SELF-CONTAINED EXPERIMENTAL APPARATUS UDD-2 TO STUDY
PHYSICOMECHANICAL PROPERTIES OF MATERIALS
UNDER DYNAMIC PRESSURES

Description
The apparatus is designed for studying physicomechanical properties of various
materials under conditions simulating process loads with due account for external factors
(temperature, pressure, etc.). The apparatus consists of a high-strength case with internal
pressure source (powder), equipped with tensometric pressure sensor and recording
system. Pressure can be delivered onto a sample through different fluids. The apparatus
permits conducting rapid analysis of sample properties under field conditions.

Figure 1 – Experimental apparatus

Technical specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impulse action amplitude, MPa</td>
<td>up to 200</td>
</tr>
<tr>
<td>Duration of impulse action, s</td>
<td>0.01 up to 1</td>
</tr>
<tr>
<td>Heating temperature, °C</td>
<td>up to 150</td>
</tr>
<tr>
<td>Evacuation, MPa</td>
<td>up to 0.01</td>
</tr>
<tr>
<td>Static pressure, MPa</td>
<td>up to 20</td>
</tr>
<tr>
<td>Weight of body, kg</td>
<td>not more 15</td>
</tr>
<tr>
<td>Effective volume, см³</td>
<td>up to 500</td>
</tr>
<tr>
<td>Required area of the system of devices and connections, м²</td>
<td>2</td>
</tr>
</tbody>
</table>

Figure 2 – Apparatus diagram
1 – Igniter;
2 – Seal assembly;
3 – Top cover;
4 – Powder charge;
5 – Case;
6 – Working fluid;
7 – Tested sample;
8 – Bottom cover;
9 – Pressure sensor.
Technical appraisal and economic benefits

A peculiar feature of the apparatus is that it uses an internal pressure source (powder charge). In this case, the value of pressure impulse is defined by powder weight. The apparatus allows one to:
- conduct studies under different types of action on material samples by impulse or static pressure;
- generate depression loads on a sample;
- have a complex effect upon samples of chemical (using composite fluids) and impulse action.
To study the temperature effect upon the pressure of sample destruction, thermostating of the apparatus is provided.

Application areas

The apparatus is intended for studying physomechanical properties of rock samples, core samples of oil and gas wells, samples of building and other materials in different industries.

Development stage

Design documentation is elaborated; a prototype of the experimental apparatus has been manufactured. Samples of rocks from oil wells have been tested. The system is prepared for implementation at Institute of Petroleum Chemistry, SB RAS.

Patent situation

Application for a patent is under preparation.

Commercial offers

Manufacture and supply contract.

Estimated cost

Total costs for manufacture of the experimental apparatus to study physomechanical properties of materials under dynamic pressures amount to 260,000 RUB.

Contacts

Dr. Sergey Gavrilovich Ilyasov, Deputy Director
Institute for Problems of Chemical & Energetic Technologies
Siberian Branch of the Russian Academy of Sciences
1, Sotsialisticheskaya Str., 659322 Biysk, Altai Region, Russia
Tel.: (3854) 30-58-37
Fax: (3854) 31-13-09
E-mail: admin@ipcet.ru
http://www.ipcet.ru