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Relation between Metric and Whitworth Thread Through Regression Analysis

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***Abstract*— In this paper, relationship between two different types of threads major diameter is analysed by regression analysis technique. Special purpose thread is used for analysing i.e. socket screw thread which is used in mainly for assembly purpose. Regression analysis develops the relationship between variables. It is based on the relationship between 2 or more variables. The known variable is independent variable and the variable we are trying to predict is dependent variable. Regression method is used to evaluate and for testing the relationship between British whit worth thread and metric thread.**

***Index Terms*— major diameter, Regression analysis, profile projector, whit worth thread (BSW) & Metric thread.**

I. INTRODUCTION

Of the various screw thread forms which have been developed, the most used are those having symmetrical sides inclined at equal angles with a vertical center line through the thread apex. Present-day examples of such threads would include the Unified, the Whitworth metric and the Acme forms. Symmetrical threads are relatively easy to manufacture and inspect and hence are widely used on mass-produced general-purpose threaded fasteners of all types. In addition to general-purpose fastener applications, certain threads are used to repeatedly move or translate machine parts against heavy loads.

Screw: Threaded fastener with the thread running up to the head of the fastener; has no plain shank.

Screw Thread: A ridge of constant section which is manufactured so that a helix is developed on the internal or external surface of a cylinder.

Socket Screws: While many hex cap screws may be found in vehicles, socket head screws are becoming more popular and have some space saving advantages over hex cap screws. Socket heads take up less space themselves and don't require side room for wrenches. They also are usually made from stronger alloy steel vs. hex cap screws, but this depends on the grade and manufacturer.

Set Screws: These are threaded along their entire length and are typically used to secure a shaft from rotating. They're used in pulleys, sprockets, collars and knobs among other things.

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II. THREAD TERMINOLOGY

Major Diameter: On a straight thread the major diameter is that of the major cylinder. On a taper thread the major diameter at a given position on the thread axis is that of the major cone at that position.

Minor Diameter: On a straight thread the minor diameter is that of the minor cylinder. On a taper thread the minor diameter at a given position on the thread axis is that of the minor cone at that position.

Pitch: The pitch of a thread having uniform spacing is the distance measured parallel with its axis between corresponding points on adjacent thread forms in the same axial plane and on the same side of the axis. Pitch is equal to the lead divided by the number of thread starts.

Pitch diameter: The diameter of an imaginary cylinder having a surface of which cuts the thread forms where the width of the thread and groove are equal.

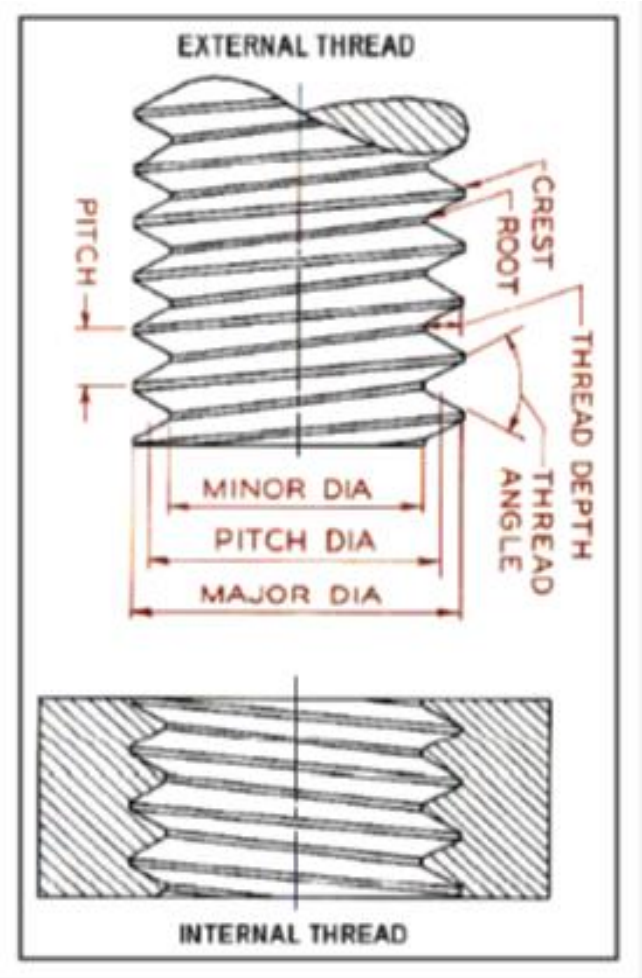
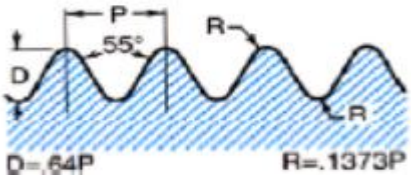
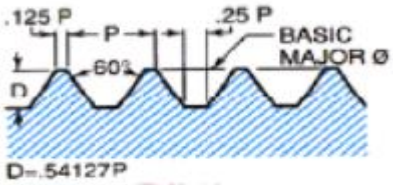


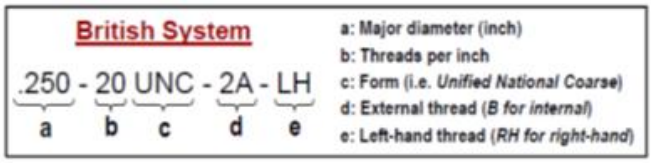
Fig.1-screw threads geometry
Whit worth thread

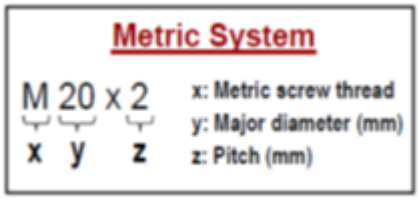


Metric thread



DESIGNATIONS OF SCREW THREAD





III. DATA COLLECTION

For collecting data two methods are used which is

- **Profile projector**

An optical comparator (often called just a comparator in context) is a device that applies the principles of optics to the inspection of manufactured parts. In a comparator, the magnified silhouette of a part is projected upon the screen, and the dimensions and geometry of the part are measured against prescribed limits. The measuring happens in any of several ways.

Fig.2- Profile Projector Machine

Table no.1 Reading on profile projector

sr.no.	BSW	Metric
1	7.719	7.819
2	7.733	7.817
3	7.731	7.816
4	7.731	7.812
5	7.732	7.81
6	7.738	7.866
7	7.73	7.854
8	7.759	7.855
9	7.74	7.86
10	7.734	7.867
11	7.758	7.802
12	7.769	7.804
13	7.752	7.8
14	7.749	7.801
15	7.752	7.798
16	7.726	7.762
17	7.737	7.759
18	7.734	7.762
19	7.732	7.761
20	7.717	7.756
21	7.742	7.83
22	7.735	7.821
23	7.723	7.816
24	7.717	7.82
25	7.731	7.823
26	7.764	7.772
27	7.755	7.79
28	7.751	7.797
29	7.759	7.773
30	7.765	7.77
31	7.749	7.851
32	7.745	7.849
33	7.744	7.847
34	7.742	7.847
35	7.741	7.849
36	7.772	7.782
37	7.775	7.783
38	7.768	7.785
39	7.767	7.783
40	7.77	7.784
41	7.729	7.829
42	7.737	7.829
43	7.725	7.825
44	7.725	7.823
45	7.735	7.828
46	7.744	7.777
47	7.739	7.782
48	7.738	7.782
49	7.732	7.772
50	7.731	7.775

Fig. 3-socket screw thread for study

IV. METHODOLOGY

Regression analysis develops the relationship between variables. It is based on the relationship between 2 or more variables. The known variable is independent variable and the variable we are trying to predict is dependent variable. An inverse relationship exists between the variables.

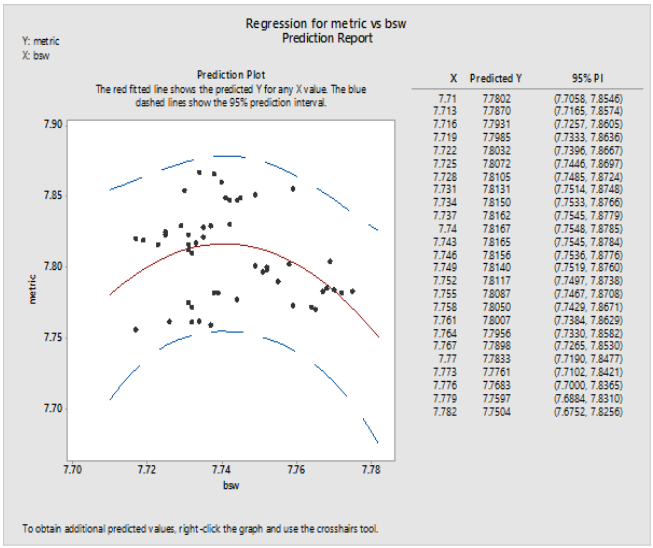
Regression method is used to evaluate and for testing the relationship between British whit worth thread and metric thread the collecting data. Regression analysis very powerful tool to establishing the relation between different threads.

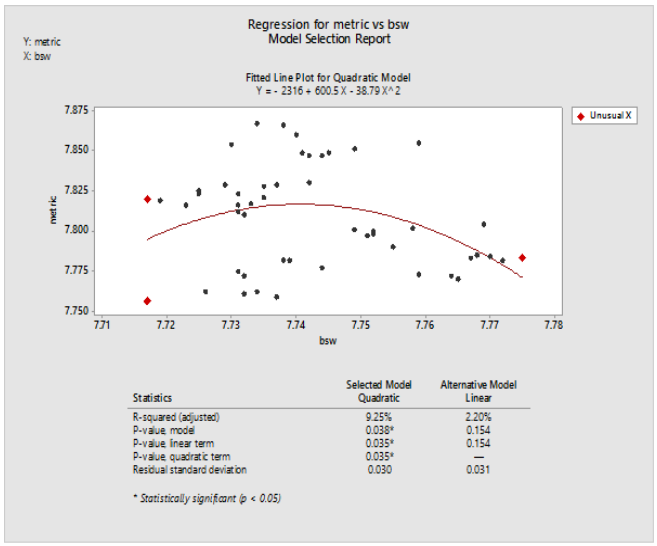
If X represents the cause & Y, the effect, then we are searching for

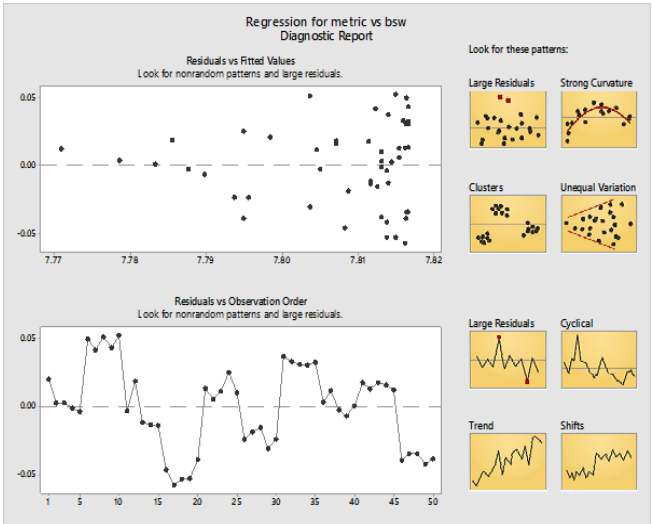
$$\hat{Y}_X=(Y/X=x)= A+Bx$$

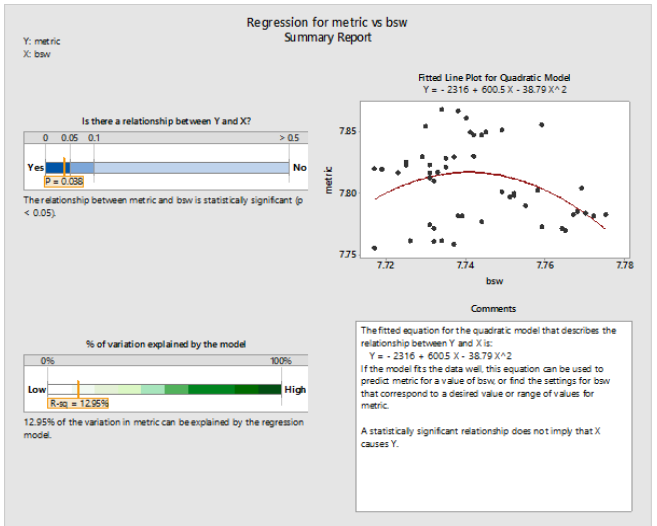
Descriptive Statistics: bsw, metric thread

Variable	N	N*	Mean	SE Mean	StDev	Minimum	Q1	Median	Q3	Maximum
bsw	50	0	7.7425	0.00218	0.0154	7.7170	7.7310	7.7385	7.7527	7.7750
metric	50	0	7.8075	0.00448	0.0317	7.7560	7.7820	7.8070	7.8290	7.8670









V. CONCLUSION

Data that are analysed is following the normality test which means that data are normally distributed. Sample size is 50

which has no issue about normality. There 3 data points have unusual X values which can cause the fitted line to be pulled closer to the unusual points and away from other points. These points are marked in red colour in model selection report.by correcting that data points we can remove the unusual values of X.

The sample adequately covers the range of X value. The model properly fits quadratic curvature in the data.

The fitted equation for the quadratic model which is best suited or describes relation between two variables is

Y=-2316+600.5X-38.79X^2

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