

# Numerical modeling of mechanical behavior of clinch connections at breaking out and shearing

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## Abstract

© The Authors, published by EDP Sciences, 2017. This article describes an approach to constructing the defining relationships between increment of true stresses and true deformations, with considering the contact interaction of elastoplastic deformed bodies among each other. Within the framework of finite element method, solving these problems in case of "breaking out" and "shearing" in the clinch joint, the stress fields in the zone of the clinch connection are defined, and recommendations are given for realizing the process of their creation.

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## References

- [1] D. Kolarov, A. Baltov, N. Boncheva, Mechanics of plastic mediums (Mir, Moscow, 1979), 302. (In Russian)
- [2] A.S. Sakharov, V.N. Kislooky, V.V. Kirichevski, N. Altenbach, U. Gabbert, Y. Dankert, Kh. Kepler, Z. Kochyk, The finite element method in the mechanics of solids (Higher School, Kiev, 1982), 480. (In Russian)
- [3] P.V. Trusov, A.I. Shveikin, The theory of constitutive relations, (Perm State Technical University, Perm, 2008), 243. (In Russian)
- [4] S.N. Korobeynikov, Nonlinear deformation of solids (Novosibirsk, 2000), 262. (In Russian)
- [5] V.I. Levitas, The large elastic-plastic deformation of materials under high pressure (Naukova Dumka, Kiev, 1987), 232. (In Russian)
- [6] A.A. Pozdeev, P.V. Trusov, Y.I. Nyashin, The large elastic-plastic deformation theory, algorithm, application (Nauka, Moscow, 1986), 232. (In Russian)
- [7] A.I. Abdrakhmanova, L.U. Sultanov, Materials physics and mechanics, 26 (1), 30-32 (2016)
- [8] A. Golovanov, L. Sultanov, Applied mechanics, 41 (6), 614-620 (2005)
- [9] R. Davydov, L. Sultanov, (DEStech publications inc., USA, 2013), 64-67
- [10] L.U. Sultanov, Procedia earth and planetary science 15, 119-124 (2015)
- [11] R.L. Davydov, L.U. Sultanov, Journal of engineering physics and thermophysics, 88 (5), 1280-1288 (2015)
- [12] L.U. Sultanov, Lobachevskii journal of mathematics 37 (6), 784-790 (2016)
- [13] A.I. Abdrakhmanova, I.R. Gariffulin, R.L. Davydov, L.U. Sultanov, L.R. Fakhрутdinov, Applied mathematical sciences, 9 (118), 5907-5914 (2015)
- [14] I.B. Badriev, V.V. Banderov, G.Z. Garipova, M.V. Makarov, R.R. Shagidullin, Applied Mathematical Sciences 9 (82), 4095-4102 (2015)
- [15] I.B. Badriev, V.V. Banderov, M.V. Makarov, V.N. Paimushin, Applied mathematical sciences, 9 (78), 3887-3895 (2015)
- [16] I.B. Badriev, M.V. Makarov, V.N. Paimushin, Russian mathematics 3 (59), 66-71 (2015)
- [17] I.B. Badriev, V.V. Banderov, O.A. Zadvornov, Applied mechanics and materials, 392, 188-190 (2013)
- [18] I.B. Badriev, M.V. Makarov, V.N. Paimushin, Procedia engineering 150, 1056-1062 (2016)

- [19] O.A. Sachenkov, V.I. Mitryaikin, T.A. Zaitseva, Yu.G. Konoplev, Applied Mathematical Sciences 8 (159), 7889-7897 (2014)
- [20] O. Sachenkov, L. Kharislamova, N. Shamsutdinova, E. Kirillova, Yu. Konoplev, IOP Conference series, Materials science and engineering 98, 012015 (2015)
- [21] R.R. Galiullin, O.A. Sachenkov, R.F. Khasanov, P.S. Andreev, International journal of applied engineering research 10 (24), 44855-44860 (2015)
- [22] F.A. Shigapova, R.F. Mustakimova, G.T. Saleeva, O.A. Sachenkov, International journal of applied engineering research 10 (24), 44711-44714 (2015)
- [23] D.V. Bereznoi, V.N. Paimushin, V.I. Shalashilin, Mechanics of solids 6 (44), 837-851 (2009)
- [24] D.V. Bereznoi, V.N. Paimushin, Journal of Applied Mathematics and Mechanics 75 (4), 447-462 (2011)
- [25] M.K. Sagdatullin, D.V. Bereznoi, Applied Mathematical Sciences 8 (35), 1731-1738 (2014)
- [26] D.V. Bereznoi, A.A. Sachenkov, M.K. Sagdatullin, Applied Mathematical Sciences 8 (127), 6341-6348 (2014)
- [27] D.V. Bereznoi, A.A. Sachenkov, M.K. Sagdatullin, Applied Mathematical Sciences 8 (143), 7107-7115 (2014)
- [28] D.V. Bereznoi, I.S. Balafendieva, A.A. Sachenkov, L.R. Sekaeva, IOP Conference Series, Materials Science and Engineering 158, 012018 (2016)
- [29] M.R. Shamim, D.V. Bereznoi, IOP Conference Series, Materials Science and Engineering 158, 012083 (2016)
- [30] V.V. Novozhilov, Fundamentals of nonlinear elasticity (Gostechizdat, Moscow-Leningrad, 1948), 211. (In Russian).