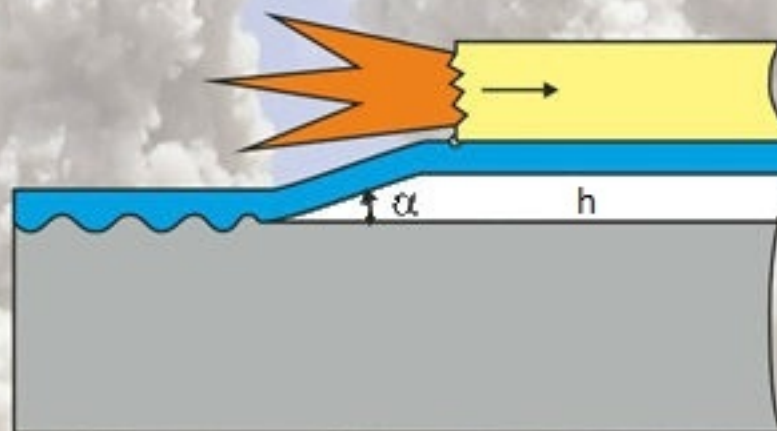


**VLADIMIR VAKIN\*, ANDREY KRASILNIKOV\*\***

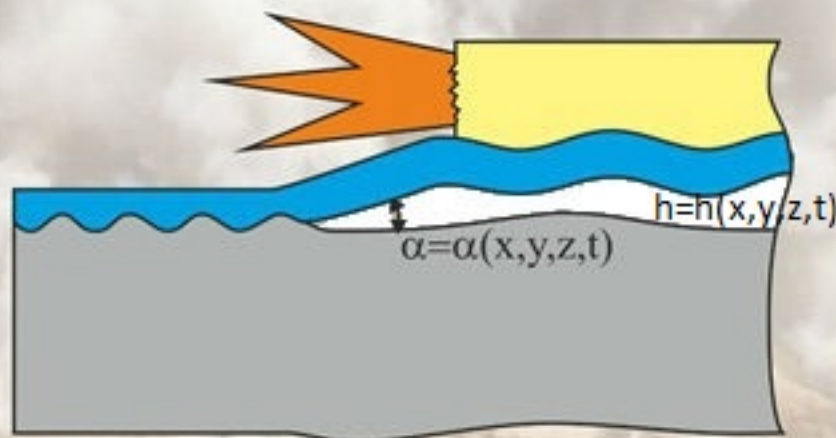
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*\*\*BALTIC STATE TECHNICAL UNIVERSITY VOENMECH,  
ST.PETERSBURG, RUSSIAN FEDERATION*

# Dynamic Features of Explosion Welding of Extra-Large Clad Plates



Picture №1



Picture №2

**A: Explicit Dynamics (ANSYS)**

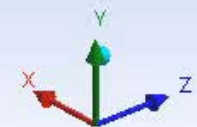
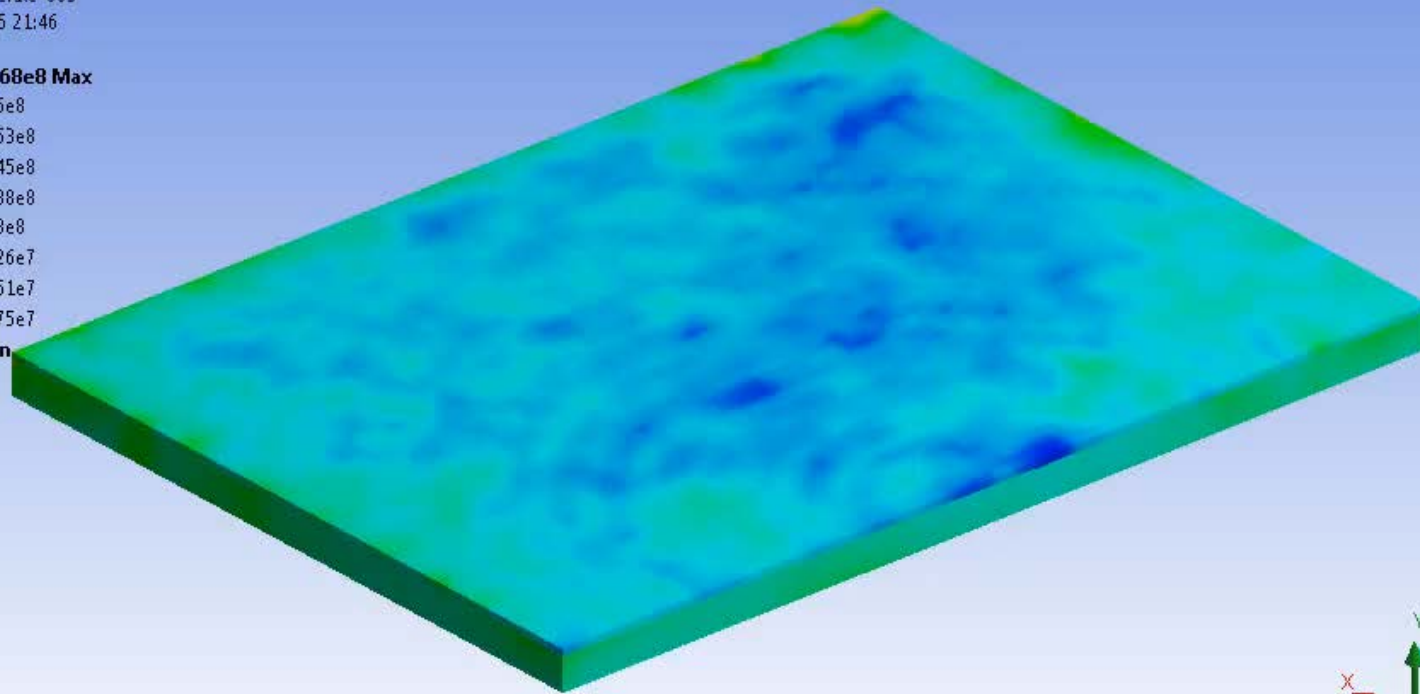
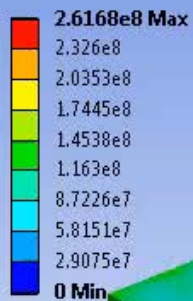
Equivalent Stress

Type: Equivalent (von-Mises) Stress

Unit: Pa

Time: 2.4240e-003

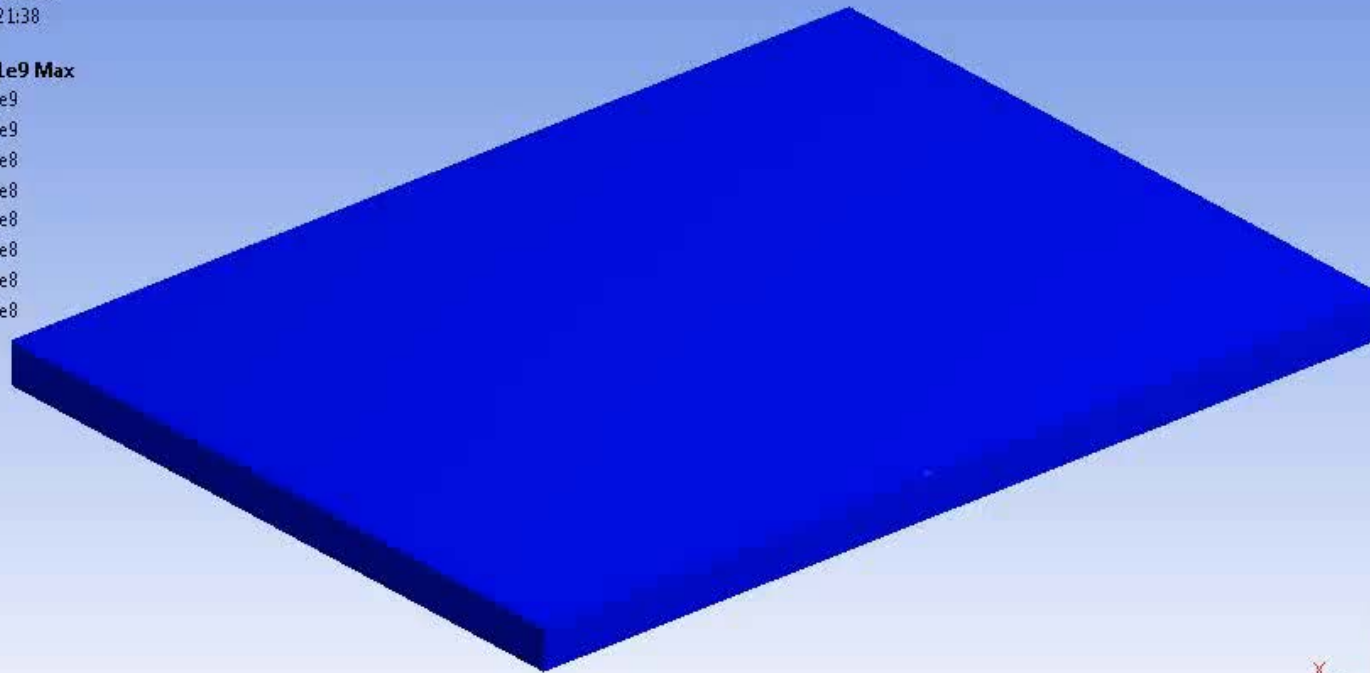
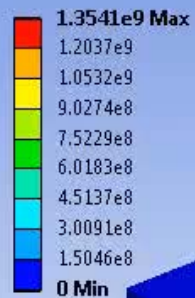
22.03.2015 21:46



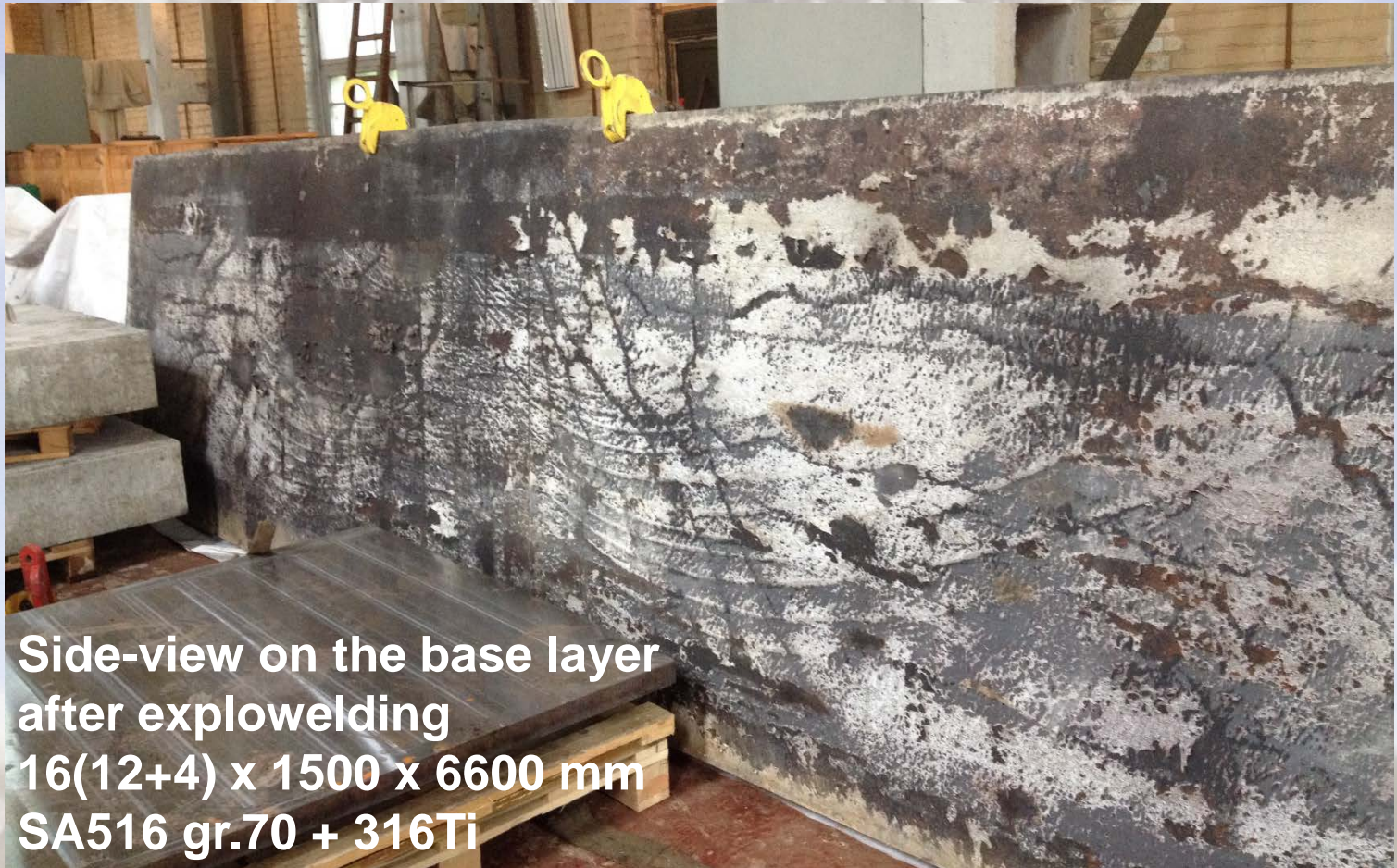
**Stress waves between the base and cladding layers**  
**46(40+6) x 4106 x 5516 mm SA561 gr.70 + B265 Gr.1**

**A: Explicit Dynamics (ANSYS)**

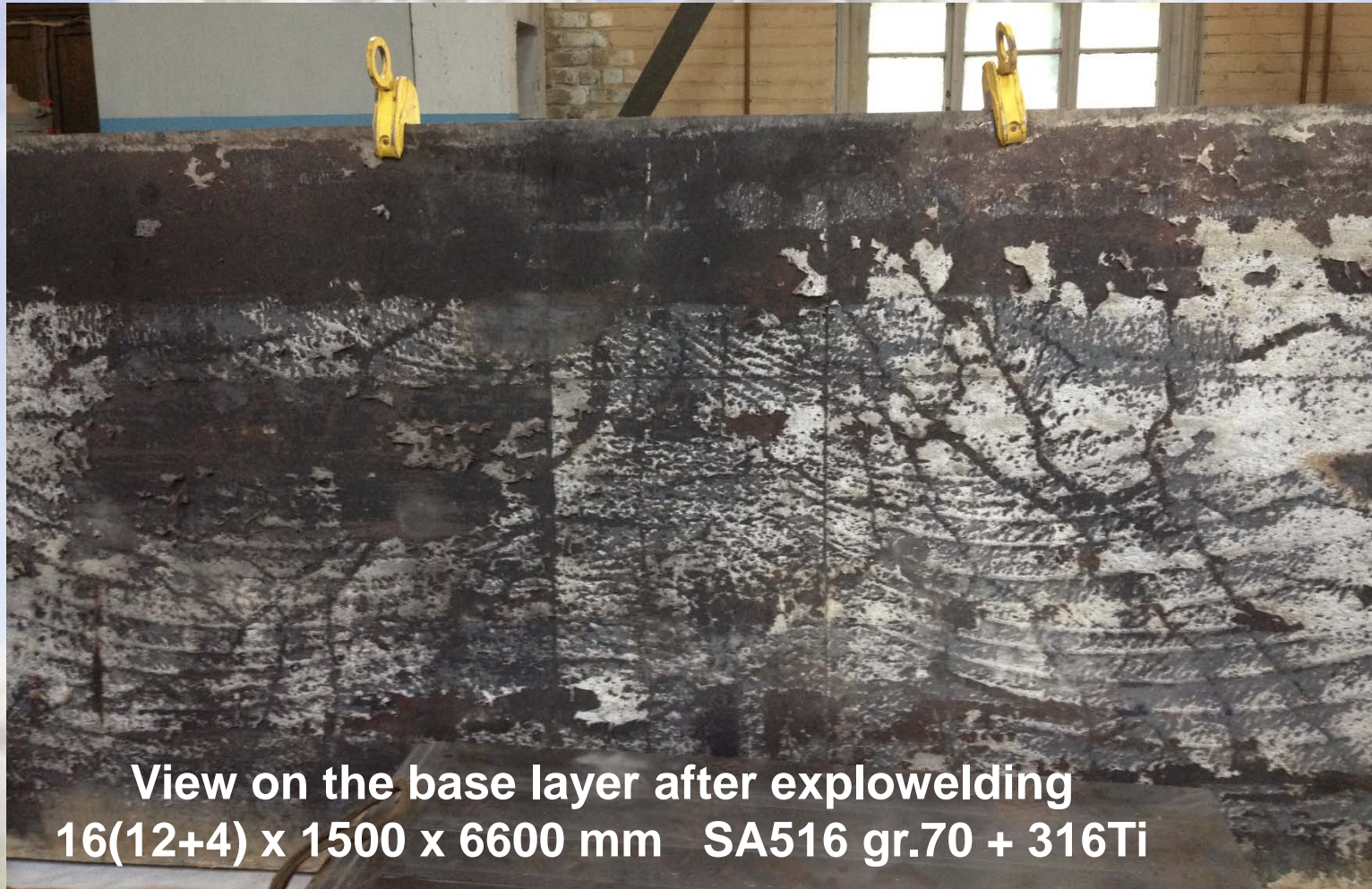
Equivalent Stress  
Type: Equivalent (von-Mises) Stress  
Unit: Pa  
Time: 2.5254e-005  
22.03.2015 21:38



**Propagation of stress waves along the surface of the cladding layer 46(40+6) x 4106 x 5516 mm SA561 gr.70 + B265 Gr.1**



Side-view on the base layer  
after expowelding  
16(12+4) x 1500 x 6600 mm  
SA516 gr.70 + 316Ti



**View on the base layer after explowelding  
16(12+4) x 1500 x 6600 mm SA516 gr.70 + 316Ti**

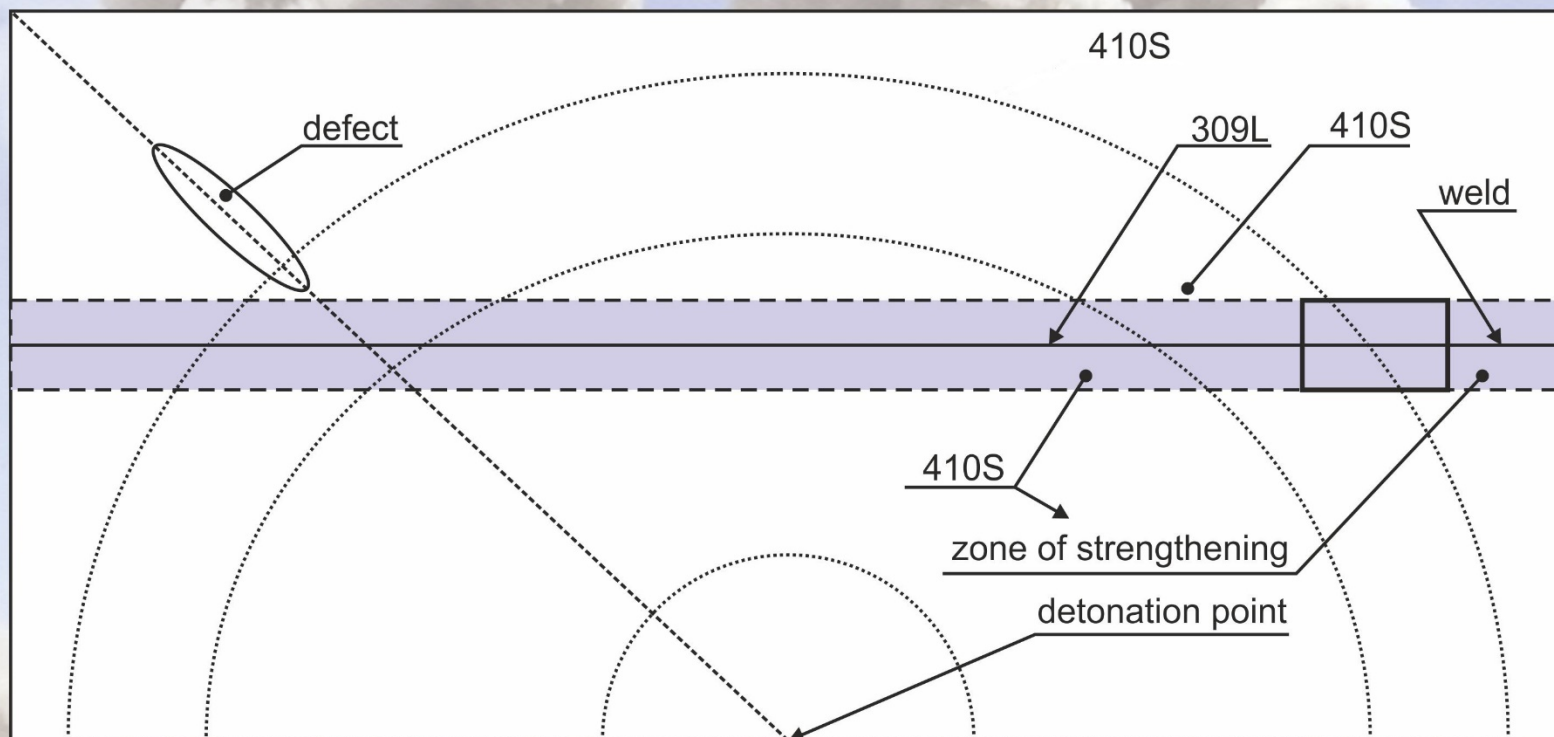


**Imprint on the cladding layer**  
**36(30+6) x 2500 x 10000 mm      09G2S + 410S**



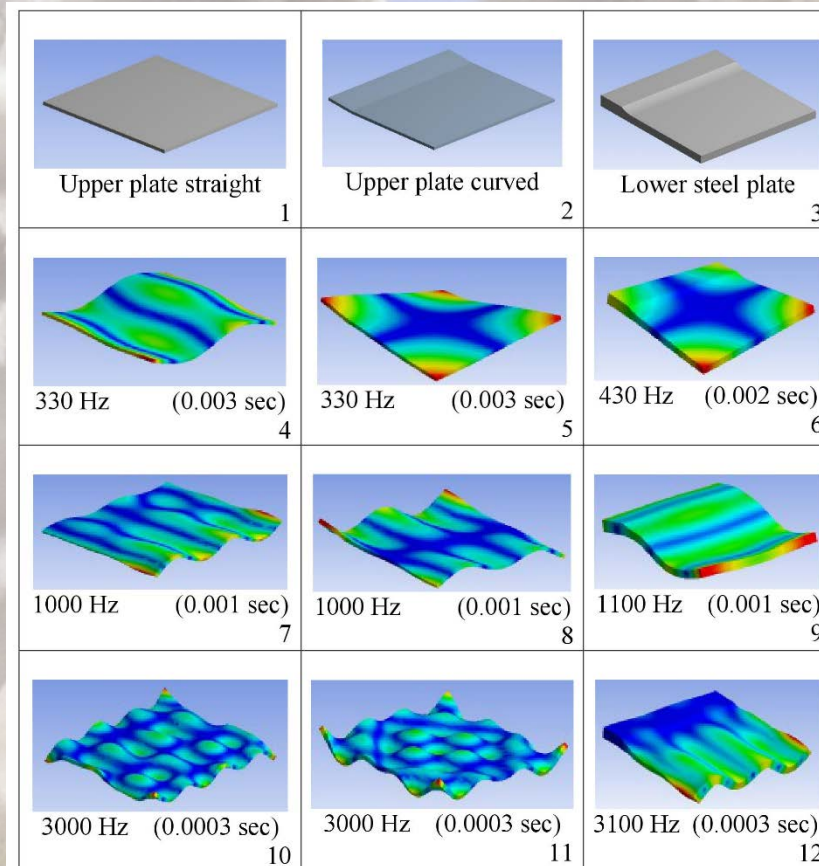
**Clad plate 36(30+6) x 2500 x 10000 mm 09G2S + 410S  
with the welded cladding layer 410S**

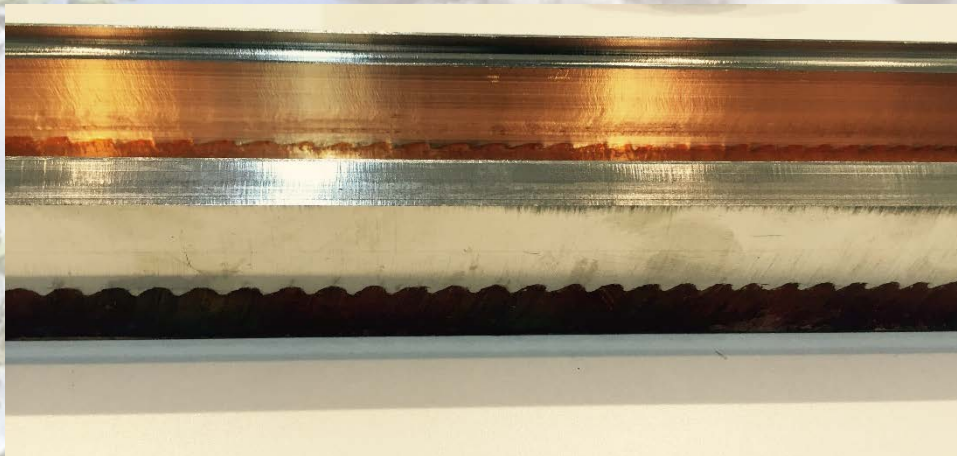




## Deformation wave spreading in a cladding layer having the weld

## Design oscillation modes generated in welded parts at the initial moment of blast effect





Views of the finished contact

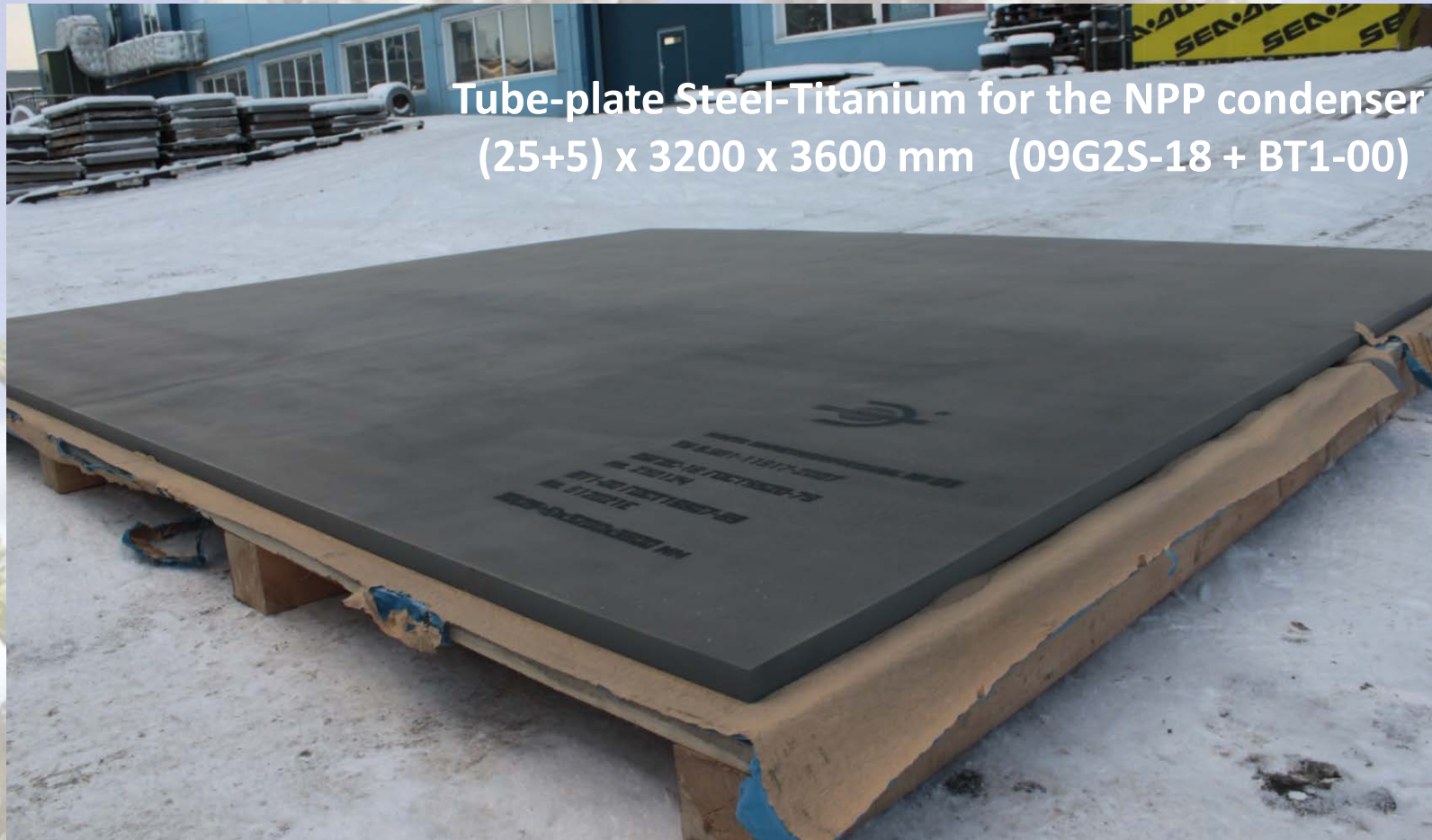


**Clad plate (84+6)x2750x10800mm (09G2S-15 + ASTM A240 TP321)  
used in the emergency cooling and safety system of nuclear reactor (SAOZ)**

**XIII International Symposium on Explosive Production of New Materials.  
Science, Technology, Business, and Innovations (EPNM-2016). Coimbra, Portugal, June 20-24, 2016**



**Clad plate (84+6)x2750x10800mm (09G2S-15 + ASTM A240 TP321)  
used in the emergency cooling and safety system of nuclear reactor (SAOZ)**



## CONCLUSIONS

1. During explosion welding a complicated set of oscillation processes is excited in a welding package, that should be taken into account when planning the welding jobs.
2. Every welding package has got its own unique dynamic features in accordance with the properties of the materials to be welded, its dimensions and mass.
3. Dynamic properties of the welding package can be adjusted with the help of additional technological tools in order to obtain the desired quality of the final product.
4. The wave nature of interaction between the base and cladding plates can explain, why bonding strength is not uniform over an area, and the presence of local defects.

# Thank you for your kind attention!

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