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ABSTRACT

Design of machine elements is a critical job, because these elements must be designed without any error according to their use. Also the design procedures differ from element to an other and they may need some iteration to find the final acceptable results, because in these procedures data may be collected from tables, figures, or graphs and used in some formulae and equations. For all of these difficulties this program is promoted.

The program is to design three types of gears, spur, helical, and bevel gears according to the AGMA standards for the design of gears.

Microsoft Visual Basic is the programming language used create this package for the design different types of gears.

The required data for this program is the same as that data required for the manual design such as the bending strength, surface fatigue strength, gear ratio, power transmitted, angular speed, . . . etc.

The benefits from this program are the time saving, ease of the design procedure, accurate results.

Same input data for gears was calculated to compare between the manual design and computerized design (this CAD package). It was found the same

The program was completed and tested. It was found to be correct and beneficial.

LIST OF ABBREVIATIONS

Abbreviation	
2D	Two-dimensional
3D	Three-dimensional
ADS	AutoCAD Development System
AGMA	American Gears Manufacturing Association
AMD	Advanced Micro Devices
ASCII	**A**merican **S**tandard **C**ode for **I**nformation **I**nterchange
AutoLISP	Auto List Processing
CAD/CAM/CAE	Computer-Aided Design/Computer-Aided Manufacturing/Computer-Aided Engineering
CADAM	Computer-Augmented Drafting and Manufacturing
CADD	Computer Aided Draughting and Design
CADKEY	Computer Aided Design Key
CADVANCE	Computer Aided Design Advanced
CATIA	Computer-Aided Three-Dimensional Interactive Application
DAC	Design Automated by Computer
IES	Illuminating Engineers Society
IGES	Initial Graphic Exchange Standard
PADL-2	Practical Aspects of Declarative Languages
PDP-1	Programmed Data Processors
Pro/E	Pro/ENGINEER.
SAGE	Semi Automatic Ground Environment
SIGGRAPH	Special interest group graph
STEP	Standard for the Exchange of Product model data
VDS	Virtual Dedicated Server

LIST OF THE SYMBOLS

Symbol	Name	Units
C_a	Application factor (for surface fatigue strength)	Dimensionless (Factor)
C_f	Surface-condition factor(for surface fatigue strength)	Dimensionless (Factor)
C_H	Hardness-ratio factor (for surface fatigue strength)	Dimensionless (Factor)
C_L	Life factor (for surface fatigue strength)	Dimensionless (Factor)
C_m	Load-distribution factor (for surface fatigue strength)	Dimensionless (Factor)

C_P	Elastic coefficient (for surface fatigue strength)	Dimensionless (Factor)
C_R	Reliability factor (for surface fatigue strength)	Dimensionless (Factor)
C_s	Size factor (for surface fatigue strength)	Dimensionless (Factor)
C_T	Temperature factor (for surface fatigue strength)	Dimensionless (Factor)
C_V	AGMA dynamic factor (for surface fatigue strength)	Dimensionless (Factor)
D	Pitch diameter	m.
D_G	Pitch diameter of gear	m.
D_P	Pitch diameter of pinion	m.
F	Face width	mm.
H	Power	W
H_{BG}	Brinell hardness of gear tooth	Dimensionless (Factor)
H_{BP}	Brinell hardness of pinion tooth	Dimensionless (Factor)
I	Geometry factor of surface strength	Dimensionless (Factor)
J	Geometry factor of bending strength	Dimensionless (Factor)
K_a	Application factor	Dimensionless (Factor)
K_f	Fatigue stress-concentration factor (for bending strength)	Dimensionless (Factor)
K_L	Life factor (for bending strength)	Dimensionless (Factor)
K_m	Load-distribution factor (for bending strength)	Dimensionless (Factor)
K_R	Reliability factor (for bending strength)	Dimensionless (Factor)
K_s	Size factor (for bending strength)	Dimensionless (Factor)
K_T	Temperature factor (for bending strength)	Dimensionless (Factor)
K_V	AGMA dynamic factor (for bending strength)	Dimensionless (Factor)
m	Metric module	mm.
m_F	Face-contact ratio	Dimensionless (ratio)
m_G	Speed ratio	Dimensionless (ratio)
m_N	Load-sharing ratio	Dimensionless (ratio)
m_p	Transverse-contact ratio	Dimensionless (ratio)
n	Angular speed	Rev/min.
P	Diametral pitch	m.
P_d	Diametral pitch in plane of rotation	m.
p	Circular pitch	m.
p_N	Normal base pitch	m.
p_x	Axial pitch	m.
Q_v	Transmission accuracy-level number	Dimensionless (Factor)
S_c	AGMA surface fatigue strength	MPa
S_t	AGMA bending strength	MPa
V	Pitch-line velocity	m./sec.
W_t	Transmitted {tangential} load	N

Y	Lewis form factor	Dimensionless (Factor)
Y	AGMA form factor	Dimensionless (Factor)
σ	Tooth bending stress	MPa
σ_{all}	Allowable bending stress	MPa
σ_c	Contact stress {AGMA formula}	MPa
$\sigma_{c,all}$	Allowable contact stress	MPa
ϕ	Pressure angle	degree
ϕ_t	Transverse pressure angle	degree