

Research Article

Dimensional Computing of Muff Coupling By using Java

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Abstract

Even though Java has tremendous applications as a programming language and as a platform but it is not widely used for computation. Java has many more advantages in computing, this leads to present work of computing of dimensions of two basic types of Shaft couplings, Muff coupling and Split Muff Coupling. Coupling is the most common machine element which is widely used in power transmission systems and it requires computing the dimensions for each and every application separately. To reduce the time of manual computing and to get precise values with in shorter duration java program can be used.

Keywords: Java, Computing, Shaft Coupling, Muff Coupling

Introduction

The Java programming language has numerous features, which makes it attractive for software development in computational engineering and science. Even though the same function can be done by the other programming languages like Fortran, C, C++ Etc. Java has tremendous advantages than other all. Even though the Fortran has numerous features that make it Particularly useful for scientific calculations/Programs and also Fortran compilers tend to produce highly efficient code compared to the compilers for other languages. We think that it is time to replace the Fortran with a modern language that also provides these features.(Van Reeuwijk et al,2003)

Java is related to both C and C++, In fact its syntax is most similar to both the languages. Each innovation in Programming language design was driven by the need to solve a fundamental problem that the preceding languages could not solve (Herbert Schildtet al).

Although Java has attractive features for producing portable, architecturally neutral code, it is not widely used in engineering computations. Java has too much to present to be overlooked. First of all, Java is portable at both the source and object format levels. The java Program file i.e. source file to be saved as a .java file. The object format is the byte code in a .class file. Either type of file is expected to behave the same on any computer with the appropriate Java compiler and Java virtual machine. Second, Java code is safe to the host computer.

Programs (more specifically, applets) can be executed in a sandbox environment that prevents them from doing any operation (such as writing to a file or opening a socket) which they are not authorized to do. The

combination of portability and safety opens the way to a new scale of web-based global computing, in which an application can run distributed over the Internet. Third, Java implements a simple object-oriented model with important features (e.g., single inheritance, garbage collection) that assist the learning curve for beginners. But the most important thing Java has to offer is its popularity, in all aspects. Java runs on virtually every platform.

With such universal availability and support, it only makes sense to consider Java for the development of numerical applications. Indeed, a growing community of scientists and engineers developing new applications in Java has been slowly developing (Boisvert, Ronald et al, 2001).

Coupling is device that used to connect two shafts which are used to transmit the power. The main purpose of a coupling is to reduce the losses, angler deflections of the shafts and to transmit the maximum power from one shaft to another. Shaft couplings are mainly two types, that is rigid coupling and Flexible couplings. Rigid coupling won't allow the lateral misalignment of shafts but flexible couplings permits both lateral and angular misalignment. Muff couplings are rigid couplings which are used to connect two shafts of same diameter to transmit the power. These are again classified into two types' i.e Sleeve/muff/Box coupling and Split muff/compression coupling.(R.S. Kurmi et al, 2005)

Box or muff coupling

Box or sleeve or muff coupling Is a simplest form of Rigid coupling, this coupling is generally manufactured by Cast iron and used to connect two shafts solid or hallow. Shaft

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and sleeve are positioned with help of Key. The proportions of the coupling are as shown in figure 1.

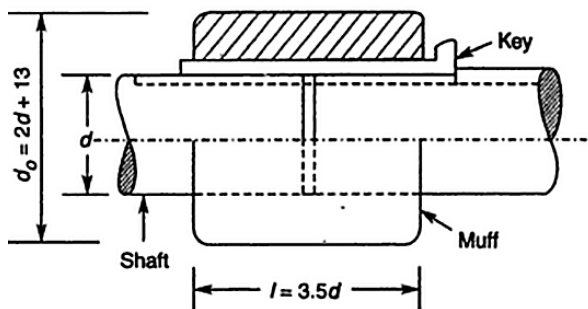


Fig.1 Muff coupling (C. S. Sharma et al, 2005)

Split muff coupling

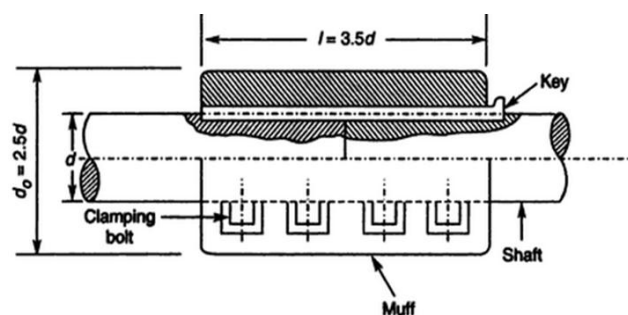


Fig. 2. Split Muff coupling.(C. S. Sharma et al, 2005)

Clamp or Compression or Split muff coupling is similar to the Sleeve coupling but it is made in two half's and joined with help of bolts. Sleeves are generally made up of Cast Iron. The Proportions of the Coupling are as shown in figure 2

Computing the dimensions

First step of java program has to import the packages from the vast library.

```
import java.io.*;
import java.math.*;
import java.lang.*;
```

After importing the packages, define the class and followed by main function

```
class muffcoupling
public static void main(String args[])throws IOException
DataInputStream in=new DataInputStream(System.in);
```

Next step is to read the input values of diameter and speed of the shaft entered by the user. After entering the values value should read and convert the data as a double value.

```
System.out.print(\n enter the diameter of the shaft(in mm):);
String shaftdia =in.readLine();
double d =Double.parseDouble(shaftdia);
System.out.print(\n enter the speed of the shaft(in rpm):);
String speed =in.readLine();
double N =Double.parseDouble(speed);
```

creating an object that contains its own copy of each instance variable defined by the class
muffcoupling mf=new muffcoupling();
 In next step define the methods for muff coupling and split muff coupling,
mf.boxcoupling(d,N); // method for computing the muff coupling
mf.compression(d,N); // method for computing the split muff coupling

For Computing the dimensions in the design point of view assuming that the sleeve or coupling is made up of C.I., Shafts, key and bolts are made up of Mild steel. Considering the allowable stress values as follows,

- Allowable shear stress in Shaft, *tovs = 42 Mpa,*
- Allowable Crushing stress in Shaft, *sigmacs=82 Mpa,*
- Allowable Shear stress in Bolt and Key, *tovb, tovk=56 Mpa.*
- Allowable Crushing stress in bolt, *sigmacb=112 Mpa*
- Allowable tensile stress, *sigmat=70 Mpa*

These values are defined as the integers

```
int tovs = 42,sigmacs=82,tovk=56, tovs1=14,tovb=56, sigmacb=112,sigmat=70; //All the variables defined and assigned at a time.
```

Same variable values are used for compression coupling but the number of bolts as n=4 it is programmed as
int n=4;

Other dimensions are calculated as per the standard design rules based on allowable stress values and all the proportions are based on shaft diameter d. All the values are defined as double to get exact values.Few Proportions of the coupling and the code written in java for it is as tabulated below.

Parameter	Formula	Java program code
Outer Diameter of the sleeve	$D_o = 2d + 13$ mm	double Do=((2*d)+13)
Length of the sleeve	$L = 3.5d$	double L=(3.5*d)
Torque transmitted through shaft	$T_s = (\pi/16) t_s d^3$	double Ts=((pi/16)*tovs*(d*d*d))

Results & discussion

Program file is saved as *muffcoupling.java*, to compile the program open the command prompt and type as *javac muffcoupling.java*

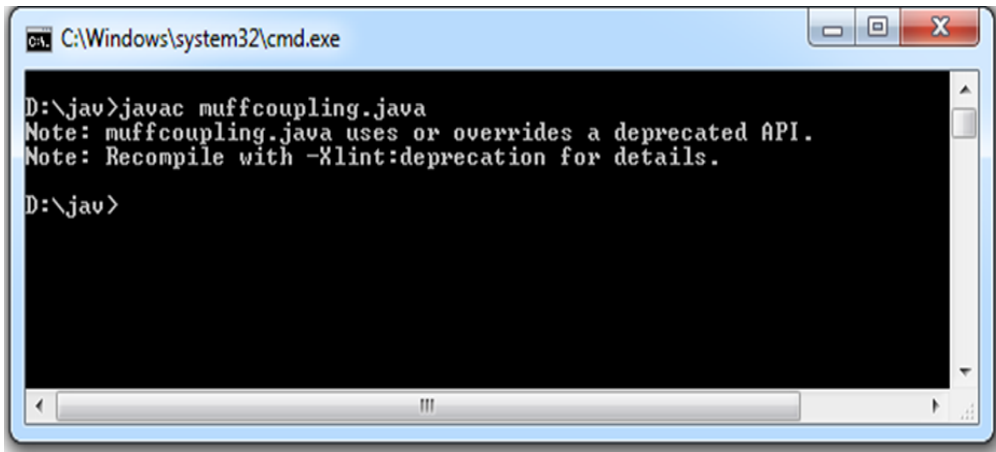


Fig.3

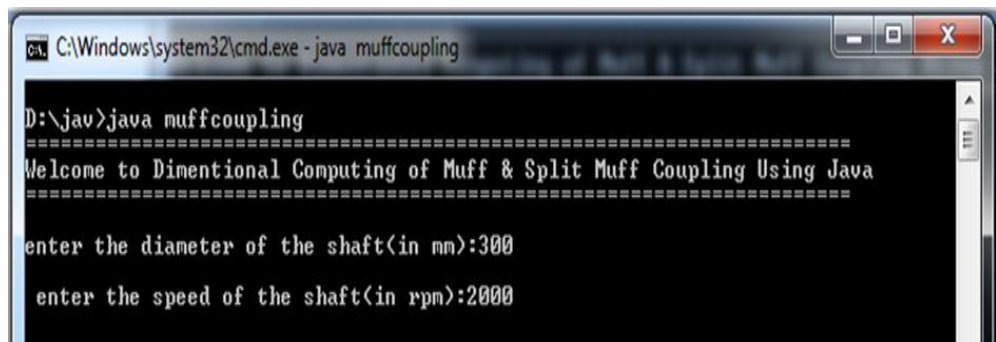


Fig.4

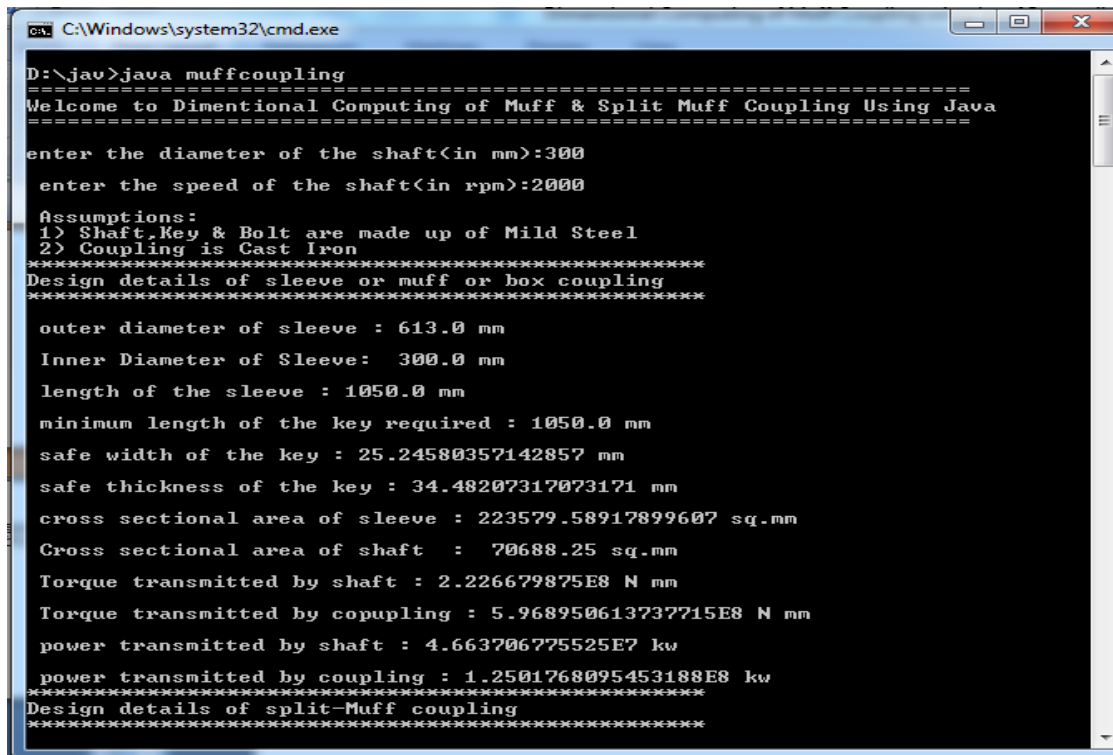


Fig.5

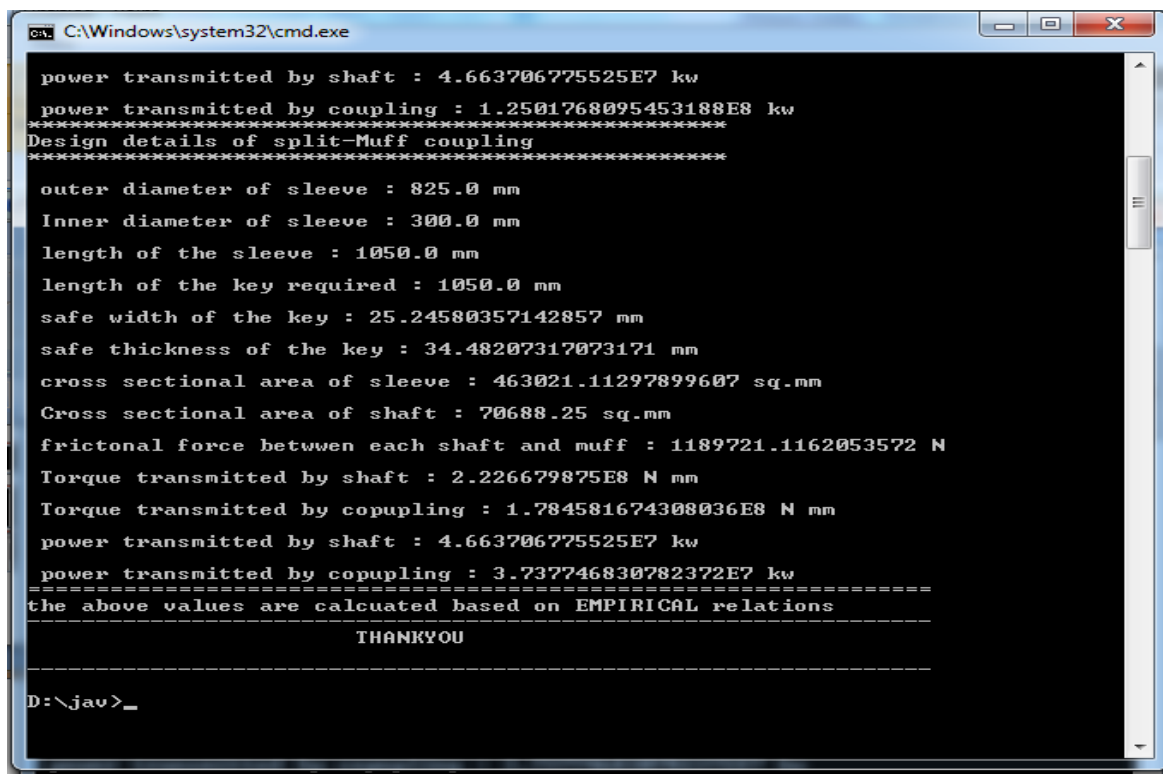


Fig.6

Then java class file will generates at the location of .java file saved.

Then enter into the command prompt as **java muffcoupling**

Then the message displays as *enter the diameter of the shaft (in mm):* 300mm

Then again the message displays as *enter the speed of the shaft(in rpm):* 2000 rpm

(300 mm and 2000 rpm are entered for sample calculations).(Fig.4)

Then the dimensions of the sleeve coupling will be as follows (Fig.5)

Then the dimensions of the split-muff coupling will be as follows (Fig.6)

Conclusion

In this paper we have summarised our work on Dimensional computation of muff coupling by using Java. We have written a tool for auto computing of dimensions of muff coupling with design and stress considerations. With this program any one can compute the dimensions of the coupling with in fraction of seconds.

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