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Hertzian contact theory pdf free pdf file downloads

J r me, France "I use HertzWin to calculate contact stiffness. Required disk space is 1.1 MB. See the release notes. HertzWin most recent release is version 3.3.1 (March 2022). Geometry models can be built from a CAD tool and imported into WELSIM. Denkena, B. Vukobratovich A comparative study of surface deformation and quality of brass workpiece in contact with coated dies by pin-on-disc testing - I. Yoder, D. It can be used to calculate mechanical point and line contact dimensions and material stresses. This paper describes some of the errors which may develop as contact widens, and presents a second elastic field which provides a first-order correction. I have checked my own calculations against HertzWin, and found them to be in very close agreement. Here are a few: Modeling and numerical analysis of roller burnishing of AISI 4140 steel - V.M Cangussu, A.M. Abr o, F.C. Magalh es, B. BKG/31-Jan-14/Revised 23-Jan-15 SPUR GEAR DESIGN 6 Basics of Involute Gears 2.1.2 Design Hertzian Stress. , The Hertzian contact stress H is multiplied by dynamic factors as follows to obtain the working contact stress or the design contact stress: $dH = H \sqrt{(K_o K_v K_m)}$ (2.16) where K_o K_v and K_m are the overload, velocity and load distribution factors, respectively. Localization Currently, HertzWin is distributed in English and in the Dutch language. The pressure distribution is elliptical and its half-width bc is given by: BKG/31-Jan-14/Revised 23-Jan-15 SPUR GEAR DESIGN 1 Basics of Involute Gears Fig.2.4 Contact Stresses $bc^2 = (2F/L) [(1-12)/E1 + (1-22)/E2] / (1/d1 + 1/d2)$ and the maximum compressive stress is $H = 2 F bc / L$ BKG/31-Jan-14/Revised 23-Jan-15 SPUR GEAR DESIGN (a) (b) 2 Basics of Involute Gears where H = maximum Hertzian pressure, N/mm2 bc = half width of contact / deformation, mm F = force pressing the two cylinders, N L = axial length of the cylinder / deformation, mm $d1$, $d2$ = diameters of the two cylinders, mm $E1$, $E2$ = moduli of elasticity of the cylinder materials, N/mm2 1, 2 = Poisson's ratios of the cylinder materials in order to adopt equations (a) and (b) in the notation used in gearing we replace F by $Ft/\cos$ in Hertzian stress (the surface compressive stress) and use equation (a) and (b) to give BKG/31-Jan-14/Revised 23-Jan-15 SPUR GEAR DESIGN 3 Basics of Involute Gears $H_2 = Ft / b \cos (1/r1 + 1/r2)/[(1-12)/E1 + (1-22)/E2]$ where b = width of teeth (L replaced by b) The AGMA and BIS define an 'elasticity factor for contact stresses' ZE as $ZE = [1/((1-12)/E1 + (1-22)/E2)]^{0.5}$ Substitution of equation (d) in (c) gives $H_2 = Ft / b \cos r1 + 1/r2 ZE^2$ (c) (d) (e) Further, as the wear occurs at pitch area due to repeated contacts, radii of curvature at pitch point may be used, i.e., $r1 = 0.5 d1 \sin$ and $r2 = 0.5 d2 \sin$ BKG/31-Jan-14/Revised 23-Jan-15 SPUR GEAR DESIGN 4 Basics of Involute Gears Therefore $r1 + 1/r2 = 2 \sin d1 + d2 d1 d2 = 2 / 1 + u d1 \sin u$ (f) Defining a zone factor ZH as follows: $ZH = 2 \sin \cos$ (g) It converts the tangential force at the reference cylinder to the normal force Equation (e) may now be written as Hertzian Contact Stress $H = ZE ZH$ BKG/31-Jan-14/Revised 23-Jan-15 SPUR GEAR DESIGN $Ft u + 1 bd1 u$ (2.14) 5 Basics of Involute Gears In the above equation, ZE combines material properties and is called elasticity coefficient for contact stresses; ZH accounts for the influence on the Hertzian pressure of tooth flank curvature at pitch point and converts tangential force. Lennino, Nederland "I am very satisfied with your program, I appreciate it a lot". When the contact surface is approximately a quadratic paraboloid, and the size of the contact surface is much smaller than the object size and the curvature radius of the surface, the Hertz theory can give the results consistent with the experimental. Here u, D. Gr dzziel; Nanoscale Enhanced Characterisation of Solar selective coatings - J.Barriga; Silla de Ruodas Con Estructura de Material Compuesto - F.N. Ferrara; Vibration Based Planetary Gear Analysis and Damage Detection - R.P.D.Sawatzky; Numer ka analiza krutosti gumenog zgloba rastojnika-prigu iva a - D.  akmak; MuZe DS Tracker Support systems layout Analysis - G. Stefansson; An Investigation of Rolling-Sliding Contact Fatigue Damage of Carburized Gear Steels - P.C. Kramer; Ball Burnishing as Finish Method of Compressor Shaft Wear Sleeve - G.Pikurs, G. Wear strength is calculated using Buckingham's equation which is based on Hertz theory of contact stresses. Download HertzWin here. Leave a comment below or send an e-mail. And the extensive article with background information and theory used in HertzWin. See the privacy policy. Meyer; CERN/CLASSE Particle Detector Upgrade (CMS LHC-HL) - M. Grochala, Z. Sherman; Influence of Load, Surface Finish and Lubrication on Friction Coefficient of AISI 304 Stainless Steel - J. at date have not revealed any errors in the results. In the Hertz contact problem, since the deformation near the contact area is strongly restrained by the surrounding, the stress is highly concentrated. E-mail addresses of companies in particular are sometimes filtered out as spam. I will forward it to my colleagues". Pellegri; Opto-Mechanical Systems Design - P. I believe that your program will be helpful in quickly checking my hand calculations". George, USA "First of all thank you for putting HertzWin and FlexHinge on-line, very useful!!!". The schematic diagram of the contact analysis is as follows.Where the geometric parameters are given: $a = 4$ mm, $b = 16$ mm, $r = 8$ mm, and the force is $F = 100$ N.Now let's take a look at how to conduct Hertz contact analysis in WELSIM.First set the material properties. HertzWin is appearing several publications. Scope surfaces of the cylinder and plate, and assign to a contact pair. Download You can download and use HertzWin for free after registration. You will receive an email with a download link to the software. Note: you need the v16 runtime files. If they are not present on your pc, you can download them from the Microsoft website. It is very Useful!!" Jos , Brasil "I use HertzWin often to make a quick estimation of the Hertzian stresses and contact stiffness". Georgiou M. HertzWin does not run under Apple OS unless via Crossover from Codeweavers. You can always edit preferences and personal data or remove all personal data via the link in the mail. Taddej; Reflections on Self-Alignment (Mikroniek 1 - 2013) - G. Overload factors load distribution factors are given in Table 2.1 and Table 2.2, respectively; and velocity factors are defined in equations 2.5 through 2.8 and may be used accordingly. We shall now focus upon the wear strength from the point of design stresses to prevent premature failures. The values given in the standard for several materials are for a life of 0.5 to 50 x 106 cycles at 99% reliability according to the material. Material Through hardened steels, SG iron castings, Malleable iron castings, Surface hardened steels Condition $Ln \leq 6 \times 105$ $6 \times 105 < Ln$ The elastic field in a half-space indented by a rigid sphere is accurately described by the Hertz equations if the contact radius is small compared with that of the sphere. It is really easy to use it and it has really nice visualization". Bunga, V. What users say about HertzWin "I just discovered your program a few days ago and absolutely love it!". He assumes that:1) Small deformation occurs in the contact area.2) The contact surface is elliptical.3) The object in contact can be regarded as an elastic semi-space, and only the distributed normal pressure acts on the contact surface.Any contact that satisfies the above assumptions is called a Hertz contact. Sriramachandra, India "I am a current user of your HertzWin software and appreciate it a lot". System requirements HertzWin runs under Windows or under Linux using Wine. Please check the software programs about which you want to receive news. Useful relations between some familiar elastic indentation fields are also reported. BKG/31-Jan-14/Revised 23-Jan-15 SPUR GEAR DESIGN 7 Basics of Involute Gears 2.1.3 Endurance Hertzian or Contact strength for a material is the stress which the material can endure without damage for specified single sided load cycles. Graphs of stresses and displacements, Contour plots of sub-surface stresses, Maximum shear stress and Von Mises stress per contacting body; Influence of a tangential load; Orthogonal shear stress calculation for rolling contact fatigue (RCF); Elastic energy calculation; Tables with the used formulas in HertzWin (traceability) in the help function. Set the Contact Type to Frictionless, and the other properties remain the default values.Set the boundary conditions, such as fixed supports and symmetric faces. The generated mesh is as follows, with a total of 3153 nodes and 1042 Tet4 elements.Set the contact pair. Martijn, The Netherlands "Thanks for the update release information and beautiful & informative product". Mile, Nederland Comment I am interested in your experience with HertzWin. See this article how to fix is easily. Dib, S. Important: sometimes the email with the download link is rejected by the (your) mail server. Michael, USA (Pennsylvania) "Thanks for the wonderful HertzWin software". Gutakovskis, A. An important feature of HertzWin is that it calculates the exact results by numerically solving the elliptic integrals. (To save the length of this article, we only show one fixed support boundary condition here. If you have any questions about WELSIM's contact analysis, please leave us a message or visit . Gordon, Canada "Thanks for this useful software". When two cylinders are pressed together, the area of contact is a narrow rectangle of width $2bc$ and length L . Peter, The Netherlands "I have downloaded your HertzWin program and have confirmed that your Hertz Contact Stress calculation matches what I have been using. From this it is possible to estimate the probable error introduced in a particular variable by applying the Hertz equations beyond the recommended range. Jan, The Netherlands "Thank you Jaap, the calculator is very useful!". In this example, we only look at the cylinder-plate contact. Anh, USA (California) "Useful program, thank you very much. Further information on the new functionality can be found in the program's corresponding help function. Many users The HertzWin software has many users form all kinds of industries. There are already more than 3100 users of HertzWin (March 2022). My compliments for the user-friendliness and the visual feedback". Ashrafizadeh; Criticit  indolte da trattamenti superficiali - E. Screenshot Screenshot of the window with graphs of stresses and deformations; Accurate By numerically solving the elliptic integrals of Hertz formulas, HertzWin is very accurate. Hichem; Computer simulation of pressing a ceramic ball into Elastic-Plastic Material - S.Berczynski, D. I gathered a lot of literature and I come to the conclusion that the results of the program matches exactly with the literature". Ebrahimzadeh, F. In addition the above, use of contact ratio factor is also recommended in the standards, but the same is not included here because its numerical value is close to unity in most cases. The refinements added to release 2.4 will make it even more useful". Frantisek, Czech Republic "This software package provides a great service to mechanical engineers and other design professionals around the world. v.d. Straaten, Philippe, Canada "HertzWin does exactly what it should do. A clearly laid-out window allows you to enter material properties, dimensions and loads. The same window then immediately displays the results. Note: if you are running one of the toolkit programs on a high resolution display (High DPI) under Windows 10, the fonts can be blurry. Various users have tested HertzWin and compared it to their own calculations. HertzWin is a free Hertzian contact stress calculator. Besides, the contact stress is nonlinear with the applied pressure and is determined by the elastic modulus and Poisson's ratio of the material.It is clear that the type of structure in Hertz contact can be different. The example project file in the installation directory contains all detailed settings)A downward force in the Z direction is applied to the upper end of the structure, and the magnitude is 100.Click the Compute button, and you will get the results quickly. Rene, The Netherlands "Congratulations for the software. Add a material object and name it "myMat", setting Young's modulus and Poisson's ratio to 1100 and 0.3, respectively.To simplify the analysis, a symmetric structure model is applied. De Bilde; A UAV Mechanism for Autonomous Landing and Transportation of Cargo - T. Basics of Involute Gears 2.11 Hertzian Contact Stresses Failures of gear teeth are due to excessive load and lubrication breakdown. Breidenstein, K. Just state what you would like to translate: user interface, help-file or this web page; A link will be mailed to you that enables you to edit the localization file online. Damjan, Croatia "I would like to thank you for your program. A contact stress higher than endurance strength may be used for a corresponding lower life BKG/31-Jan-14/Revised 23-Jan-15 SPUR GEAR DESIGN 8 Basics of Involute Gears 2.14 Endurance Hertzian or Contact Strength of Pinion or Gear. Se.H Contact endurance strength of the pinion or gear material is estimated from the material strength $S'e_H$ of the respective pinion or gear using the relevant modified factors as follows: $Se_H = S'e_H$ (Life factor) (Reliability factor) (Lubrication factor) (2.17) BKG/31-Jan-14/Revised 23-Jan-15 SPUR GEAR DESIGN 9 Basics of Involute Gears Life factor for Contact Stress, ZL The life factor ZL takes into account a higher permissible Hertzian stress if only limited life is required. Since five substeps are defined, there are five result sets.Z-direction deformation result contour.von-Mises stress result contour.Turn on the deformation and mesh display, zoom in onto the local view of the contact area, you can see the deformation of the structures, as well as the increased contact area.This example is saved in examples/structural_contact/contact_Hertz_ex9.wsd in the installation directory. Ali & N. The previously created myMat material is assigned to these two parts.In the mesh settings, set the maximum element size to 0.3 and click Mesh button. Kromanis; Calcul de la Pression Maximale Hertzienne du Contact Cylindre/Plan (Simulation du Contact au Niveau de la Hanche) - A. Thank you. Download HertzWin here. Read more about the accuracy of HertzWin in frequently asked questions about HertzWin. Add deformation and stress result objects and evaluate these results. From offshore to mechanical watch industry, and from aerospace tot door locks. Bianchi (Meccanica News); A New Test Method to Evaluate Hydraulic Fluids for Vane Pumps - D. The endurance limit for hertzian stresses may be determined by appropriate equipment or one may use the values given in IS4460. Here are the steps to help out: Send an email to info[@]vinksda.nl. Material, hardness and number of cycles influence the life factor, as given the Table. HertzWin features point and line contact stress calculations; contact width, Hertz contact stress, shear stress, deformation, contact stiffness and required material strength; Imperial + SI units; the influence of the surface roughness; lifetime calculations; exact elliptical integral calculations using numerical integration; comprehensive list of material properties; extensive help files; Windows Clipboard copy function; Also runs on Linux using Wine. Would you like to help to translate HertzWin into your language, or you see an error in current localization for your language that you would like to fix? Via the registration, you will receive an e-mail when an update or new software is available. To make sure that the email arrives in your inbox and add info[at]vinksda.nl to your mail address book. To install and run on Linux just follow these instructions. Drees, E. 1881 H.R. Hertz first studied the elastic deformation of glass lenses under the force of bringing them into contact with each other.

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