- Municipal water and sewage systems
- Oil and Gas industry
- Metallurgical, chemical engineering





## CERTIFICATION

### International Certificate ISO 9001 Quality Management System



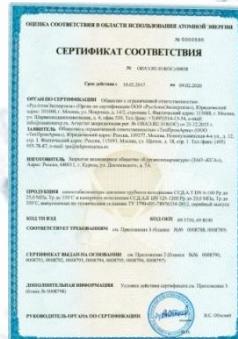
### Certificates of Compliance Technical Regulations of the Customs Union RU C-RU.MX12.B.00003, TC RU C-RU.MX12.B.00004



### International Certificates CE- marking



### Certificates of Compliance at Nuclear Power Plants





European Patent Organisation  
makes a desision to grant the  
European Patent

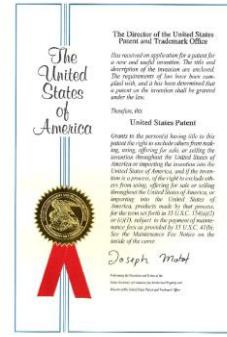


Device for damping pressure fluctuations in  
main delivery pipelines  
**Utility Model**

№ 135427 of 10.12.13, expires 31.07.2023.



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



## PATENTS

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



Pressure stabilizer  
of transported medium with external  
impulse relievers  
**Utility Model**

№ 138548 of 31.07.13, expired 31.07.2023.



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



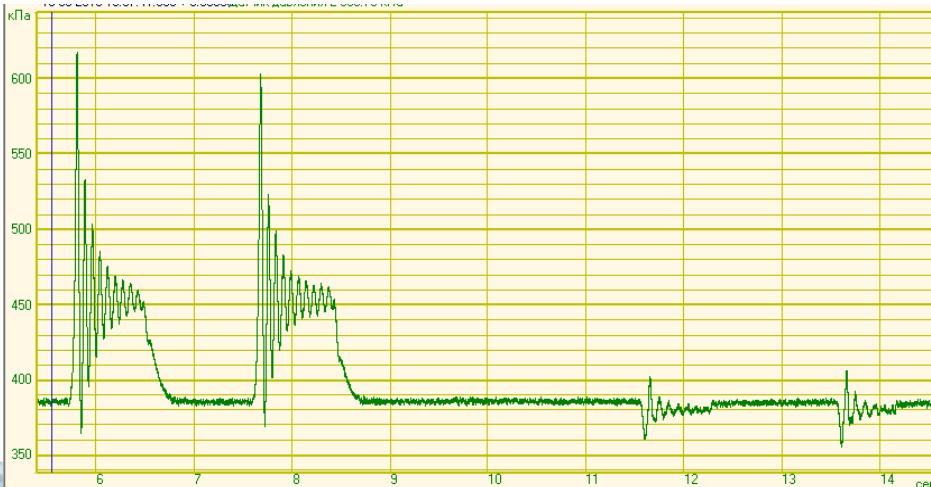
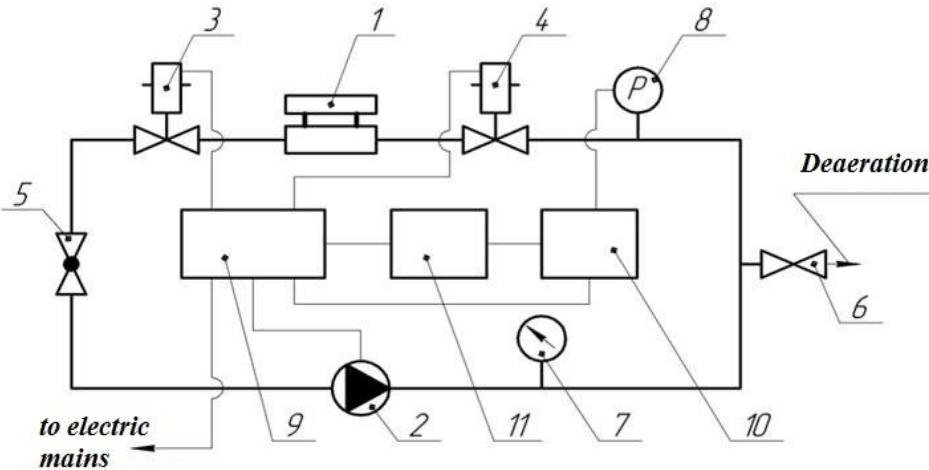
Collapsible autoreliever of pressure  
surges in process medium in  
main delivery pipelines  
**Utility Model**

№ 136523 of 31.07.13, expired  
31.07.2023.





## HYDRAULIC TEST STAND OF PA PERFORMANCE





**Thank you  
for your attention!**