IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

Web Base Expert System for Designing Spur Gear

Raj Patil Student, **Aditya Patil** Student, **Shankar Gunjal** Student, **Kalash Pratapwar** Student, **Pratik Rajguru** Student, **Dr. Shyam Singh Thakur** Assistant Professor

Department of Mechanical Engineering
D. Y. Patil College of Engineering, Akurdi, Pune, India

Abstract : Now a days internet and World Wide Web are growing very fast as a source of communication technology and also works as important data provider for industry. In this research paper we have discuss the development and implementation of a web-based gear design system with interactive and user friendly interface. By providing access to our web-base system, any user with WWW browser can use our site and can design their gears. Once designer enter in our web page designer follow system instructions and can submit their data in our designing system. As soon as system receives inputs it invokes a Common Gateway Interface program that processes the information provided by the designer through the user interface. The Common Gateway Interface breaks down the data provided by the designer and has ability to remotely run the knowledge-based gear design system that integrates knowledge about all aspects of gear design and manufacturing and provides powerful reasoning and decision-making capabilities for reducing the time between gear tooth creation, detailed design and manufacturing process specification via the Internet. When our system completes the execution of given data full specifications definition, kinematic loads, bending stresses, pitch circle are determined and sent back to designer on the web browser. To accomplish all data we used a combination of HTML, CSS, JavaScript, DBMS, MySQL is used.

I. INTRODUCTION

Gear designing and manufacturing is critical and time-consuming components of many mechanical systems' the traditional method of designing and manufacturing gear has been time-consuming and complex task. However, using web-based expert systems, the design process of spur, helical, bevel gear has been made more efficient. This process ease to long and time-consuming traditional designing process. This system lightening the designing process which help in improving productivity and efficiency. By leveraging the power of computer language, these expert systems can provide with designers accurate and reliable gear designs in a fraction of time in comparison with traditional method. The system uses the computer programming languages to improve the quality of future designs. The expert system also incorporates a knowledge based containing information about the properties and characteristics of different materials, manufacturing process and gear types. The web-based interface will allow user to input their requirements such as load, Input and output speed, gear ratio and torque. The system will generate the result from input data and display the result summary on graphical user interface. The user can modify the gears as per the requirements. The development of web-based expert system for designing of gears has potential to improve the efficiency, productivity, and accuracy of design process, while also reducing the time and resources required to develop the design. Designing to this web-based system also provides the flexibility in design, so the unskilled designer also develops the design of gears on this system. This flexible system can easy to understand and adopt for new user it only needs the knowledge of operating computer. The system provides control over designing process.

II. LITERATURE SURVEY

The development of web-based expert systems for designing spur, helical, bevel, and worm gears involves the integration of mechanical engineering knowledge and software engineering techniques. In this literature review, we will explore some of the relevant studied design data and Machine design book

By **V. B. Bhandari:**

In above books we studied the design theories of spur, helical, bevel and worm gear. Solve the problems on design of gears and understand how to prepare backend code for design. Also studied the design procedure and different theories of design for the same gears.

In design data book all the formulas are listed which are required for design of spur, helical, bevel and worm gear. Understand the basic terminology of gears. Studied beam strength theory and wear strength theory.

By **A. Kumar and P. R. Goyal:**

This study proposes an expert system for designing worm gears. The system uses an analytical approach based on the worm gear geometry and kinematics. The system provides a user-friendly interface for inputting the design parameters and viewing the results.

By A. Ghiasi and S. M. Mirsalim:

This study proposed an expert system for gear selection and design using fuzzy logic. The system provides a user-friendly interface for selecting the appropriate gear type, material, and manufacturing method based on the input data. The system was tested on several case studies, and the results showed its effectiveness in designing gears with minimal error.

By A. R. Syahrom and A. H. M. Yatim:

This study proposes an expert system for gear design and optimization using genetic algorithm. The system is trained using a large database of gear design parameters and their corresponding performance measures. The GA algorithm is then used to optimize the design parameters for the best gear performance.

Concluding Remarks:

From above literature we concluded that,

1. Automatic speed reduction and adjust the ground clearance by using various sensors.
2. Use of RF sensor the speed of vehicle is controlled below set speed.
3. Use of pneumatic cylinders for adjust the ground clearance.
4. Use of ultrasonic sensor the obstacle is detected and give signals to the system.

III. METHODOLOGY

From the flow chart, this project started with the Literature survey of the project. In which the survey has been taken. After that we define the problem statement. We found that the to calculate the gears are hard and require more time. After defining problem statement, we plan to how to solve this problem in easiest way. So, we decide to build a web page using HTML, CSS and Python programming language. Once the requirement analysis is done the next step is to clearly define and document the product requirements. A design approach clearly defines all the architectural modules of the product along with its communication and data flow representation with the external and third-party modules. The internal design of all the modules of the proposed architecture is to be clearly defined. In this stage the actual development starts and the web page is built. The programming code is generated as per requirement during this stage. This stage is usually a subset of all the stage. However, this stage refers to the testing only stage of the product where product defects are reported, tracked, fixed and retested, until the product reaches the quality standards as per defined. If the design is performed in a detailed and organized manner, code generation can be accomplished without much hassle. Then based on the feedback, the product may be released as it is or with suggested enhancements

3.1 Introduction and Formulae for Gear Designing:

3.1.1 Spur Gear:

Spur gears or straight-cut gears are the simplest type of gear. They consist of a cylinder or disk with teeth projecting radially. Viewing the gear at 90 degrees from the shaft length (side on) the tooth faces are straight and aligned parallel to the axis of rotation. Looking down the length of the shaft, a tooth's cross section is usually not triangular. Instead of being straight (as in a triangle) the sides of the cross section have a curved form (usually involute and less commonly cycloidal) to achieve a constant drive ratio. Spur gears mesh together correctly only if fitted to parallel shafts. No axial thrust is created by the tooth loads. Spur gears are excellent at moderate speeds but tend to be noisy at high speeds.

Formulae for Design of Spur Gear

Beam strength-

$Fb = \sigma mby * \prod$

$Yp = 0.154 - \frac{0.912}{Zp}$

$Yg = .154 - \frac{0.912}{Zg}$

$\sigma bp = \frac{Syt}{3}$

m = module (mm)

b = 10*m (mm)

Wear strength

Fwp = dp*b*Q*k

dp = m*Zp

b = 10m

$Q = \frac{2Zg}{Zg+Zp}$

Effective load

Feff = $\frac{Ka*Km}{Kv}*\frac{p}{v}$

KA = Applications Factor = 1

Km = Service factor = 1.5

Kv = velocity factor = $\frac{6}{6+v}$

v = $\frac{\pi*dp*np}{60000}$

Fbp = FOS * Feff

Ft = $\frac{p}{v}$

Dynamic load

Fd= ft+$\frac{21v(bc+ft)}{21v+(bc+ft)^{(1/2)}}$

error e= 2+0.16φ

φ= m+0.25(d)^(1/2)

c=11400*e

3.3 Web Page:

Procedure:

The entire web page has been designed with the help of HTML, CSS and JavaScript programming languages.HTML helps in building the body of web page, so that we can give a specific structure to the page.With the help of CSS (Cascading Style Sheets) is used to style and layout web pages.

From the flow chart, this project started with the Literature survey of the project. In which the survey has been taken. After that we define the problem statement. We found that the to calculate the gears are hard and require more time. After defining problem statement, we plan to how to solve this problem in easiest way. So, we decide to build a web page using HTML, CSS and Python programming language. Once the requirement analysis is done the next step is to clearly define and document the product requirements. A design approach clearly defines all the architectural modules of the product along with its communication and data flow representation with the external and third-party modules. The internal design of all the modules of the proposed architecture is to be clearly defined. In this stage the actual development starts and the web page is built. The programming code is generated as per requirement during this stage. This stage is usually a subset of all the stage. However, this stage refers to the testing only stage of the product where product defects are reported, tracked, fixed and retested, until the product reaches the quality standards as per defined. If the design is performed in a detailed and organized manner, code generation can be accomplished without much hassle. Then based on the feedback, the product may be released as it is or with suggested enhancements

3.1 Introduction and Formulae for Gear Designing:

3.1.1 Spur Gear:

Spur gears or straight-cut gears are the simplest type of gear. They consist of a cylinder or disk with teeth projecting radially. Viewing the gear at 90 degrees from the shaft length (side on) the tooth faces are straight and aligned parallel to the axis of rotation. Looking down the length of the shaft, a tooth's cross section is usually not triangular. Instead of being straight (as in a triangle) the sides of the cross section have a curved form (usually involute and less commonly cycloidal) to achieve a constant drive ratio. Spur gears mesh together correctly only if fitted to parallel shafts. No axial thrust is created by the tooth loads. Spur gears are excellent at moderate speeds but tend to be noisy at high speeds.

Formulae for Design of Spur Gear

Beam strength-

Fb = σmby* ∏

Yp = 0.154 – $\frac{0.912}{Zp}$

Yg = .154 – $\frac{0.912}{Zg}$

σbp = $\frac{Syt}{3}$

m = module (mm)

b = 10*m (mm)

Wear strength
Fwp = dp*b*Q*k
dp = m*Zp
b = 10m
Q = $\frac{2Zg}{Zg+Zp}$

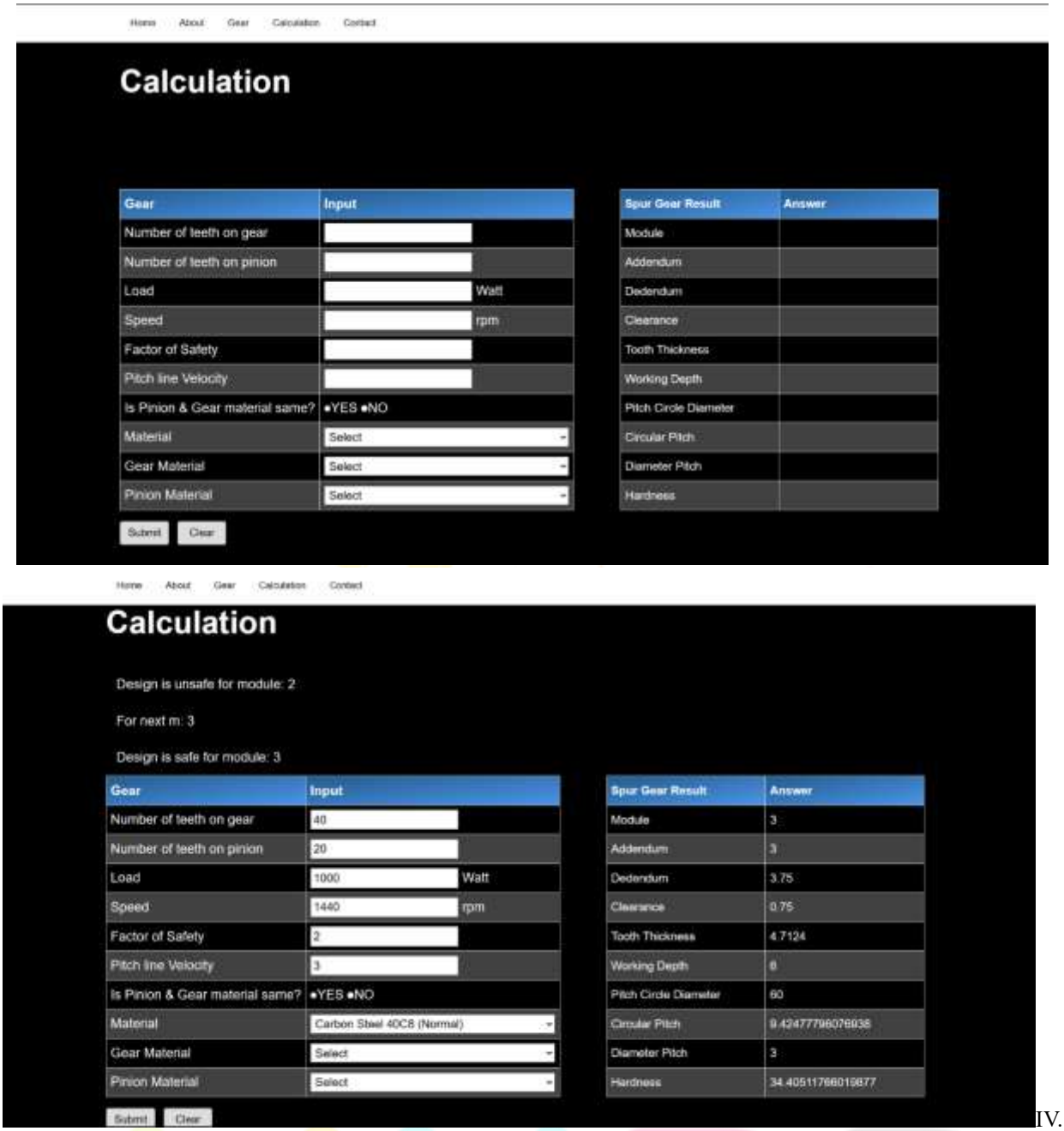
Effective load
Feff = $\frac{Ka*Km}{Kv}*\frac{p}{v}$
KA = Applications Factor = 1
Km = Service factor = 1.5
Kv = velocity factor = $\frac{6}{6+v}$
v = $\frac{\pi*dp*np}{60000}$
Fbp = FOS * Feff
Ft = $\frac{p}{v}$

Dynamic load
Fd= ft+$\frac{21v(bc+ft)}{21v+(bc+ft)^{(1/2)}}$
error e= 2+0.16φ
φ= m+0.25(d)^(1/2)
c=11400*e

3.3 Web Page:

Procedure:

The entire web page has been designed with the help of HTML, CSS and JavaScript programming languages.HTML helps in building the body of web page, so that we can give a specific structure to the page.With the help of CSS (Cascading Style Sheets) is used to style and layout web pages.



IV. CONCLUSION

Nowadays time is very precious to everyone as the world is moving faster. So, to save the time and money we build this project. This web page can help users to solve the design problems of spur, helical, bevel and worm gears. It requires very less time and saves time of the user. Before user have to remember all the formulae and process to solve the calculations which waste lots of time of the user. Also, there was requirement of skilled worker for design calculation of gears, because of that there was wastage of money on requirement of skilled worker. By using this web user can save their lots of time and money. It does not require skilled worker; anyone can solve the gear designing problems if user uses this web page. It solves lots of problem in industries where requirement of calculation needs to be accurate with saving time and money of the industries.

.

REFERENCES

1. Machine Design by V. V. Bhandari
2. https://www.researchgate.net/publication/267718177_EXPERT_SYSTEM_DEVELOPMENT_FOR_SPUR_GEAR_DESIGN
3. https://www.researchgate.net/publication/287816147_Design_of_Web_Based_Expert_System
4. https://www.researchgate.net/publication/258630740_A_Performance_Study_of_Real_Coded_Genetic_Algorithm_on_Gear_Design_Optimization
5. W3School https://www.w3schools.com
6. Apna college https://youtube.com/playlist?list=PLfqMhTWNBTe3H6c9OGXb5_6wcc1Mca52n