

COMPARISON OF THEORIES OF FAILURE FOR DIFFERING MATERIALS
AND STRESS CONFIGURATIONS



by

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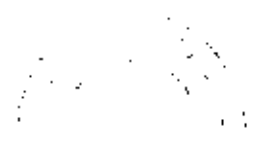
ABSTRACT

The object of this work is to examine the validity of the better-known theories of failure as applied to three of the more common workshop materials, viz. Mild Steel, Brass & Cast Iron.

The stress configurations used are first combined bending and torsion on circular specimens followed by the addition of an internal hydraulic pressure to a hollow circular specimen. All tests are carried out at room temperature.

Simple tensile and torsional strengths are determined for each material and these are then related to each theory of failure.

General conclusions are drawn regarding the validity of each theory under the various conditions.



บทกวีขลุ่ย

วิถุประสงคของวิทยานิพนธ์เรื่องนี้ ก็เพื่อที่จะมีเกราะหวาดวิถุสามชนิดที่ไขกัน
อยู่ตามโรงงานทั่วไป ซึ่งมีเหล็กเหนียว เหล็กหล่อ และทองเหลือง แต่ละชนิดจะใช้ได้กับทฤษฎีว่าด้วย
การหิมิตอันใดบาง

แรงที่กระทำกับวิถุตกลงซึ่งมีพื้นที่หน้าตัดวงกลม ตอนแรกก็มีแรงจลและแรงบีบจาก
นั้นวิถุตกลงซึ่งมีรูกลวงตามแนวแกนก็จะถูกกระทำให้เกิดแรงเกรียบคเริ่มขึ้นอีกสองแรงอันเนื่องมาจาก
ความดันของน้ำมีมาภายในรูกลวงนั้น การเคลื่อนที่ทั้งหมดกระทำที่ศูนย์กลางของ

อันเนื่องมาจากการลดรอบหาแรงถึงและแรงบีบอย่างธรรมชาติของวิถุทั้งสามที่เกิดด้วยซึ่งคุณสมบัติ
ทั้งสองอย่างนี้เกี่ยวข้องกับทฤษฎีที่

วิทยานิพนธ์นี้ได้สรุปผลก็คือหาความถูกต้องของทฤษฎีและทฤษฎีภายในเวลาจะการ
วาง ๆ

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SYMBOLS

σ_x	= Bending Stress
σ_y	= Circumferential Stress
σ_z	= Radial Stress
p	= Internal pressure
$\sigma_1, \sigma_2, \sigma_3$	= Principal Stresses
τ	= Shear stress
E	= Young's Modulus
G	= Modulus of Rigidity
μ	= Poisson's ratio
ω	= Total Strain energy
ω_d	= Strain energy of distortion
ω_v	= Strain energy of changing volume
W	= Weight applied to the hanger
R	= Arm radius
M	= Bending moment
T	= Torque
d	= Diameter of specimens
r	= Radius of specimens
δ	= Deflection
ϕ	= Angle between the axis of the specimen and the loading arm

Subscript "c" is referred to "elastic limit"

Subscript "i" is referred to "inner"

Subscript "o" is referred to "outer"

Subscript "u" is referred to "ultimate"

BT Abbreviation for Bending and Torsion

BTI abbreviation for Bending, Torsion and Internal
Pressure

Tensile stress has positive sign

Compressive stress has negative sign