Using Nickel Titanium Alloy for Fixing Damaged High Pressure Pipes in Emergency Situations

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The purpose of the project is to fix damaged, high pressure pipes in either extreme or domestic circumstances. I decided to use NITINOL alloy because of its form remembering effect (After deformation if this alloy is heated it begins deformation and takes the shape it had at the beginning). When NITINOL plate will be formed it will be made in the shape of ring, with cut on the one side, plate will be covered with silicone to have better contact with cracked pipe surface. The principle of using this ring is that, when there is a leak from pipes, NITINOL plate should get colder, straightened by hand and after bringing plate near the cracked pipe, when plate begins heating it will automatically bend and take a rings' form. The plate encircles the damaged part of the pipe and stops leak. To prove this hypothesis there were made calculations and experiments. At first I made device to measure the force which is needed to stop 100300 Pascal pressure from 5mm radius crack. For stopping air leak I used an analog of NITINOL titan plate. Air leak stopped on the benchmark of 98newton. After this I made second device for calculating how much force can provide unit of NITINOL. For this measurement, I used spring with NITINOL alloy, power supply for heating the spring and a dynamometer. After measurements, concluded that, to stop 1 atm. pressure 1.83cm3 volume of NITINOL alloy will be needed. Plate can be used more than 1500 times. With this invention it'll be possible to fix cracked pipes immediately without any preparation. After 4 experiments and calculations it can be concluded that hypothesis were correct. NITINOL plate tube fixing principal is one of the easiest ways of fixing damaged pipes. Proposed pipe fixing system can be used both in extreme or domestic situations.

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