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**SIMULATION OF ELECTROMAGNETIC-ACOUSTIC CONVERSION PROCESS UNDER  
TORSION WAVES  
EXCITATION.  
PART 3**

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**Abstract**

*Mathematical simulation and calculation of electromagnetic fields in the electromagnetic-acoustic transducer of rational design are performed under non-dispersive torsional waves excitation in tubular electrically conductive ferromagnetic hollow rods of small diameter, taking into account spatial, frequency, energy and material factors. The results of the research can be used to simulate and construct exciting EMATs for measuring, monitoring, and*

*diagnostic equipment in the energy, nuclear, chemical and other industries in view of ultrasonic studies of ferromagnetic tubular products.* References 10, figures 5.

**Key words:** mathematical simulation, ultrasonic transducer model, non-dispersive torsional waves, tubular product, skin layer, conversion loss.

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## References

1. Dragobetskii V.V., Shapoval A.A., Zagoryanskii V.G. Development of Elements of Personal Protective Equipment of New Generation on the Basis of Layered Metal Compositions.

*Steel in Translation*

.  
2015.

Vol. 45. Issue 1.

Pp. 33–37.

© Allerton Press, Inc.

DOI:

<https://doi.org>

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[10.3103/S0967091215010064](https://doi.org/10.3103/S0967091215010064)

2. Dragobetskii V.V., Shapoval A.A., Mospan D.V., Trotsko O.V., Lotous V.V. Excavator Bucket Teeth Strengthening Using a Plastic Explosive Deformation. *Metallurgical and Mining Industry* . 2015. No 4. Pp. 363–368.

3. Shapoval A.A., Mospan D.V., Dragobetskii V.V. Ensuring High Performance Characteristics For Explosion-Welded Bimetals. *Metallurgist*. July 2016. Vol. 60.

[Issue 3](#)

Pp 313–317.

DOI:

[https://doi.org  
/10.1007/S11015-016-0292-9](https://doi.org/10.1007/S11015-016-0292-9)

4. Gorbatyuk S.M., Shapoval A.A., Mospan D.V. & Dragobetskii V.V. Production of Periodic Bars by Vibrational Drawing. *Steel in Translation*. 2016. Vol. 46. No 7. Pp. 474–478. © Allerton Press, Inc. DOI: [https://doi.org /10  
.3103/S096709121607007X](https://doi.org/10.3103/S096709121607007X)

5. Zenghua L., Bin W., Cunfu H., Xiuyan W., Shiming Y. A New Type Transducer for Torsional Guided Wave Generation and Its Application to Defect Detection in Pipes. *Insight*

2007.

No 49 (1).

Pp. 41–43.

6. Plesnetsov S.Yu., Petrishchev O.N., Mygushchenko R.P., Suchkov G.M. Simulation of electromagnetic-acoustic conversion process under torsion waves excitation

*Tekhnichna Elektrodynamika*

2017.

No

3.

Pp

. 79

—

88

.

(

Rus)

7. Plesnetsov S.Yu., Petrishchev O.N., Mygushchenko R.P, Suchkov G.M. Simulation of electromagnetic-acoustic conversion process under torsion waves excitation.

Part 2.

*Tekhnichna Elektrodynamika*

.

201

8

.

No

1

.

Pp.

—

8. Bolyukh V.F., Oleksenko S.V., Shchukin I.S. Comparative analysis of linear pulsed electromechanical transducers of electromagnetic and induction types.

*Tekhnichna Elektrodynamika*

.

2016.

No 5.

Pp. 46–48.

(

Rus)

**9.** Mygushchenko R.P., Suchkov G.M., Petrishchev O.N., Desyatnichenko A.V. Theory and practice of electromagnetic-acoustic control. Part 5. Features of designing and practical application of EMA devices for ultrasonic inspection of metal products. Kharkov:

Planeta-Print LLC, 2016.

230 p.

(  
Rus)

**10.** Koshlyakov N.S., Gliner Ye.B., Smirnov M.M. The partial derivatives equations in mathematical physics

.  
Moskva

:  
*Vysshaia shkola*  
, 1970.

710

p.  
(  
Rus)

[PDF](#)