5.0 Results

After analyzing and developing the behavioral models for the *Mechanical Design Desktop* System, a specific implementation was carried out. The typical methodology that a designer would follow to design a machine element would be:

- Search the Internet for information on the particular machine element.
- Catalogue the requisite information on the desktop.
- Read the design procedure before beginning the design process.
- Enter the limitations imposed on the design
- Solve the design equations till all the limitations have been satisfied.
- Plot graphs to study the influence of changes in design parameters
- Maintain a record of the optimal values.

The implementation model is discussed using the specific example of the design of a V-belt drive. The various features provided by the application have also been explained in detail.

Figure 5.1 shows the initial screen encountered by the designer.

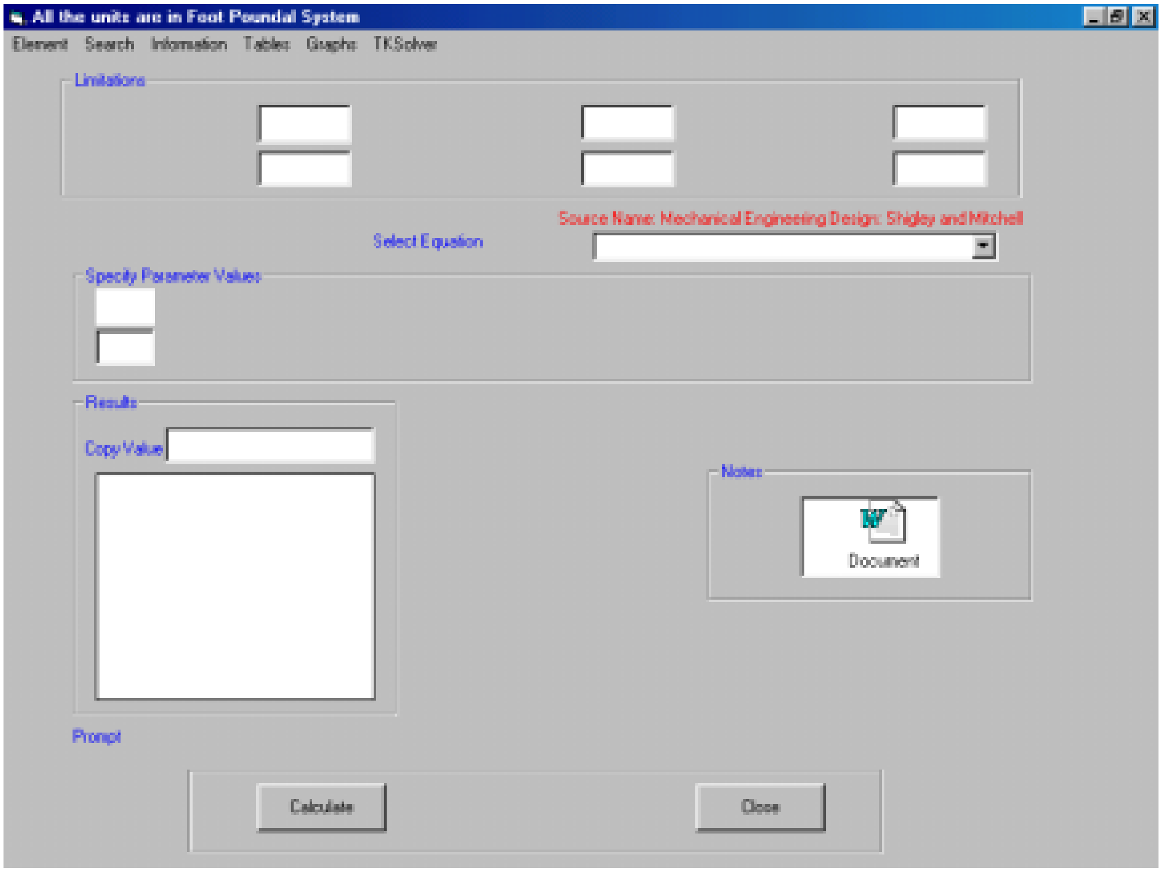


Figure 5.1: The main screen of the application.

The following is the description of the menu items:

Element: On clicking this menu, the designer can select a particular machine element to design.

Search: There is one sub menu under this menu:

1. Open Web Page: On clicking this menu item, the designer can use the services of a browser to track information resources on the web for information regarding any machine element. Any commercial search engine can be used to locate these sources. The designer can also cut relevant design information from the web page using standard Windows keyboard command *Ctrl – C*.

Information: There are two sub menus under this menu:

1.Input Information: On clicking this menu item, the designer can save any information that has been copied from a website into a designer specified destination on the desktop. He can use the standard Windows keyboard command of *Ctrl-V* to paste the design information.

2.Display Information: On clicking this menu item, the designer can view the contents of any file on the desktop containing the information previously saved.

TKSolver: On clicking this menu item, the designer can instantiate TKSolver, which is not only an implicit solving tool but also contains a graphing utility for plotting graphs.

Limitations: The limitations section can be used to enter the limitations or constraints imposed on the design. The designer can enter the values of these constraints in the textboxes provided beside the appropriate constraint.

Equation Number: All the equations pertaining to the design of a particular machine element are loaded onto this combo box along with the equation numbers and the page numbers being displayed for reference.

Specify Parameter values: On selection of a particular equation, the involved parameters and corresponding text-boxes to specify input parameter values are loaded in this frame. The designer can then specify the input design parameter values.

Results: This section displays the values of the calculated design parameters. All the calculated design parameter values are displayed in the window.

Copy value: On the finalization of the design parameter value, the designer can click the value in the results section that he wants to copy and then, that particular parameter name and value, is displayed in the box. The value can then be copied using a standard Windows command *Ctrl-C* and pasted in the design document using the standard Windows command *Ctrl-V*.

Calculate: On clicking this button, the input parameters are sent to the solver and the output parameters are displayed in the **Results** section.

Notes: On clicking the icon displayed, the designer can open a Microsoft® Word 97 document, enter the various design issues, and maintain a proper documentation of the entire design. The document can then be saved on the desktop in a destination of the designer's choice.

Prompt: The table, graph or standard that a designer needs to refer to for specifying the design parameter values in a given equation are displayed in this section.

Close: On clicking this button, the application can be closed.

The working of all the above GUI components can be best illustrated by the means of the following example:

Let us assume the designer wants to initially search for information available on the Internet regarding a particular machine element. Let us consider the design of a V-belt drive as a specific example. On clicking the *Open web page* menu item under the **Search** menu, a web browser window as shown in the Fig. 5.2 is presented to the designer.

Figure 5.2: The web browser window.

The interface is similar to that of any standard web browser. The default address specified is: http://www.google.com, which is a search engine for locating information on the Internet. The designer can navigate to any website of his or her choice or any other search engine of his or her preference by editing the address in the *Address* field.

In addition, there are some standard navigation buttons also provided above the address field. These buttons, from left to right, are the Back Button, Forward Button, Stop Button, Refresh Button, Home Button and Search Button, respectively. The functionality provided by these buttons is as follows:

Back Button:

On clicking this button, the designer can navigate to a previously viewed web page.

Forward Button:

On clicking this button, the designer can navigate from a previously viewed web page to the next web page, in the order of viewing.

Stop Button:

On clicking this button, the current web page stops loading.

Refresh Button:

On clicking this button, the web page reloads itself.

Home button:

On clicking this button, the designer can navigate to the default starting address: http://www.google.com.

Search Button:

On clicking this button, the designer can use the search engine provided by Internet Explorer® to search for information on the Internet.

Once the designer locates the information of his choice, the information can be copied by highlighting the required information using the mouse, and by clicking on the right mouse button as shown in Fig. 5.3.

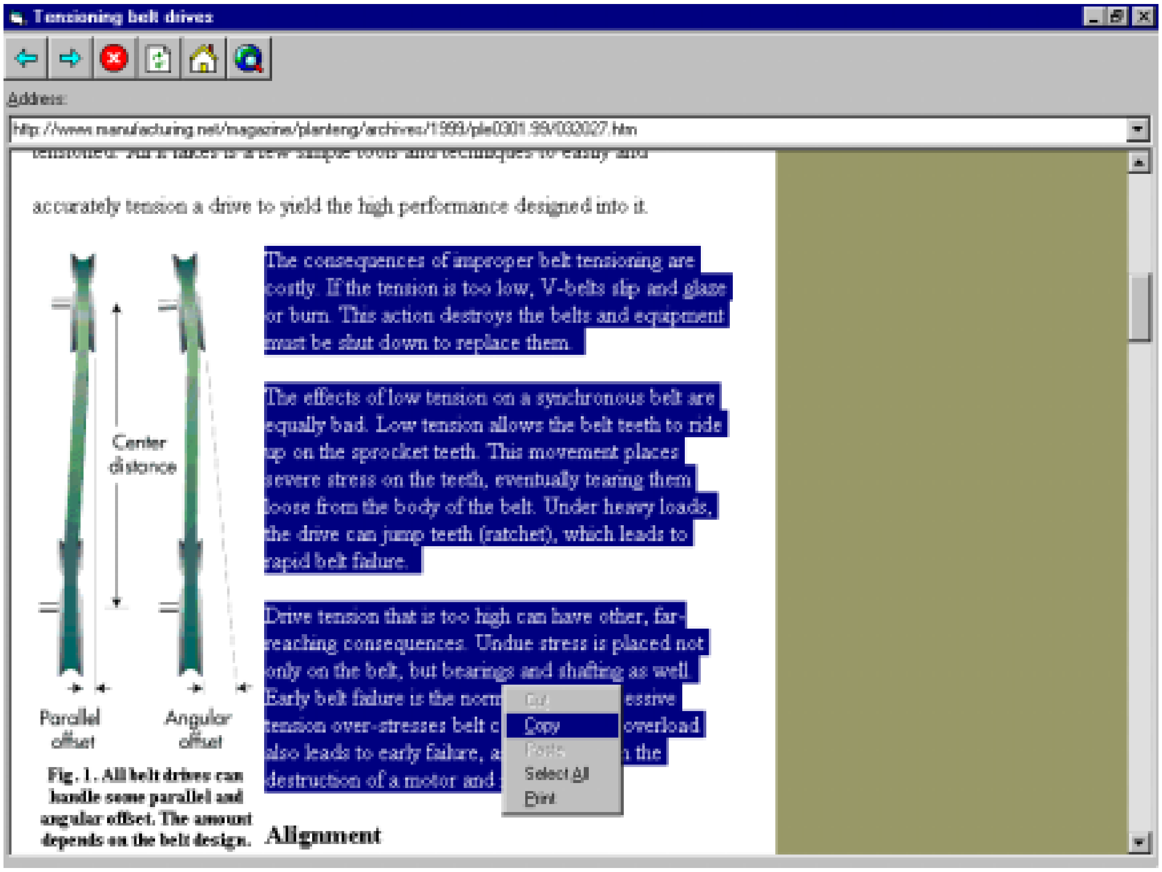


Figure 5.3: Information to be copied by the designer.

On selecting the copy option shown in the Fig. 5.3, the highlighted text is copied. The designer can also use the standard windows keyboard command *Ctrl-C* to copy the above text.

After copying the text, the designer can revert back to the main application screen using the standard windows keyboard command *ALT-TAB.* Here, on clicking the *Input Information* menu item under the **Information** menu, the designer encounters the screen shown in Fig. 5.4.

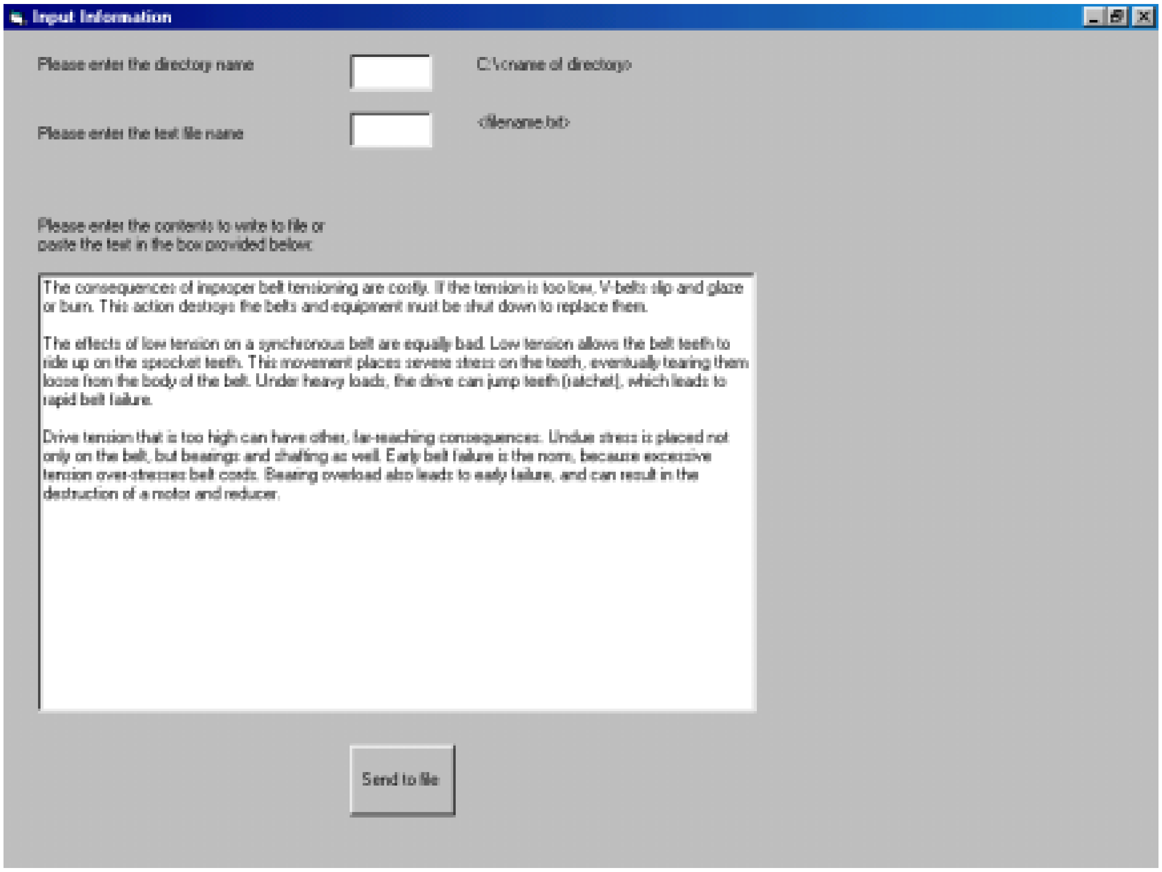


Figure 5.4: The screen for saving information.

The designer can paste the information, previously copied, into the text box provided. On specifying a destination folder and file name in the input boxes provided and clicking the *Send to file* button, the information is stored in the specified folder and file. Let the designer save the information to the **belt** folder under the filename *tension.txt* as shown in Fig. 5.5.

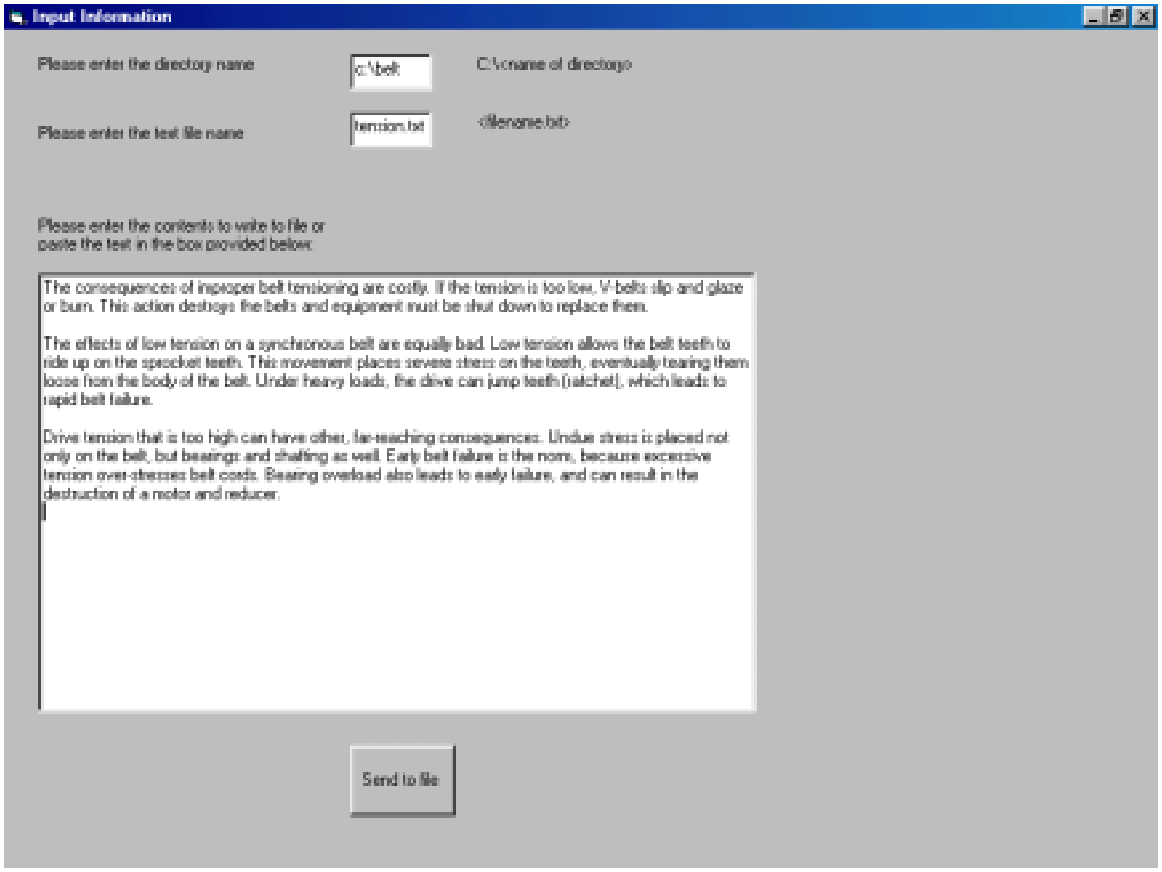


Figure 5.5: The destination folder and file where the information needs to be saved.

If the designer desires to review the information in the course of the design process, the designer can access the information by clicking on the *Display Information* menu item under the **Information** menu. Under the **File** menu, if the designer clicks on the *Open* menu item, the various files on the desktop can be accessed as shown in Fig. 5.6.

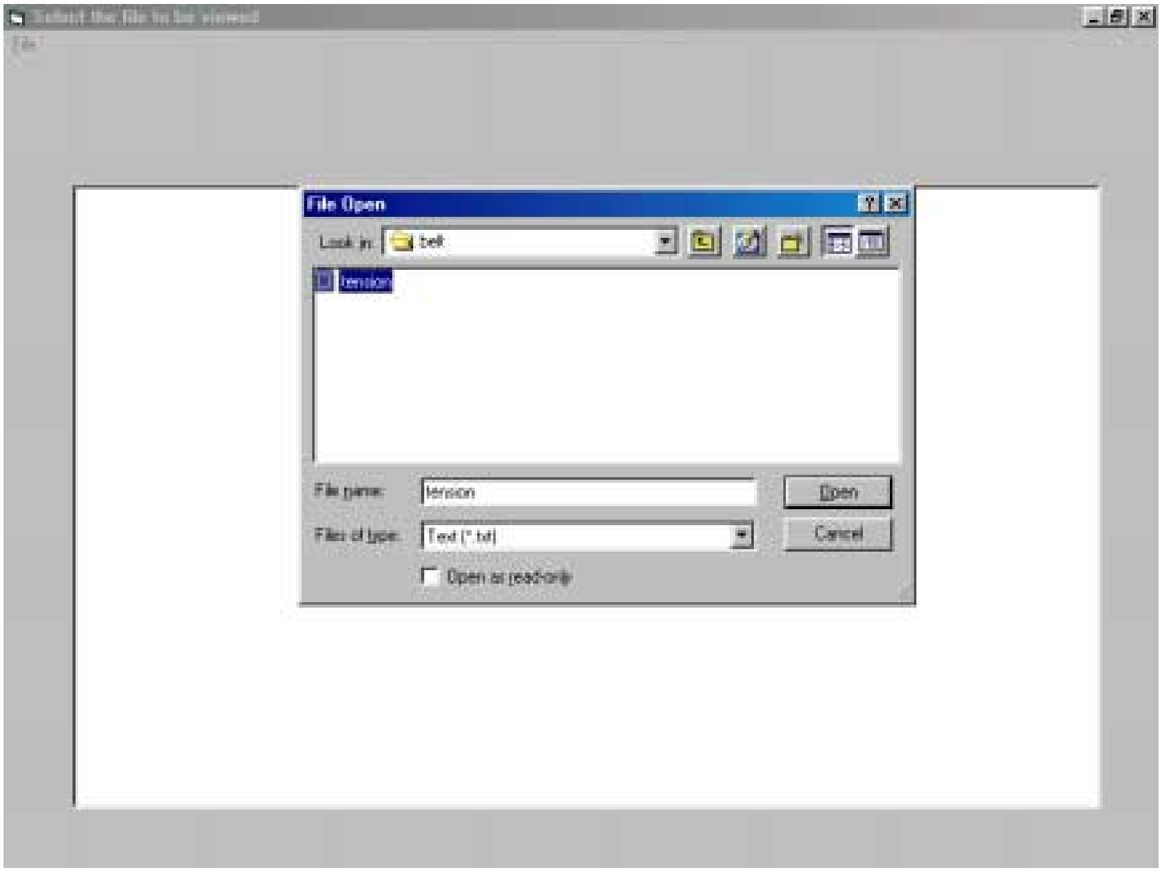


Figure 5.6: The contents of the belt folder.

The designer can then select the file *tension.txt* for viewing and click on the **Open** Button to open the file and view the contents as shown in Fig. 5.7.

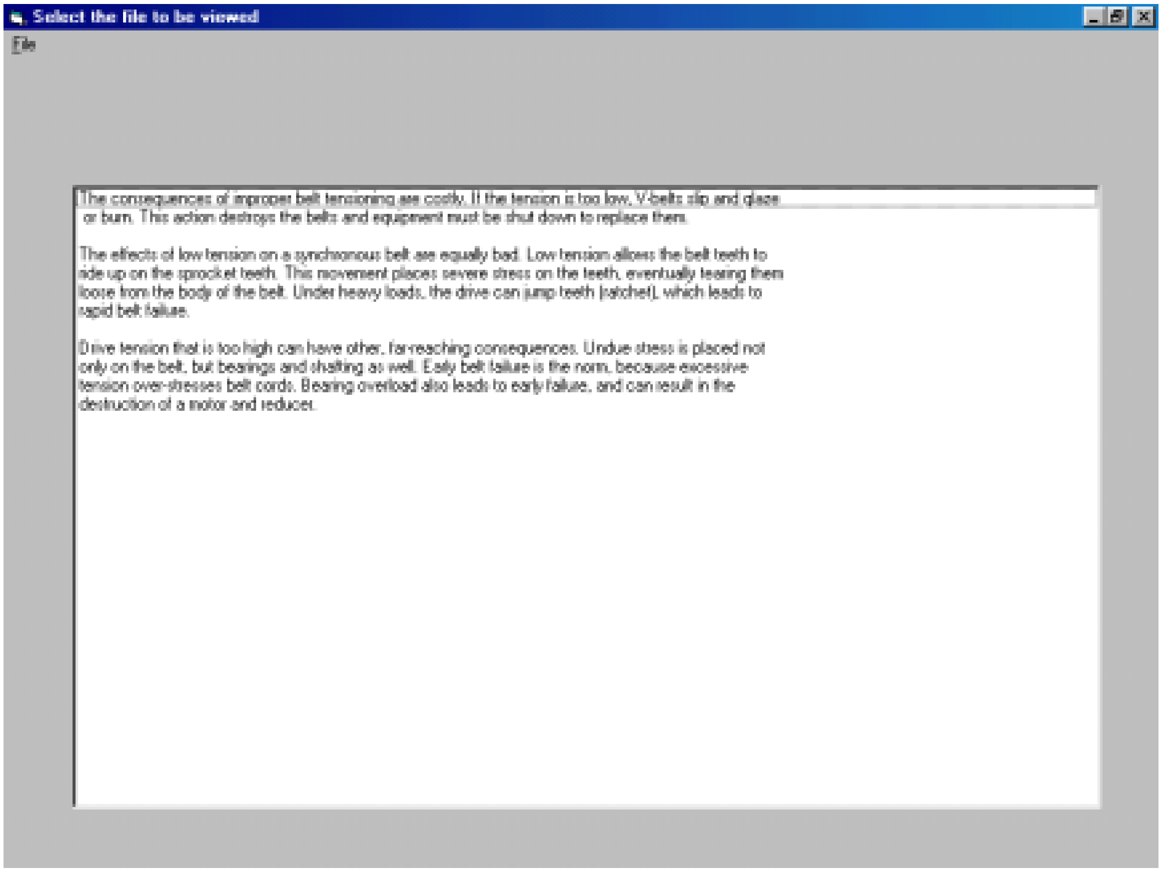


Figure 5.7: The contents of the file *tension.txt*.

On clicking the *Exit* button under the **File** menu, the designer can revert back to the main application screen.

Let us consider a test case where the designer wants to design a V-belt drive. Using the procedure outlined above, the designer saves information regarding the design of the V-belt drive and reviews the information.

On being familiarized with the design process, the designer begins the design process by clicking the *V-Belt* submenu item under the **Element** menu. Then, the form for entering the specification is encountered where the limitations/specifications of the design process can be entered in the textboxes provided as shown in Fig. 5.8. Simultaneously, all the relevant graphs, tables and standards that need to be referred to in the design process are also loaded.

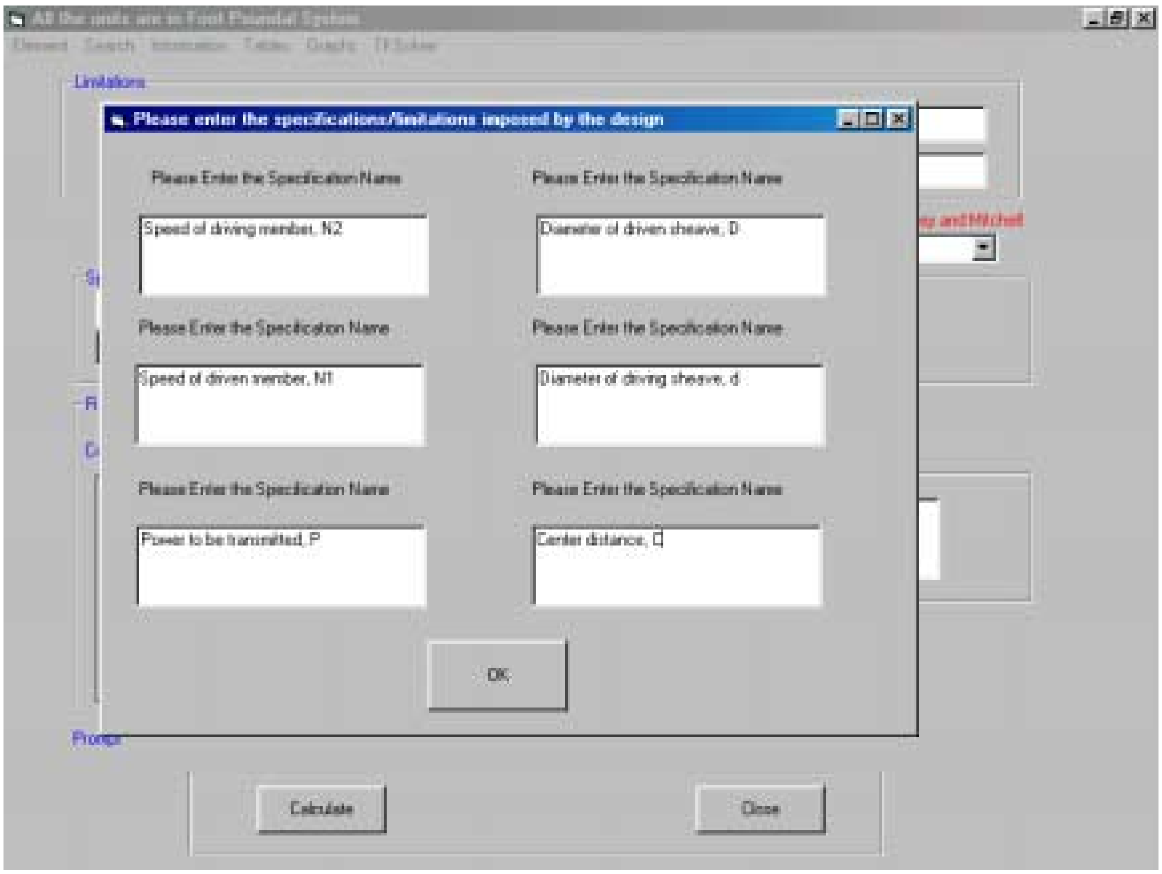


Figure 5.8: The form for entering specification names.

On clicking the **OK** button, these specification names get transferred onto the Main form as shown in Fig. 5.9.

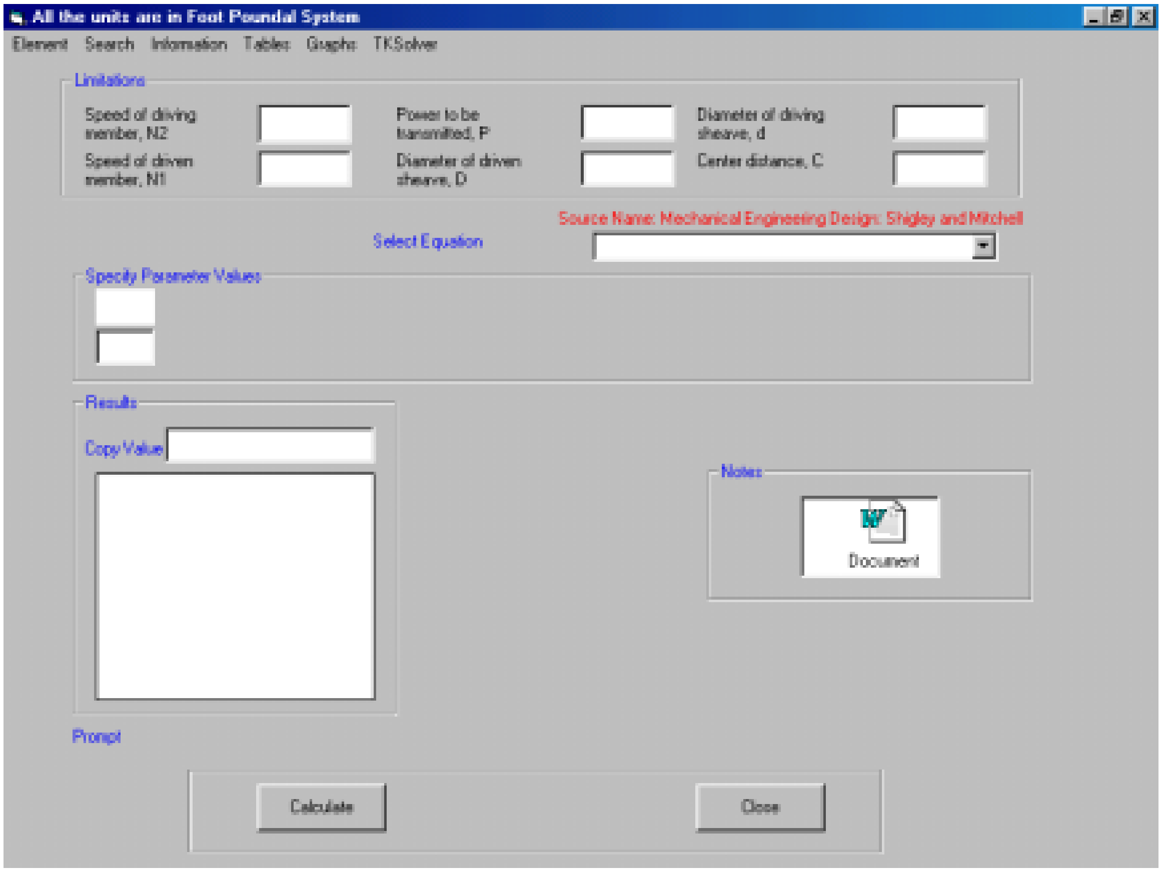


Figure 5.9: The transfer of specifications onto the main form.

Let us consider a test case wherein the following limitations have been imposed:

Speed of driving member, N2 = 3000 rpm.

Speed of driven member, N1 should be greater than 1520 rpm.

The limiting center distance = 22 inches.

Space limits the diameter of the driving sheave to 10.3 inches.

Space limits the diameter of the driven sheave to 5.5 inches.

The power to be transmitted is 5 hp.

The driven machinery has normal torque characteristic and is subject to medium shock.

The specific values for the design limitations can then be entered in the corresponding textboxes provided beside each of the design limitation names as shown in Fig. 5.10, so that the designer can keep track of the relevant limitations.

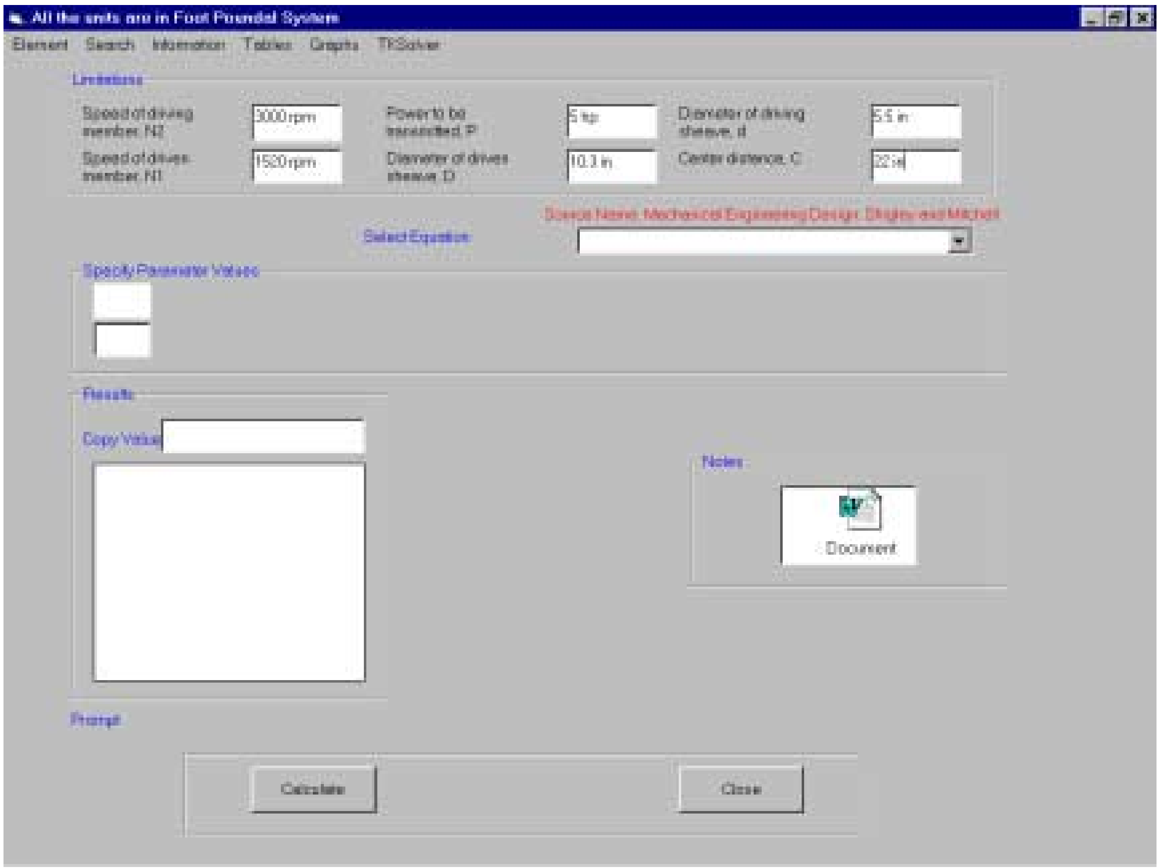


Figure 5.10: The limitations imposed on the given test case.

On clicking the arrow provided below the *Source Name*, the designer can view all the design equations involved in the design, in the prescribed order, and proceed to solve each of the design equations till each design limitation is satisfied. The list of design equations displayed to the designer is shown in Fig. 5.11.

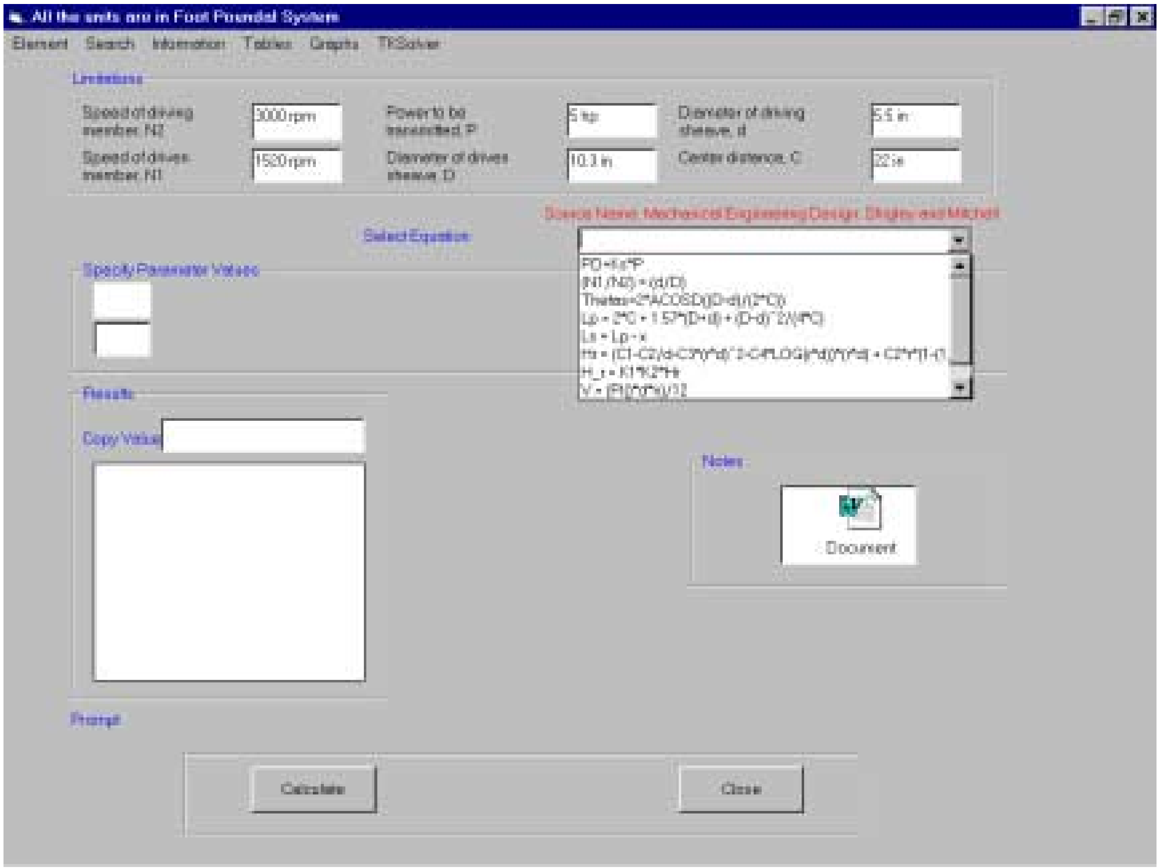


Figure 5.11: The design equations involved in the design of a V-belt drive.

The designer then proceeds to calculate the design power, *PD*, as the first step in the design. On selecting the particular equation and pressing the "*Tab*" key on the keyboard, the various parameters involved in the design equation with the respective labels and corresponding input boxes for specifying the input design parameter values appear in the *Specify Parameter Values* section. Simultaneously, the design equation number and the page number in the design book where the design equation is present are also displayed as shown in Fig. 5.12. The *Prompt* window indicates to the designer which table or graph needs to be referred to for specifying the design parameter values based on design conditions or other design parameters. For this case, the designer needs to refer to **Table 17-9** in order to specify the value of the parameter, *Ks*, based on the characteristics of the driving machinery as shown in Fig. 5.12.

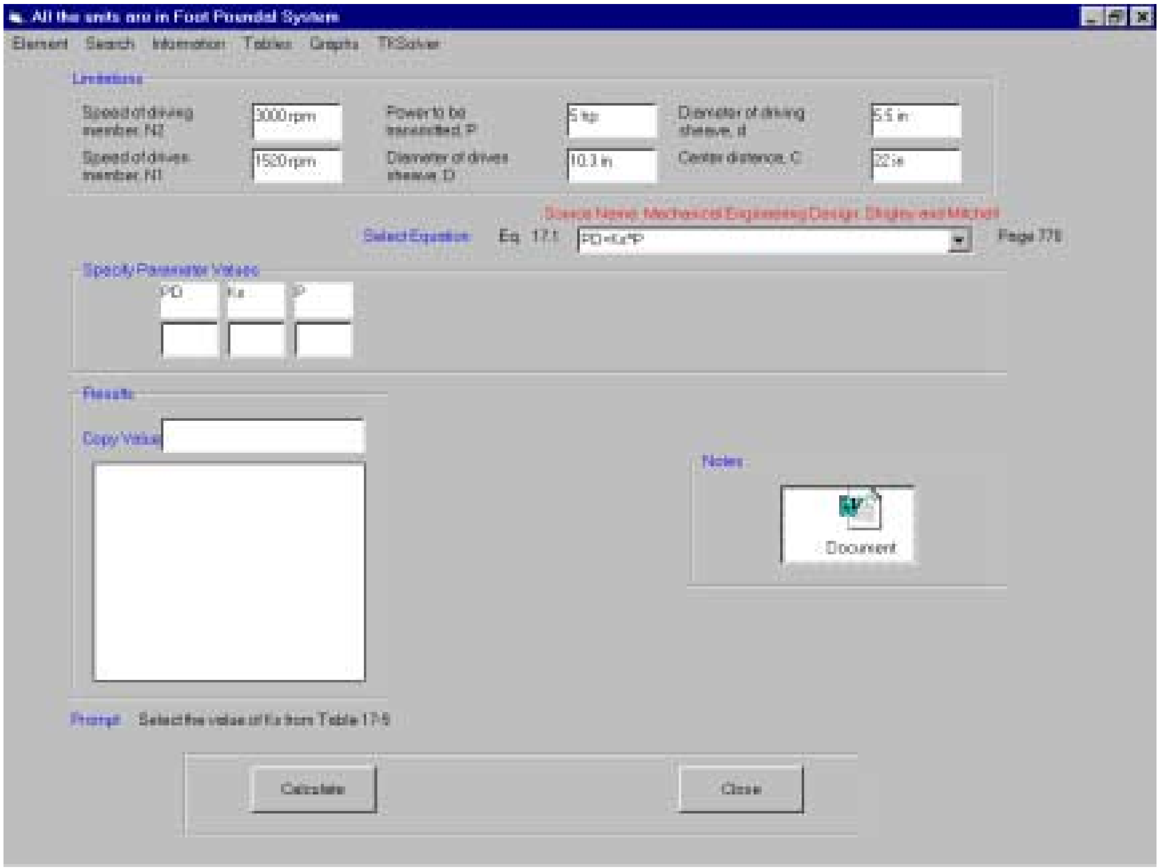


Figure 5.12: Selection of a design equation and the displayed prompt for input design parameter selection.

In order to specify the value of the service factor, *Ks*, the designer clicks the **Tables** menu to obtain the list of tables to be referred in the design process. In Fig. 5.13, the list of tables is listed and the designer can select any of the tables to choose the requisite design parameter values. For the above design equation, the designer refers **Table 17-9**. Figure 5.14 shows the table as viewed by the designer.

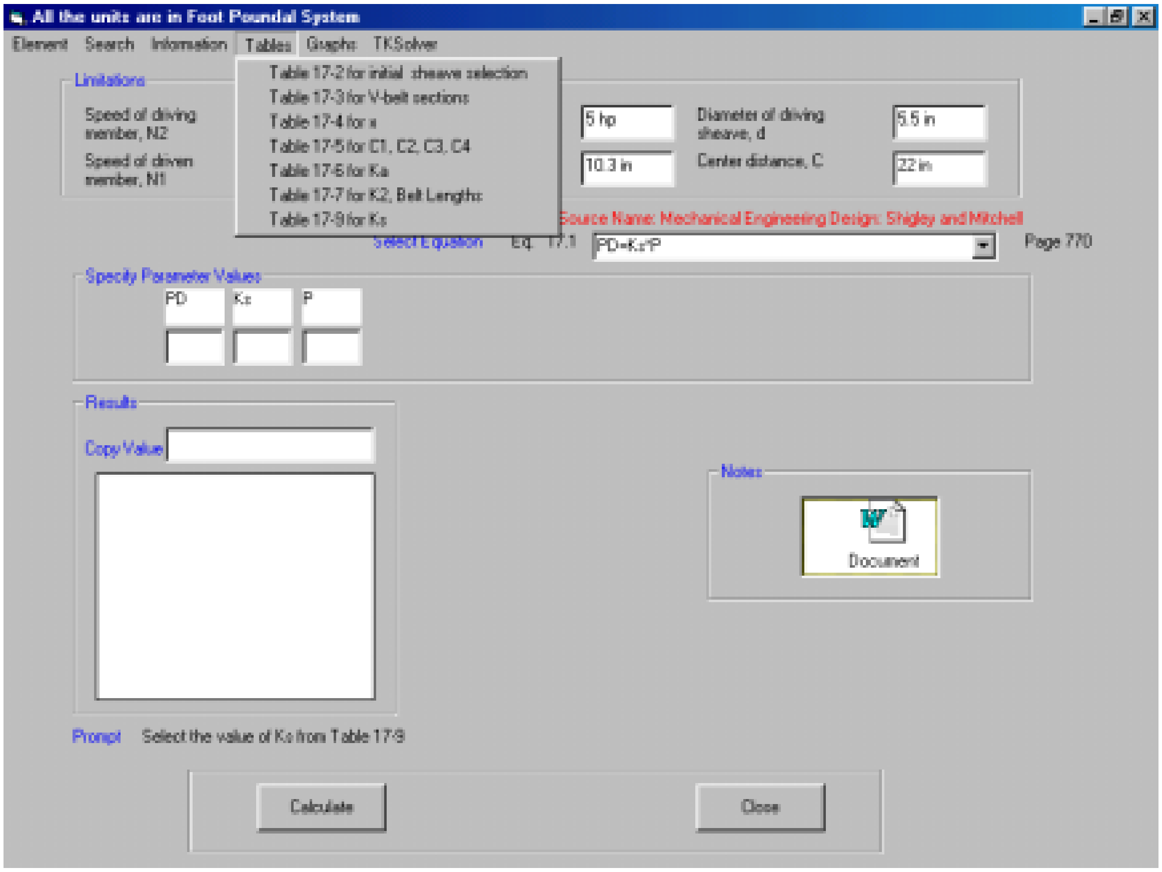
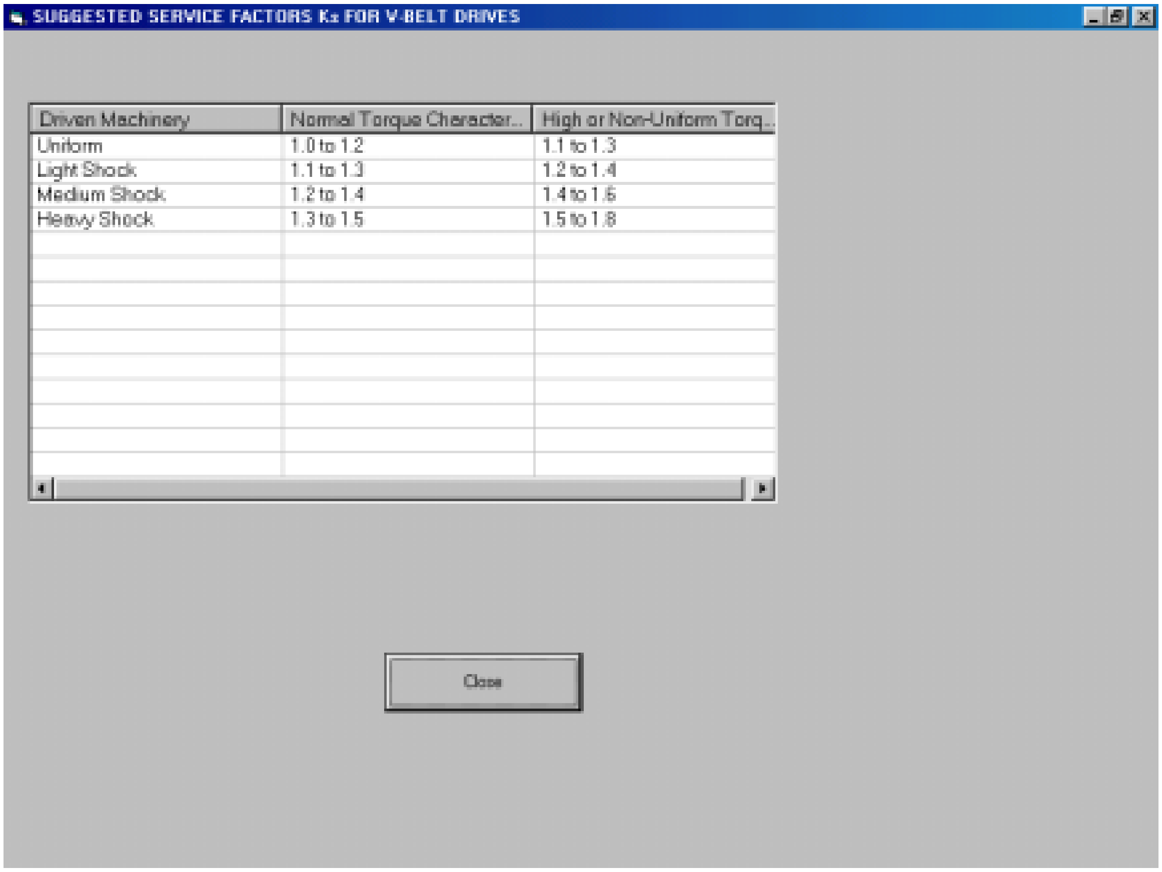


Figure 5.13: The list of tables viewed on clicking the Table menu.



Driven Machinery	Normal Torque Character..	High or Non-Uniform Torq..
Uniform	1.0 to 1.2	1.1 to 1.3
Light Shock	1.1 to 1.3	1.2 to 1.4
Medium Shock	1.2 to 1.4	1.4 to 1.6
Heavy Shock	1.3 to 1.5	1.5 to 1.8

Figure 5.14: The view of Table 17-9 for the selection of the service factor, *Ks*.

For the test case under consideration, since the driven machinery has normal torque characteristic and is subject to medium shock, the value selected may vary from 1.2 to 1.4. Let the designer select a value of 1.2.

On finalizing the selection, the **Close** button can be clicked to revert back to the main screen.

Here, the values of the power, *P*, and the service factor, *Ks*, can be entered in the corresponding input boxes as shown in Fig. 5.15.

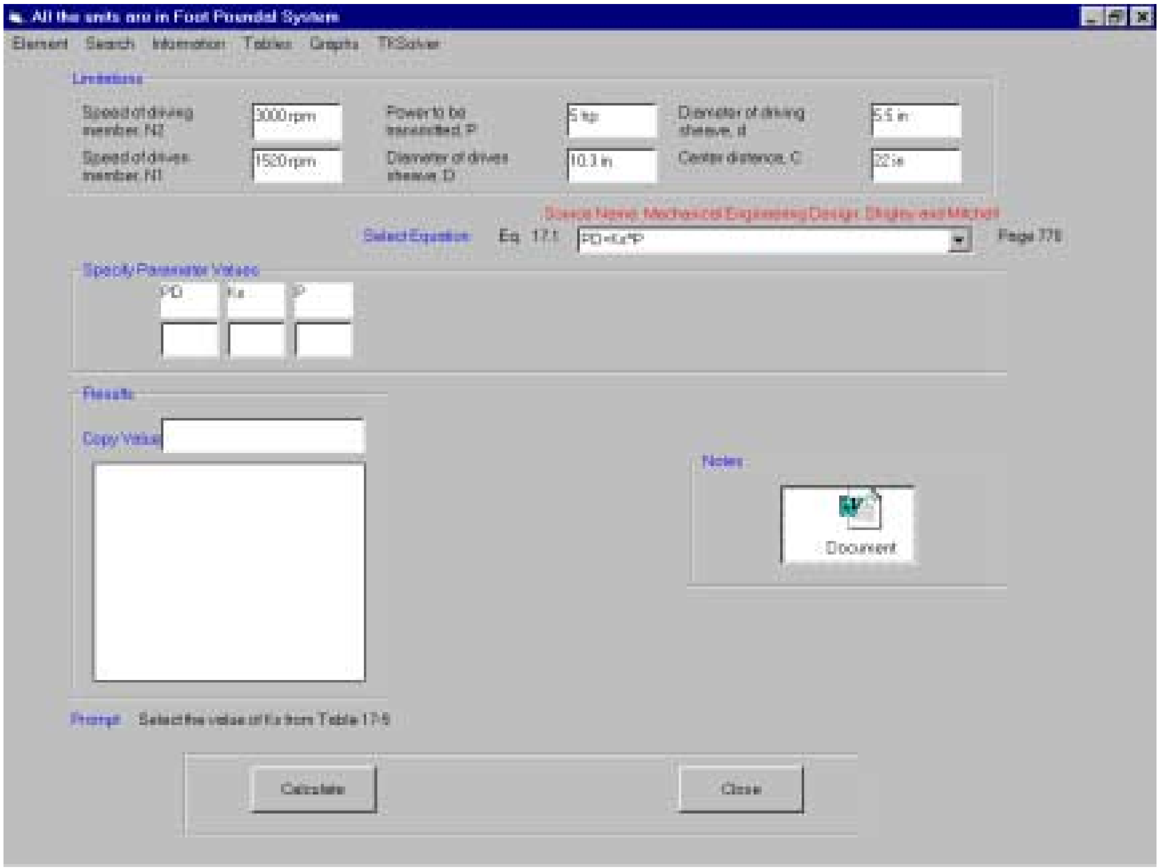


Figure 5.15: The input parameter values specified for the design equation.

On clicking the **Calculate** button, the input design parameter values are sent to the solver and the calculated value of the design power, *Pd*, is displayed in the *Results* section as shown in Fig. 5.16.

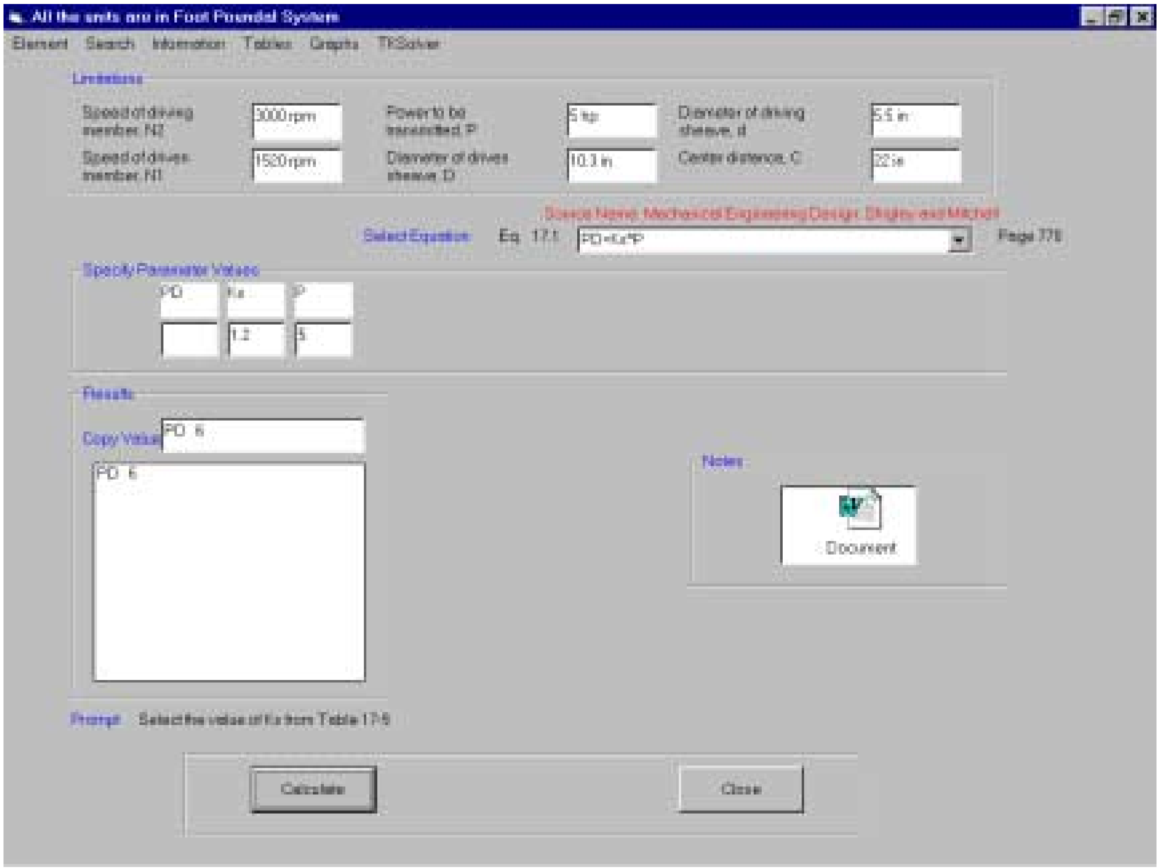


Figure 5.16: The value of calculated design parameter *Pd*, displayed in the results section.

The designer then moves onto the next design equation in the design process by selecting the next design equation from the **Equation** drop-down box. The selected design equation and the corresponding design parameters are shown in Fig. 5.17.

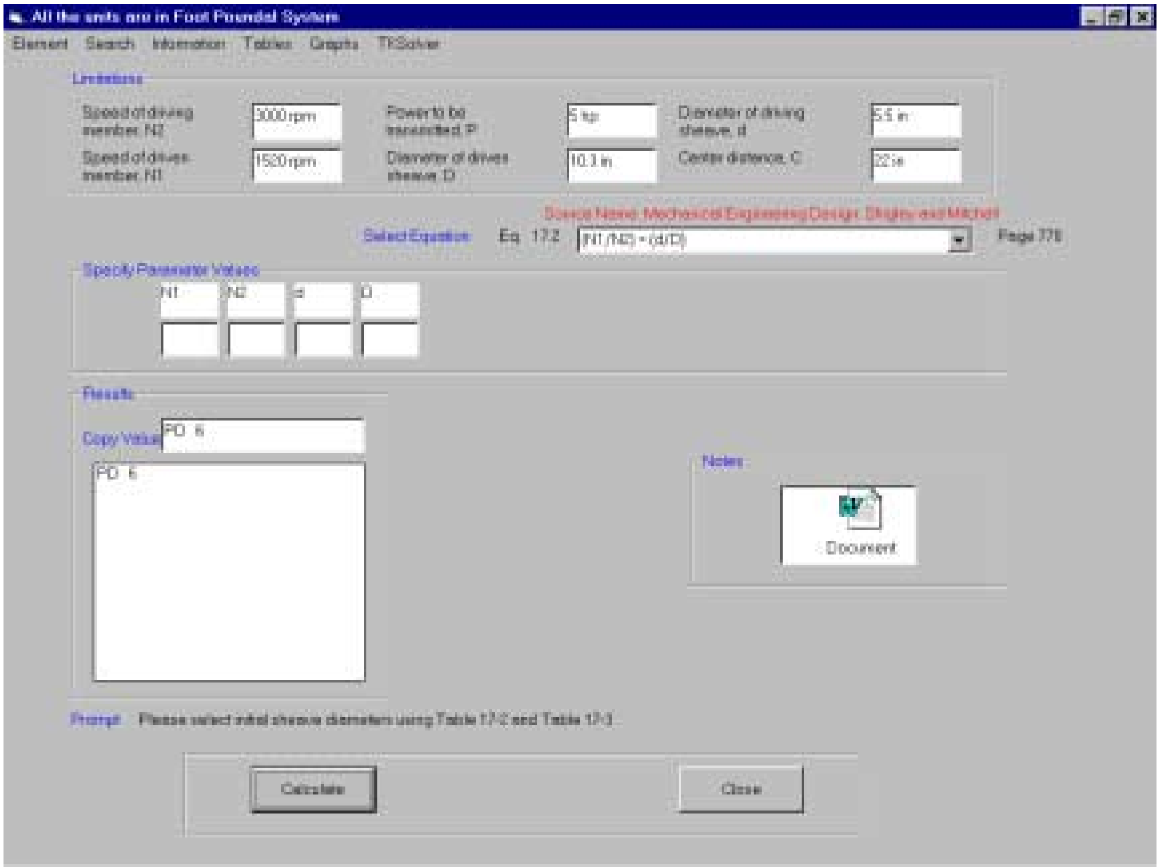
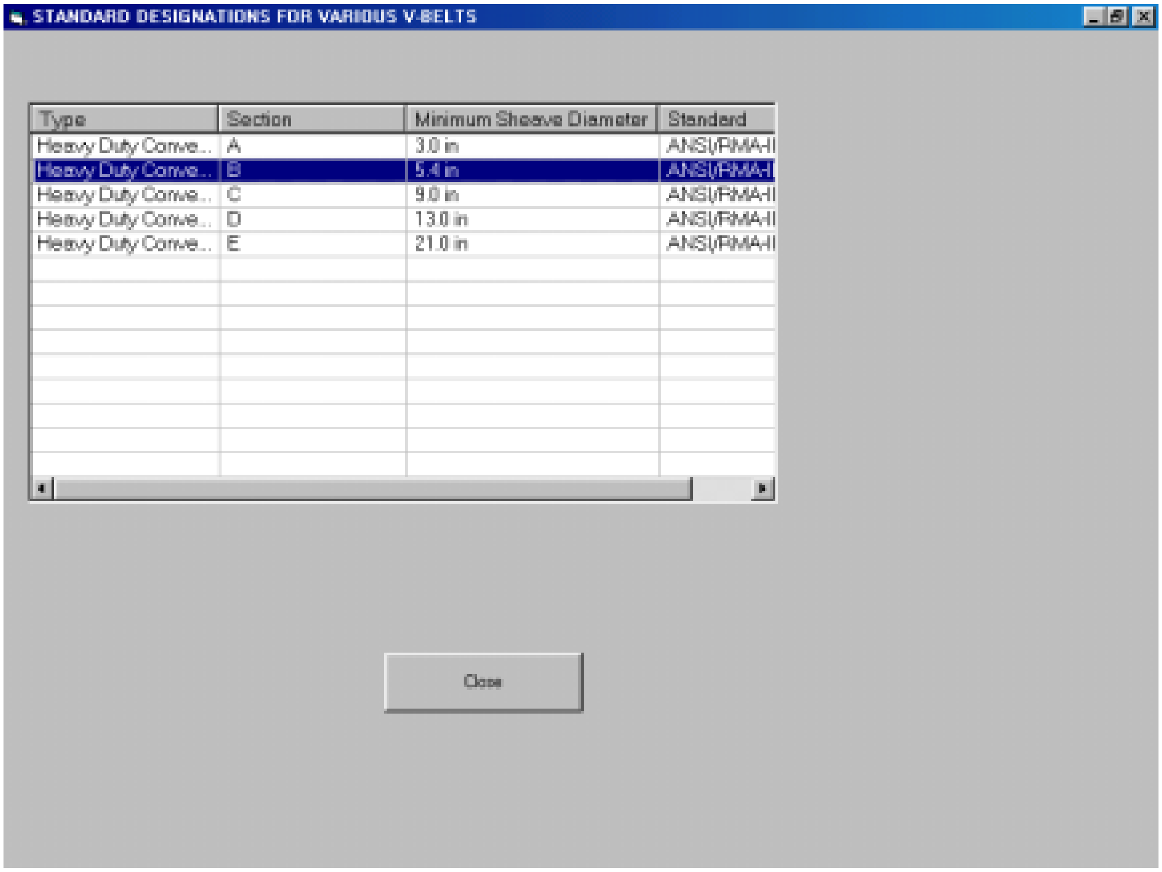


Figure 5.17: The input parameter boxes for the second design equation.

In the case of this particular design equation, the designer will tentatively select the driven and driving sheave diameters from the **Table 17-2** such that they satisfy the minimum diameters listed therein, and also, keep the specification of the speed of the driven sheave to be above 1520 rpm.

To keep the number of belts to a minimum, the designer will select a B-section belt as the minimum sheave diameter is closely matched to the space limitation of 5.5 inches. This can be observed from **Table 17-2**, the contents of which are shown in Fig. 5.18.



Type	Section	Minimum Sheave Diameter	Standard
Heavy Duty Conve...	A	3.0 in	ANSI/RMA-II
Heavy Duty Conve...	B	5.4 in	ANSI/RMA-II
Heavy Duty Conve...	C	9.0 in	ANSI/RMA-II
Heavy Duty Conve...	D	13.0 in	ANSI/RMA-II
Heavy Duty Conve...	E	21.0 in	ANSI/RMA-II

Figure 5.18: Reference table for Standard designations for various V-belts for the selection of minimum sheave diameters.

Let a minimum sheave diameter of 5.4 inches be chosen for the driving sheave, which satisfies the space constraints imposed on the given test case. Let us choose the trial value for the initial sheave diameter of the driven sheave to be 10.1 inches. The result of the above calculation appears in the *Results* section as shown in Fig. 5.19.

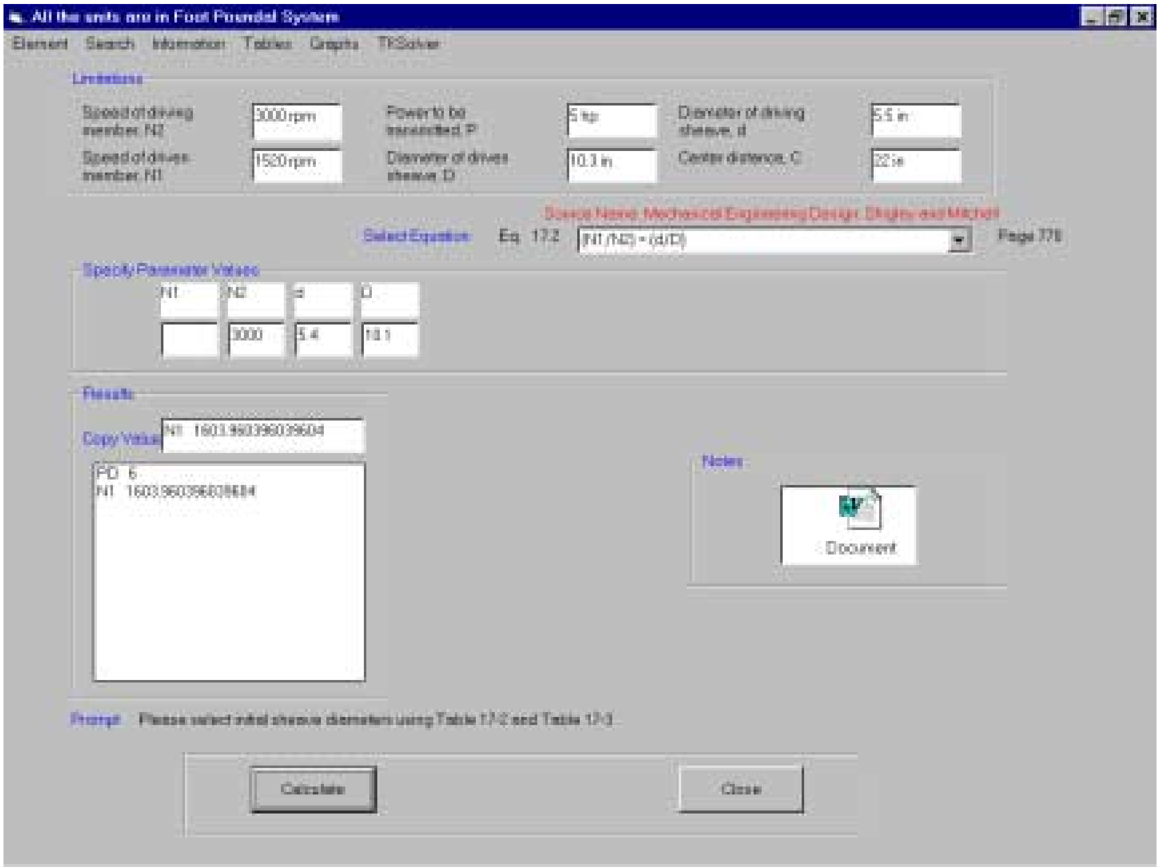


Figure 5.19: First trial calculations for selection of optimum sheave diameters.

There is a need to select the sheave diameters such that the speed of driven member matches as closely as possible to the required design speed. Let a value of 10.2 inches be selected for the diameter of driven sheave. The diameter of the driving sheave has been fixed at 5.4 inches earlier. The values chosen for the diameters of the driving and driven sheaves satisfy the space restriction imposed on the respective sheave diameters and the result of the above calculation is shown in Fig. 5.20.

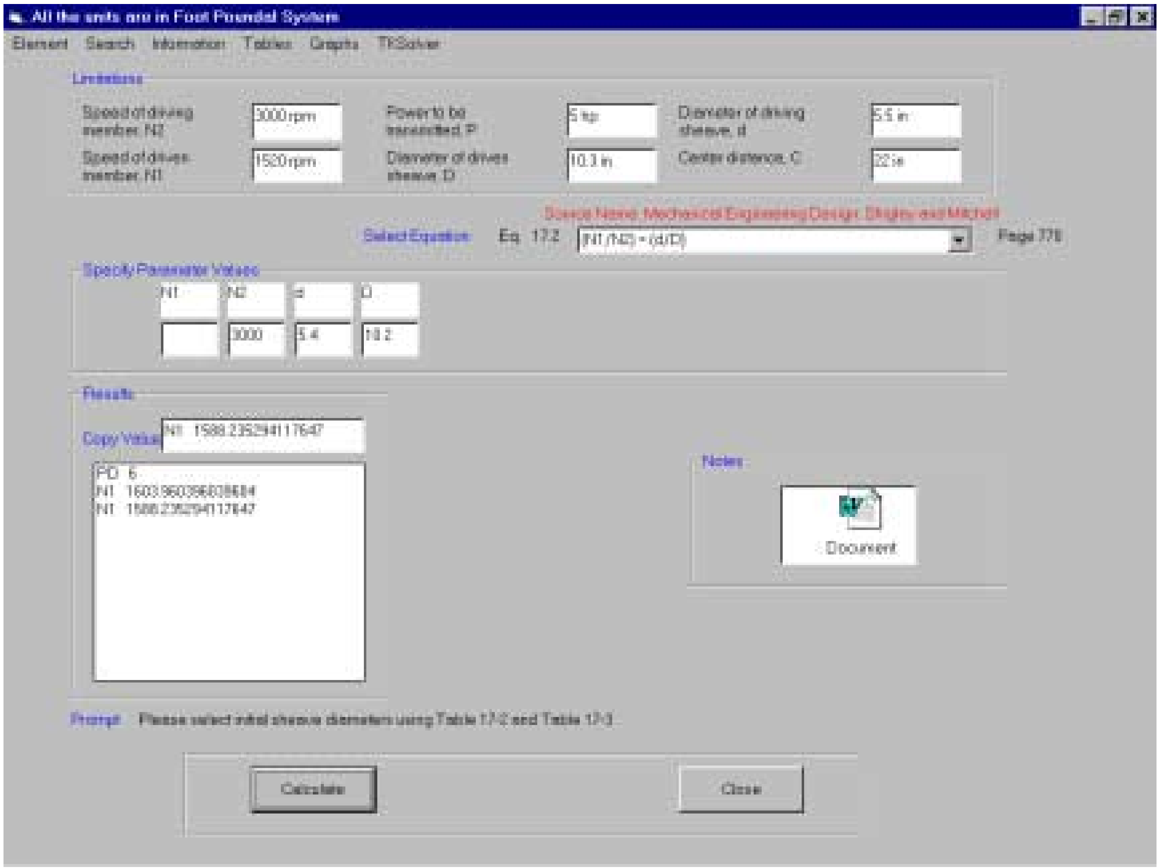


Figure 5.20: Second trial calculations for selection of optimum sheave diameters.

The values selected for the sheave diameters can now be finalized as these values satisfy the stipulation that the design speed of the driven sheave should be greater than 1520 rpm, keeping the value as close as possible, and, simultaneously, satisfy the limitations imposed by the space restrictions.

The designer will then move onto the next step in the design process and calculate the small angle of contact for the belt which determines the value of the constant, *Ka,* in the power rating equation. As the values of the sheave diameters, *d* and *D*, have been finalized, the values for those parameters are displayed by the system. The designer decides a tentative value for the center distance, *C*, to be 20 inches in this case. The results are displayed in Fig. 5.21.

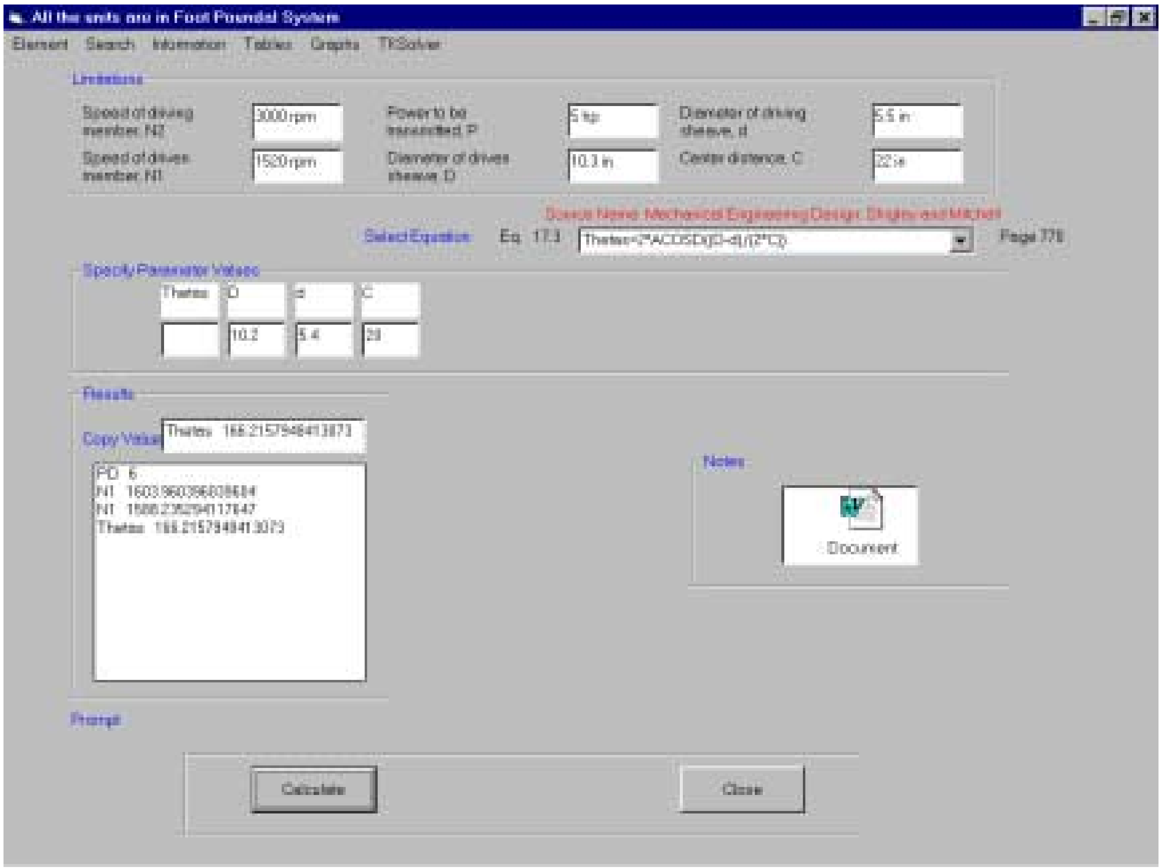


Figure 5.21: Calculations for the small angle of contact, *Thetas*.

The next step in the design procedure is to calculate the pitch length of the belt. The selected design equation and the calculations are as shown in Fig. 5.22. In this case, all the three parameters, *d*, *D* and *C*, have been finalized in the previous equations and the value of the pitch length of the belt, *Lp*, can be calculated without specifying any design parameter value. In this case, the designer has to merely click the **Calculate** button to determine the value of the pitch length, *Lp*, as shown in Fig. 5.22.

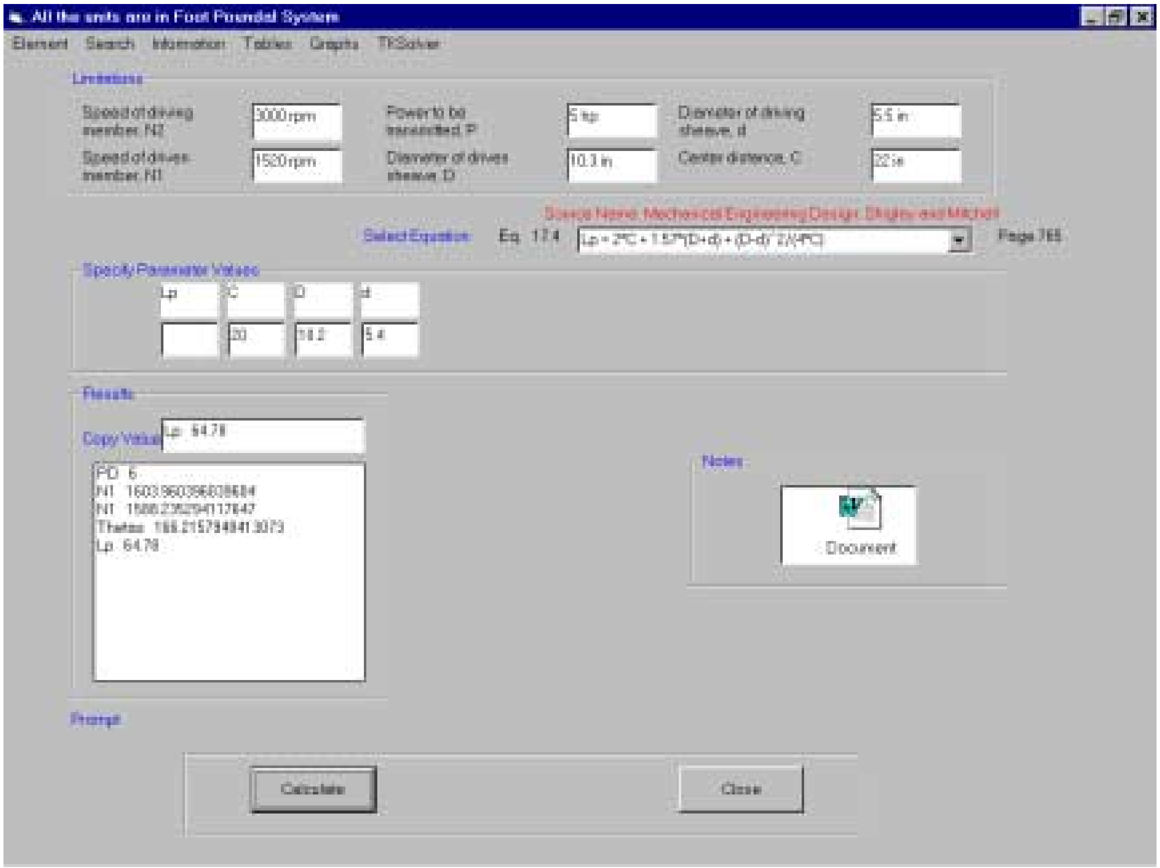
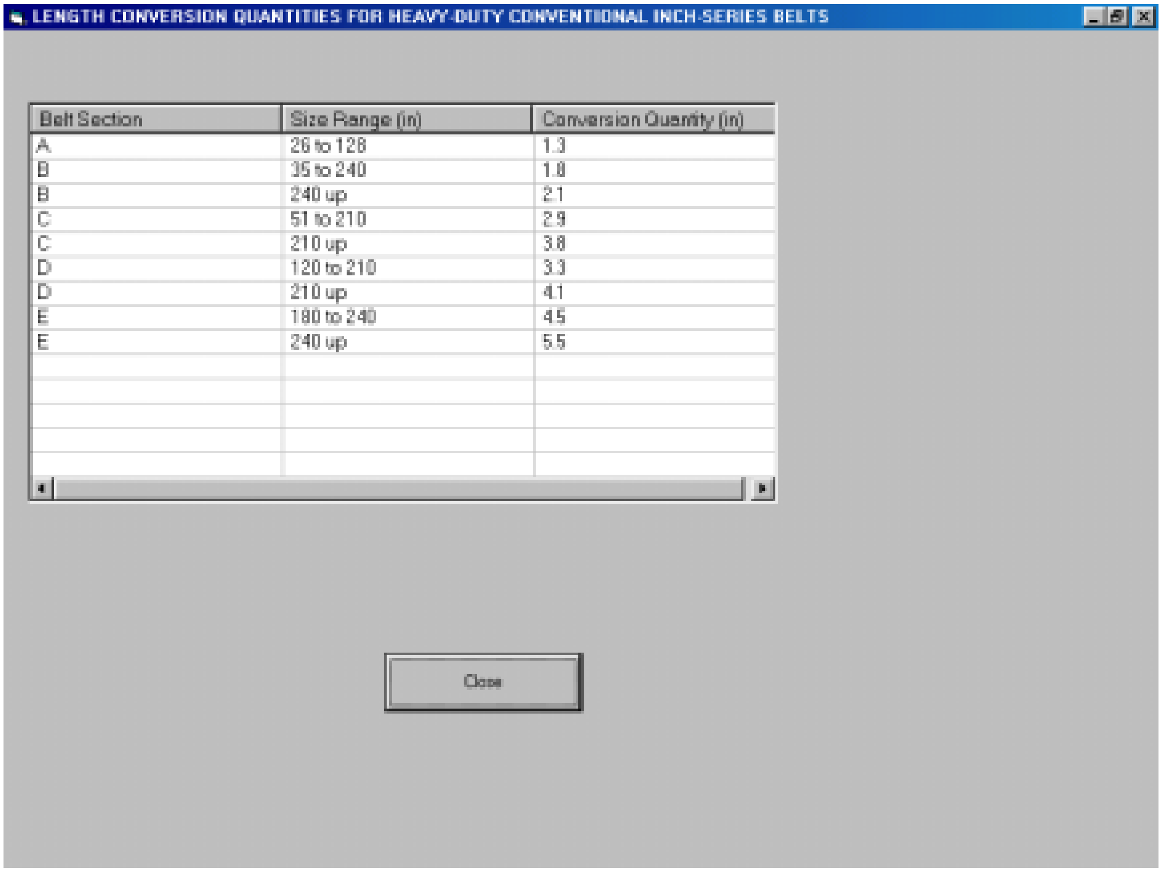


Figure 5.22: Calculation of the pitch length, *Lp*, for the V-belt.

The design now involves standardizing the belt size, for which the inside circumference of the belt needs to be determined and then, the standard needs to be referred, in order to standardize the belt selection. The calculation of the inside circumference of the belt involves the selection of a length conversion quantity based on belt type, by referring to **Table 17-4** as shown in Fig. 5.23.



Belt Section	Size Range (in)	Conversion Quantity (in)
A	26 to 128	1.3
B	35 to 240	1.8
B	240 up	2.1
C	51 to 210	2.9
C	210 up	3.8
D	120 to 210	3.3
D	210 up	4.1
E	180 to 240	4.5
E	240 up	5.5

Figure 5.23: Selection of length conversion quantity from Table 17-4.

For a B type V-belt lying in the range of 35 to 240 inches, the conversion quantity is 1.8 inches. The inside circumference is then calculated using the conversion quantity of 1.8, as shown in Fig. 5.24.

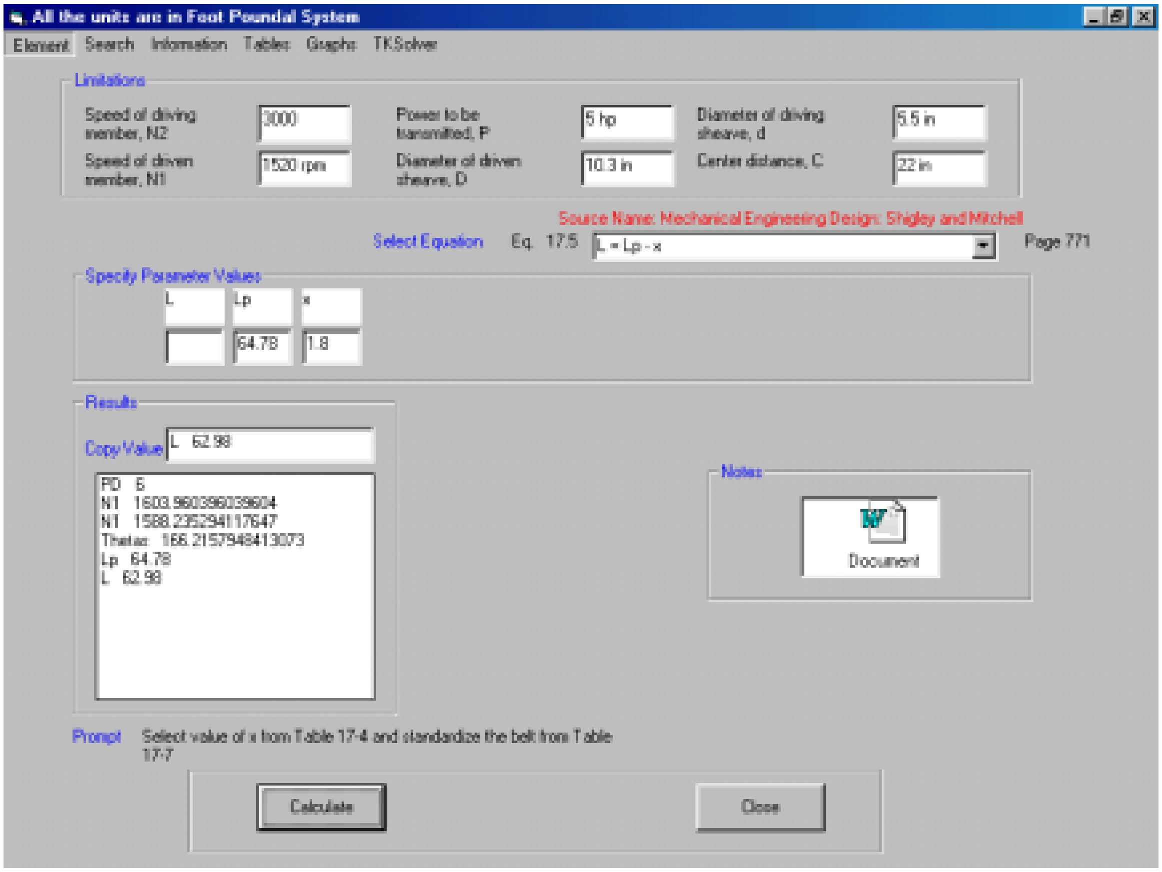
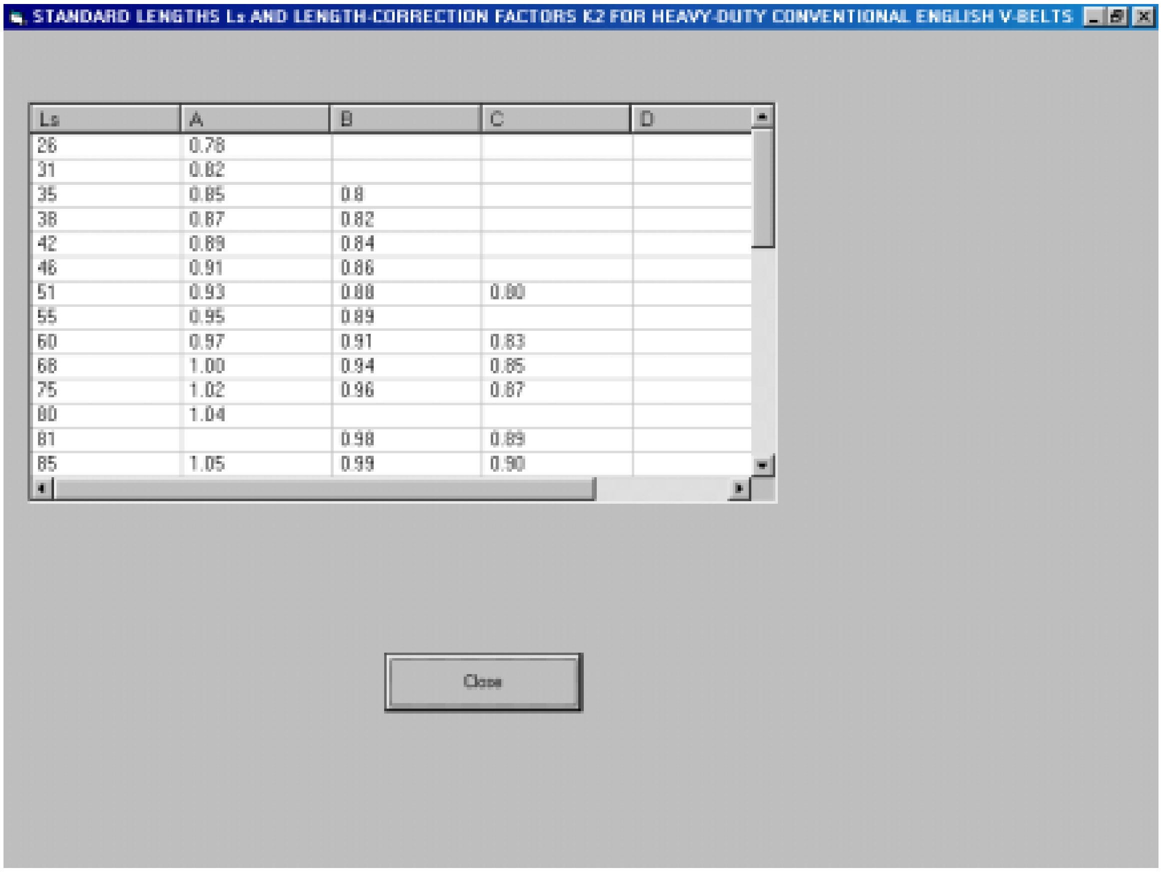


Figure 5.24: Calculation of the inside circumference of the V-belt.

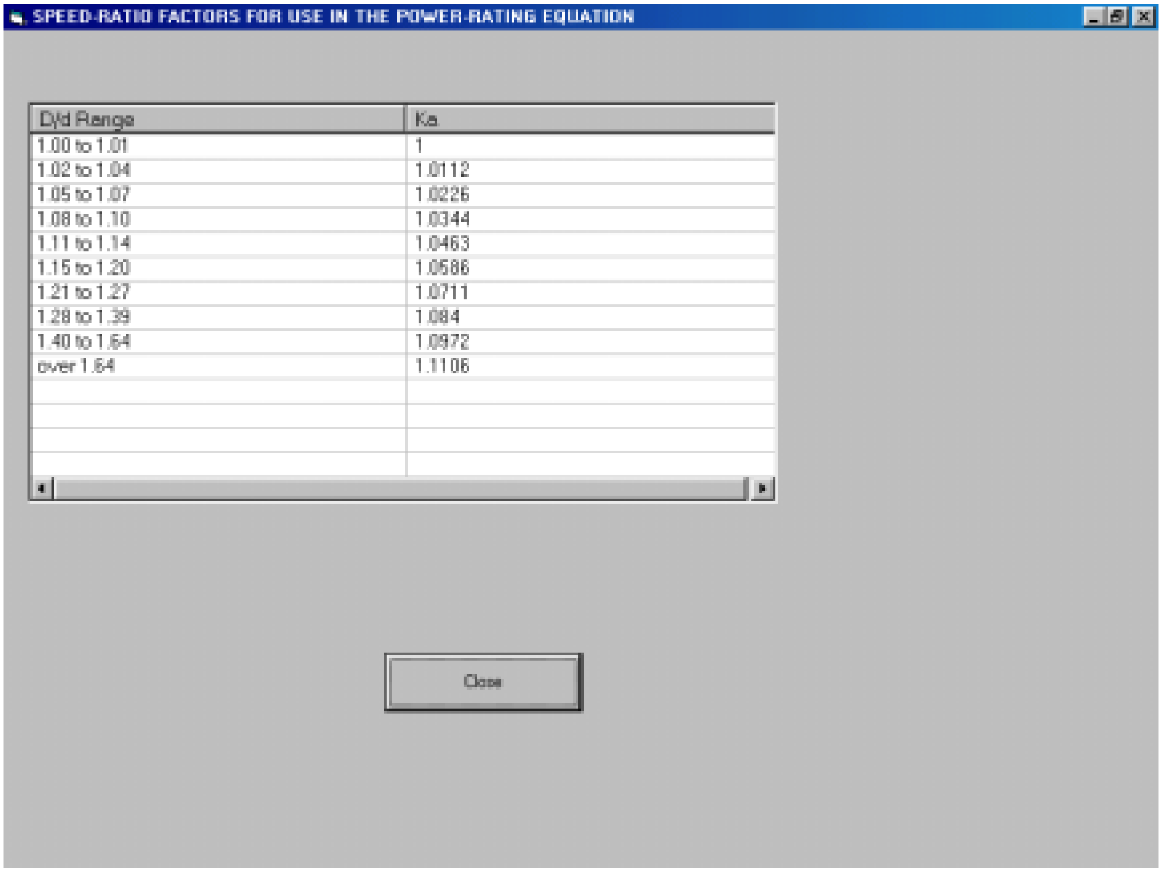
With the value of the inside circumference, thus calculated, the standardization of the belt is carried out by referring **Table 17-7**. As is evident from Fig. 5.25, the nearest standard size is a **B-68**.



Ls	A	B	C	D
26	0.78			
31	0.82			
35	0.85	0.8		
38	0.87	0.82		
42	0.89	0.84		
46	0.91	0.86		
51	0.93	0.88	0.80	
55	0.95	0.89		
60	0.97	0.91	0.83	
68	1.00	0.94	0.85	
75	1.02	0.96	0.87	
80	1.04			
81		0.98	0.89	
85	1.05	0.99	0.90	

Figure 5.25: Table for the standardization of V-belt lengths.

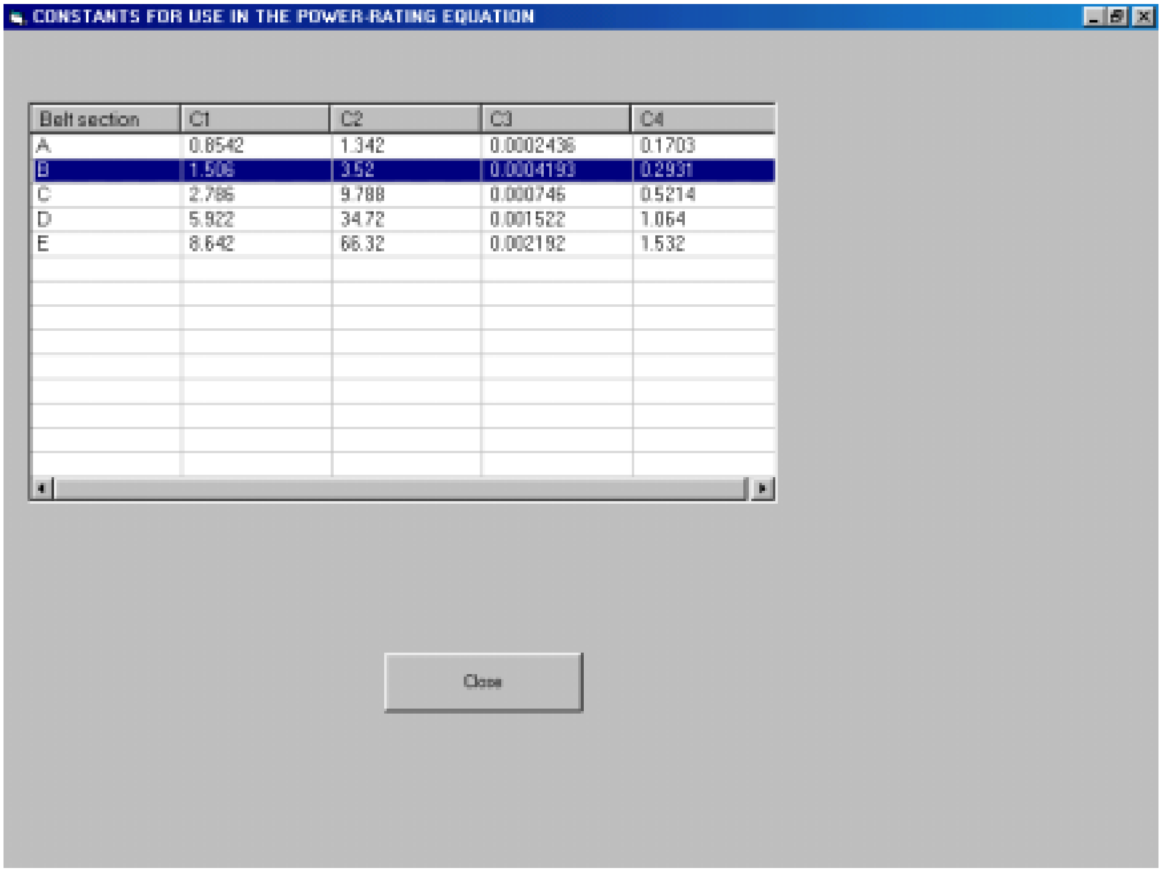
On selecting the next design equation, the designer needs to refer to **Table 17-6** for the specification of the constant, *Ka*, and **Table 17-5** for the values of the design parameters, *C1*, *C2*, *C3* and *C4*. These tables are shown in Fig. 5.26 and Fig. 5.27, respectively.



D/d Range	Ka
1.00 to 1.01	1
1.02 to 1.04	1.0112
1.05 to 1.07	1.0226
1.08 to 1.10	1.0344
1.11 to 1.14	1.0463
1.15 to 1.20	1.0586
1.21 to 1.27	1.0711
1.28 to 1.39	1.084
1.40 to 1.64	1.0972
over 1.64	1.1106

Figure 5.26: The table to be referred for the value of parameter, *Ka*.

As the value of the D/d ratio is over 1.64, the value of design parameter, *Ka,* is fixed as 1.1106.



Belt section	C1	C2	C3	C4
A	0.8542	1.342	0.0002436	0.1703
B	1.506	3.52	0.0004193	0.2931
C	2.786	9.788	0.000746	0.5214
D	5.922	34.72	0.001522	1.064
E	8.642	66.32	0.002192	1.532

Figure 5.27: Table for the selection of parameters *C1*, *C2*, *C3* and *C4*.

The values of the design parameters *C1*, *C2*, *C3* and *C4* are fixed on the basis of the type of V-belt selected. Their respective values are 1.506, 3.52, 0.0004193 and 0.2931,since we have selected a B-Type V-belt.

On substituting the values of *Ka*, *C1*, *C2*, *C3* and *C4*, the power rating can be calculated as shown in Fig. 5.28.

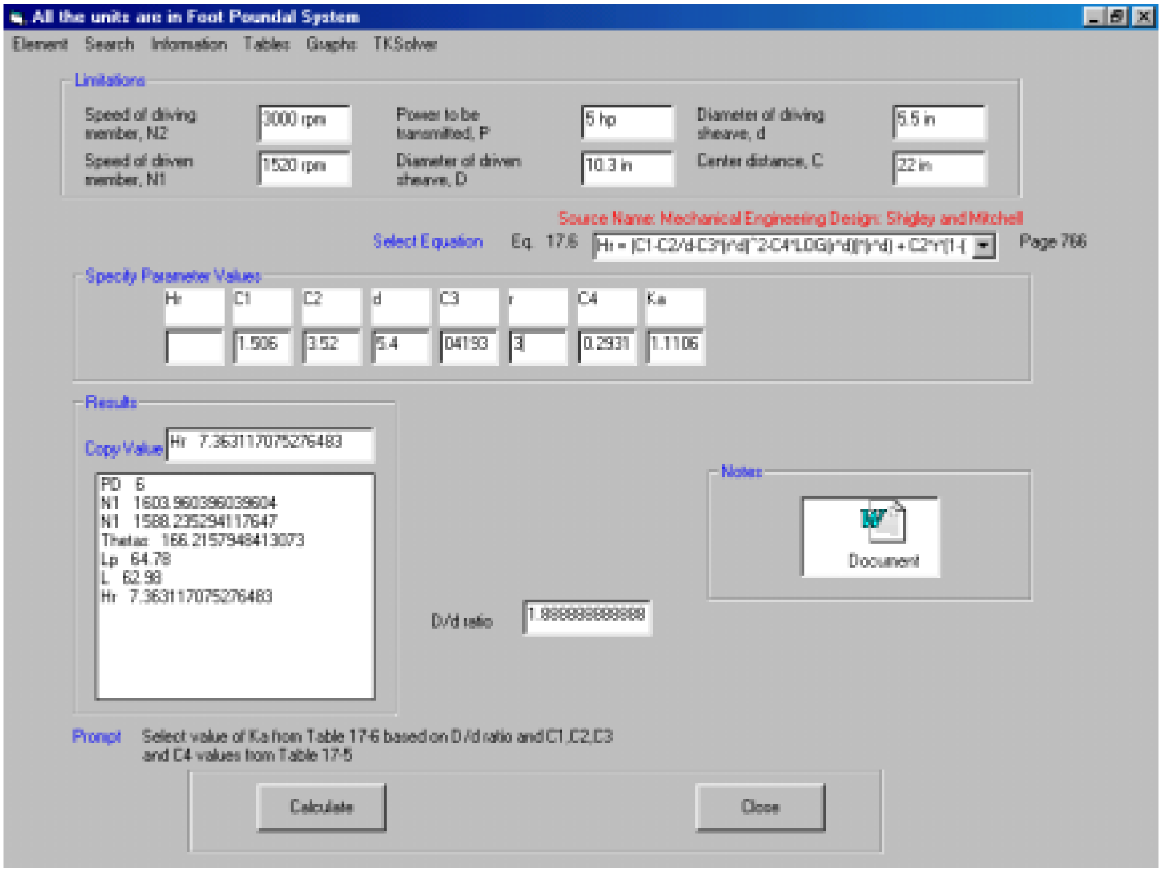


Figure 5.28: The design equation for the calculation of power rating.

As the rating is based on the arc of contact of 180 degrees and an average belt length, it must be corrected using the next design equation as shown in Fig. 5.29.

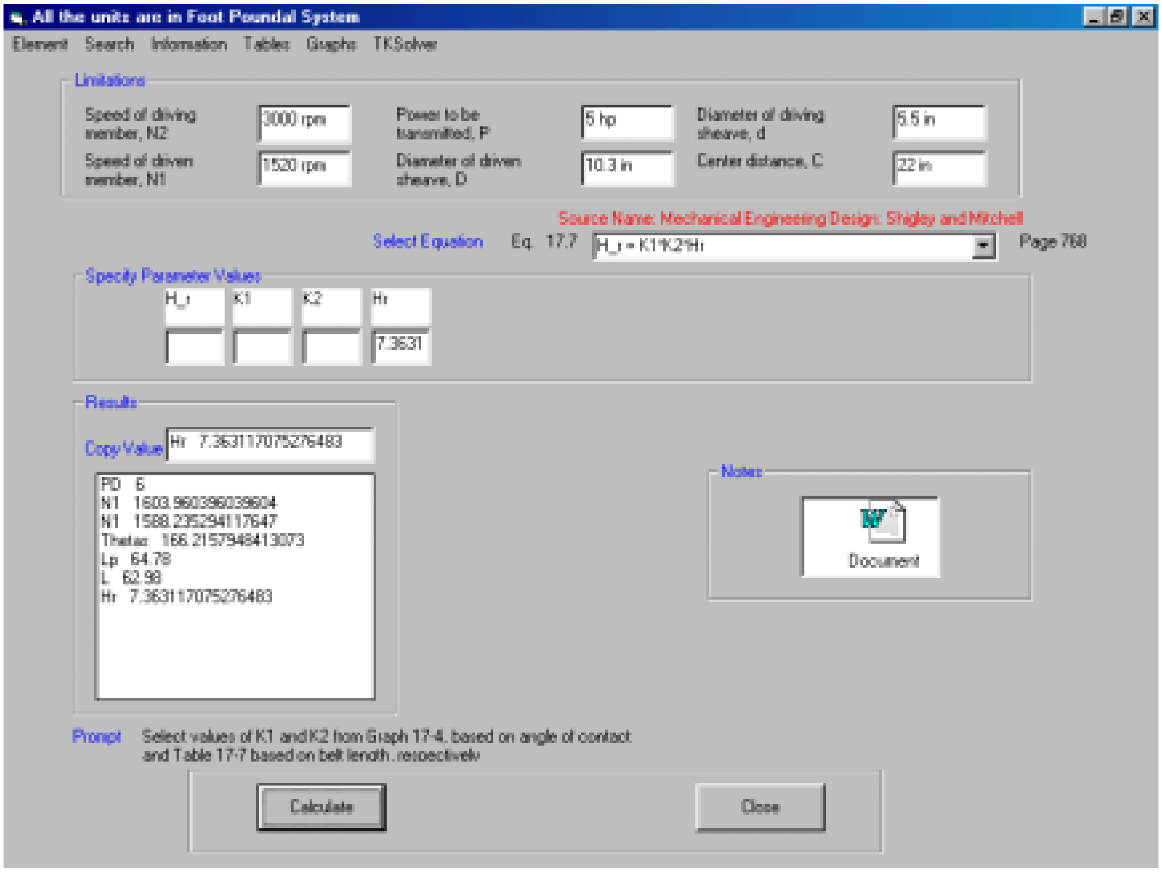


Figure 5.29: The design equation for the correction of the power rating.

In this case, the values of design parameters, *K1* and *K2*, are to be selected from the **Graph** menu by referring **Figure 17-4** and **Table 17-7**, respectively. As can be seen, the value of the angle of contact, *Thetas*, from the screen is 166.21 degrees. Referring to the *V – to –V* pulley curve in **Figure 17-4**, the value of the correction factor *K1* is determined to be 0.98. The graph is as shown in Fig. 5.30. The value of length correction factor *K2* is selected from **Table 17-7** to be 0.94, based on the selected standard belt being **B-68**, as shown in Fig. 5.31.

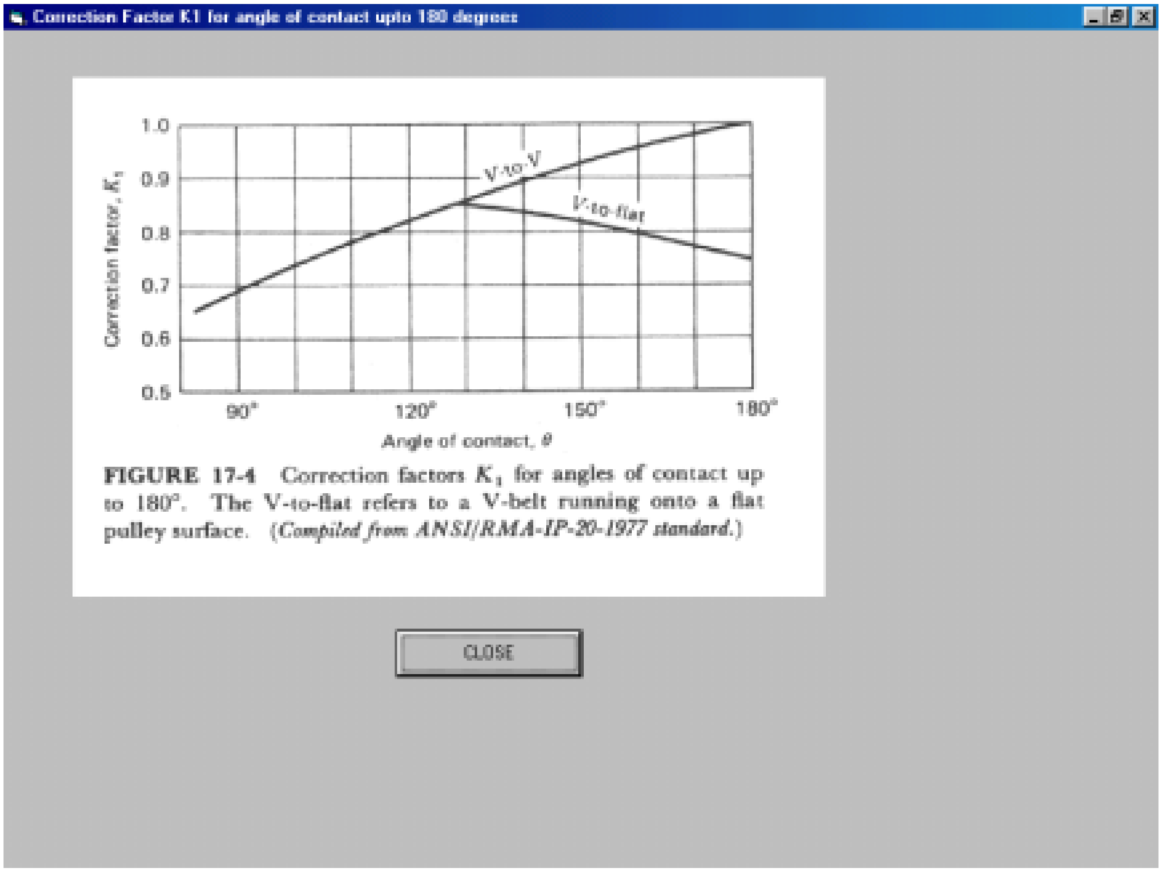
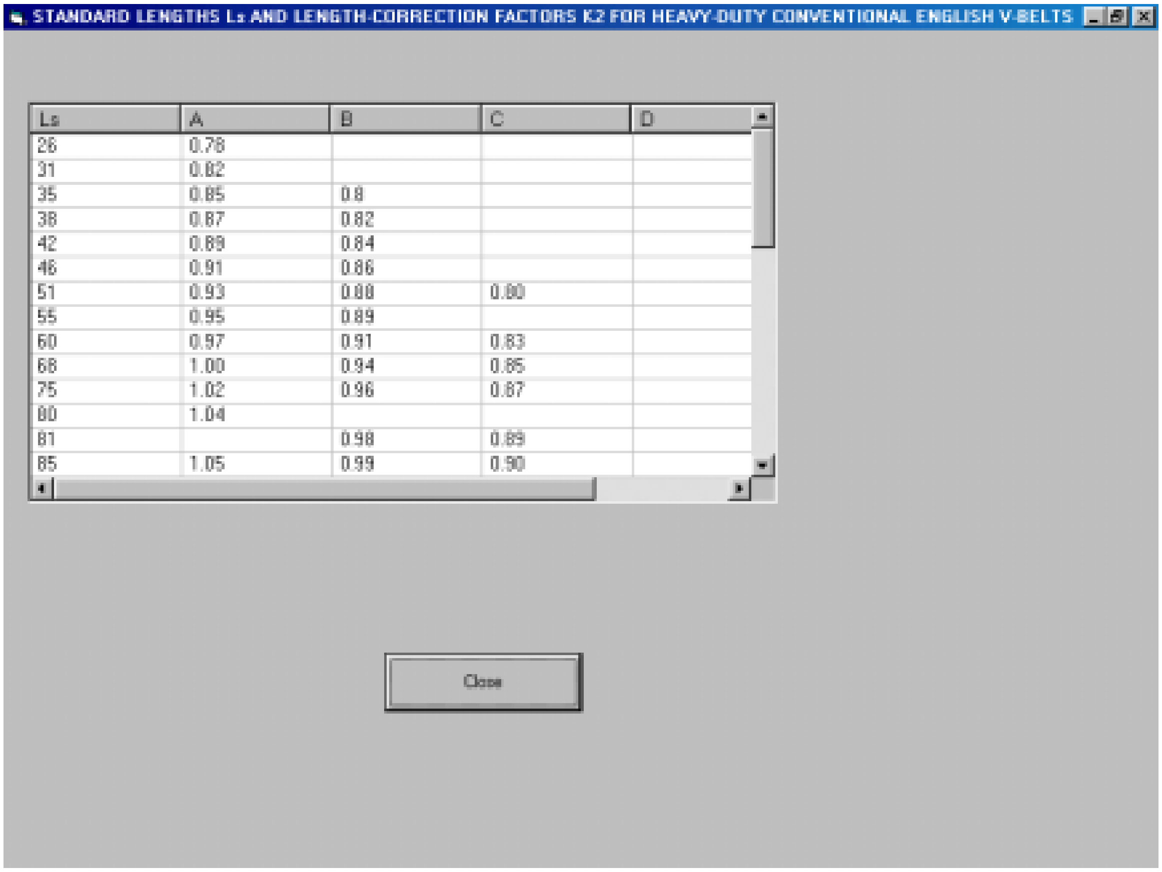


Figure 5.30: Graph to be referred for the value of correction factor, *K1*.



Ls	A	B	C	D
26	0.78			
31	0.82			
35	0.85	0.8		
38	0.87	0.82		
42	0.89	0.84		
46	0.91	0.86		
51	0.93	0.88	0.80	
55	0.95	0.89		
60	0.97	0.91	0.83	
68	1.00	0.94	0.85	
75	1.02	0.96	0.87	
80	1.04			
81		0.98	0.89	
85	1.05	0.99	0.90	

Figure 5.31: The table for the selection of Length Correction factor, *K2*.

The resultant value for the corrected power rating is 6.78 hp, as shown in Fig. 5.32.

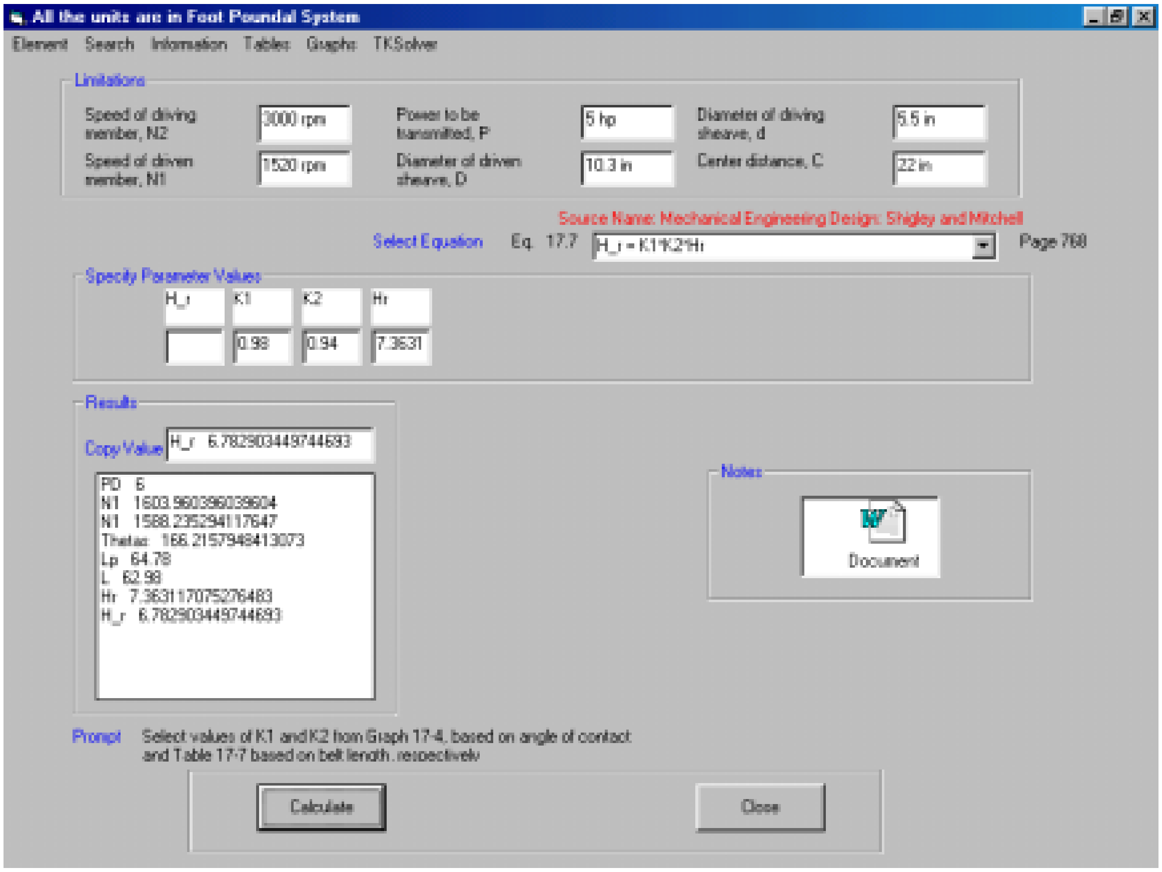


Figure 5.32: The corrected power rating for the V-belt drive.

Once the corrected power rating has been determined, the belt speed needs to be calculated. The calculated value for the belt speed, using the specifications of the driving sheave, is shown in Fig. 5.33.

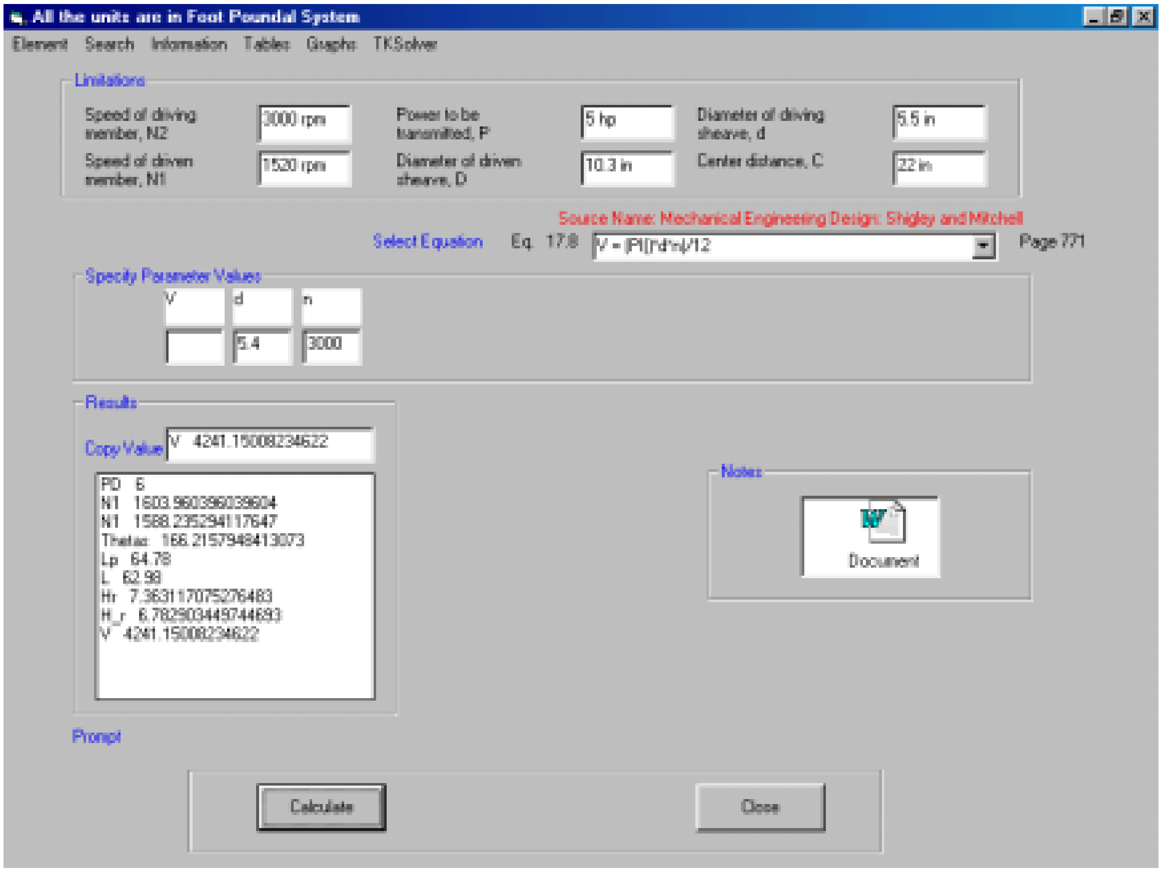


Figure 5.33: The calculated value of belt speed.

The number of belts required for the drive can now be calculated using the next design equation. As the input design parameters have already been calculated earlier, the corresponding values are displayed and the number of belts required for the test case can be calculated. The result is shown in Fig. 5.34.

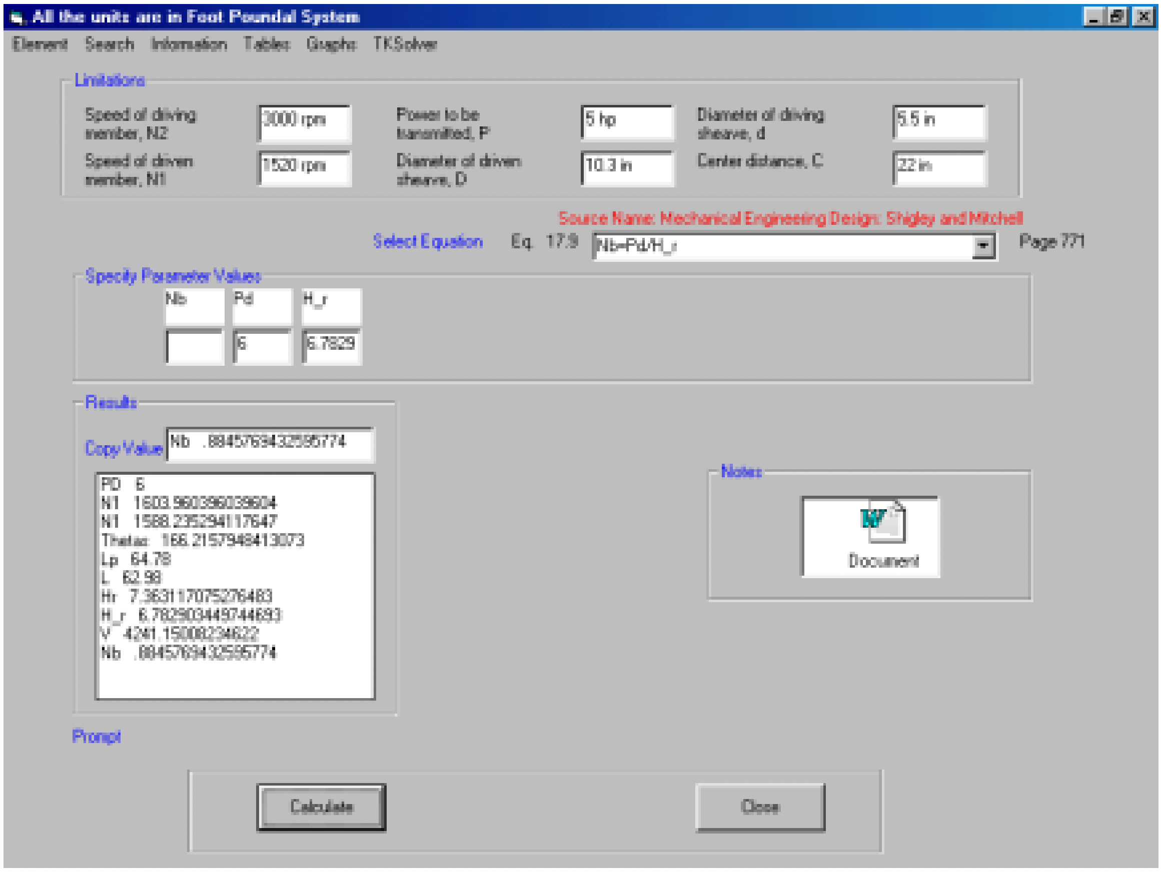


Figure 5.34: The calculation for the number of belts required for the V-belt drive.

This completes the design process for the belt drive. The various iterations involved can be seen in the *Results* section.

Now that the design parameters have been finalized the designer can select the optimal design parameter values and save the final design parameter values to document the design. This is accomplished by clicking on the icon in the *Notes* section. This opens a Microsoft® Word 97 document as shown in Fig. 5.35.

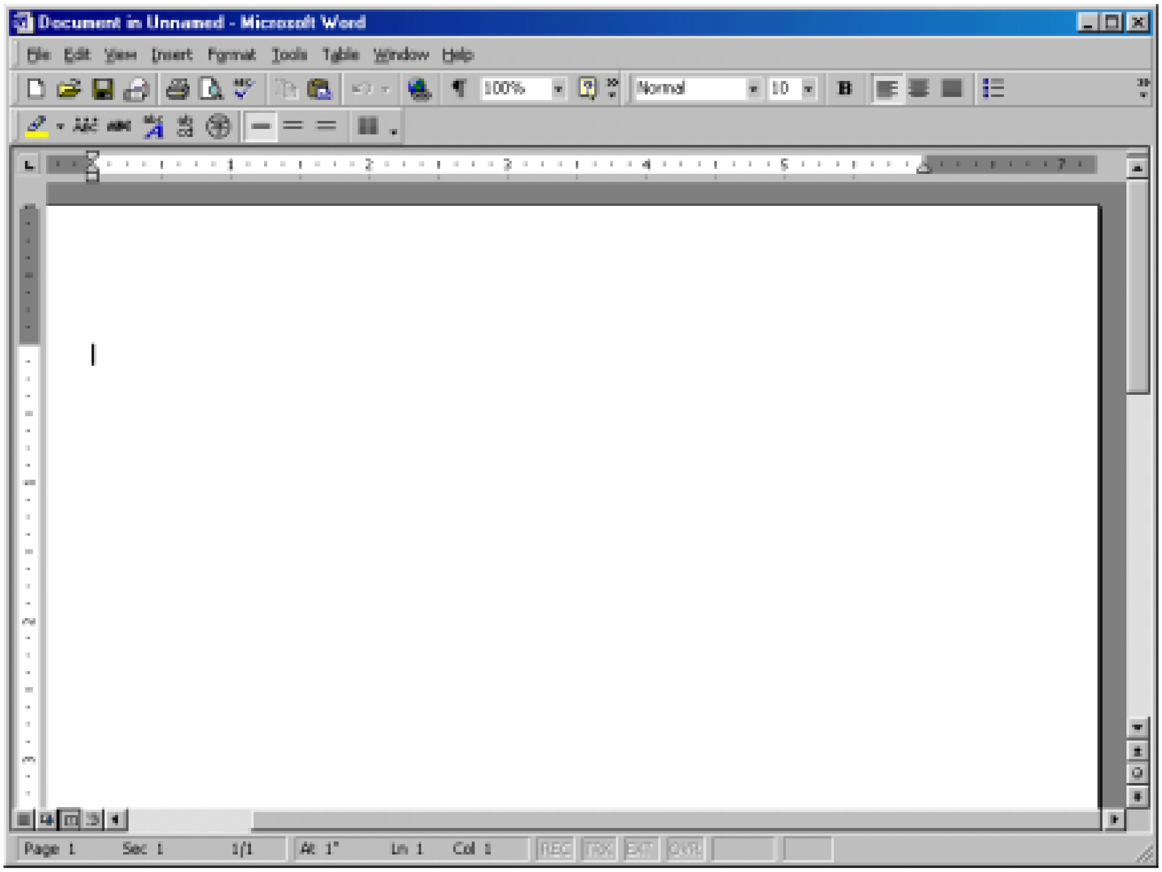


Figure 5.35: The documentation of the design can be done in a Microsoft® Word 97 document.

As can be seen, all the features offered by Microsoft® Word 97 are now at the designer's disposal to document and format the design. The designer can further switch between the main application and the Microsoft® Word 97 application by using the *Alt* and *Tab* keys of the keyboard in conjunction. On clicking on a design parameter of choice in the *Results* section, the design parameter is transferred into the *Copy Value* box. The designer can then highlight the contents in the *Copy Value* box, to transfer the contents to the design document, by using the standard Windows commands such as *Ctrl-C* to copy from the main screen and *Ctrl-V* to paste the selected design parameter into the design document. The transfer of the design parameter is shown for the third calculated design parameter in Fig. 5.36.

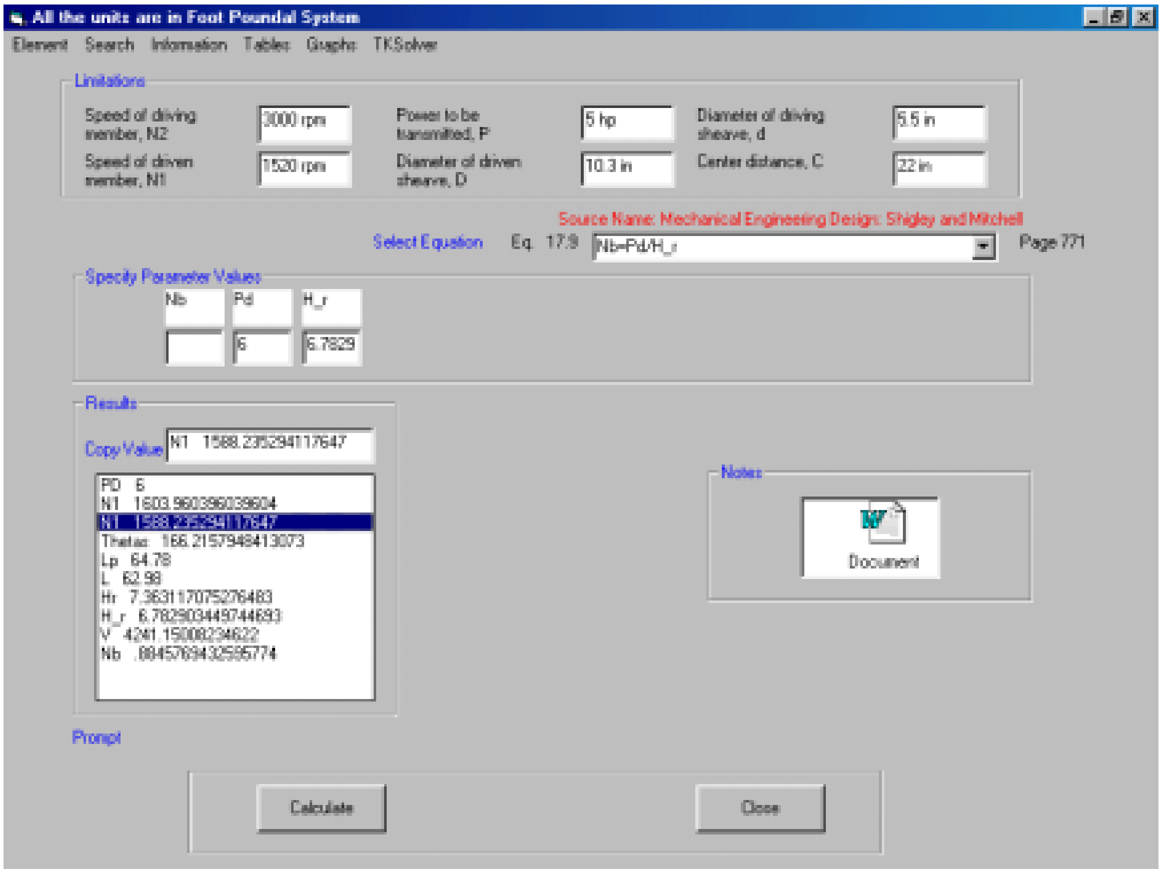


Figure 5.36: The transfer of the selected design parameter value into the *Copy Value* box on clicking a particular design parameter.

The contents of this box can then be transferred to the design document by highlighting the contents and pressing *Ctrl-C* on the keyboard. Use *Alt-Tab* to switch to the Microsoft® Word 97 application, and then press *Ctrl-V* on the keyboard to paste the contents into the design document. This process is shown in Fig. 5.37 and Fig. 5.38.

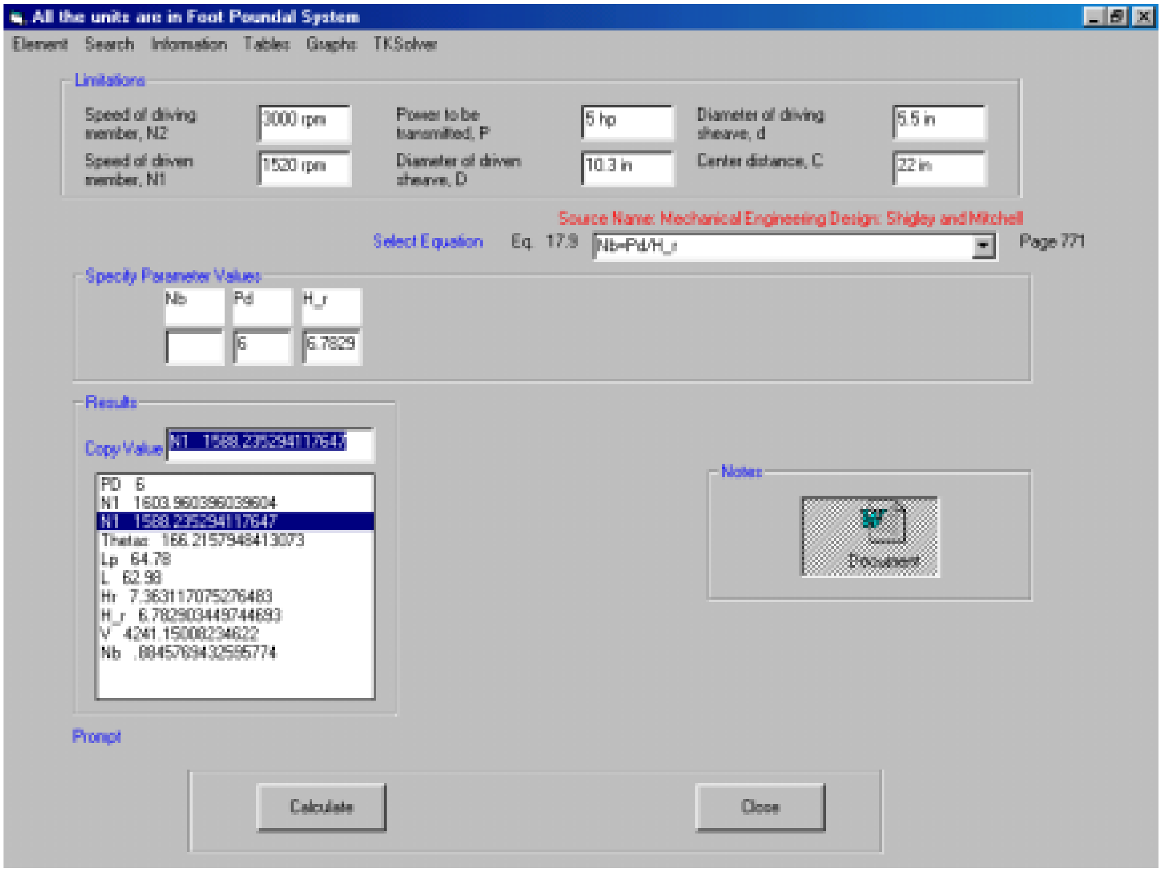


Figure 5.37: The highlighting of the design parameter value in the *Copy Value* box.

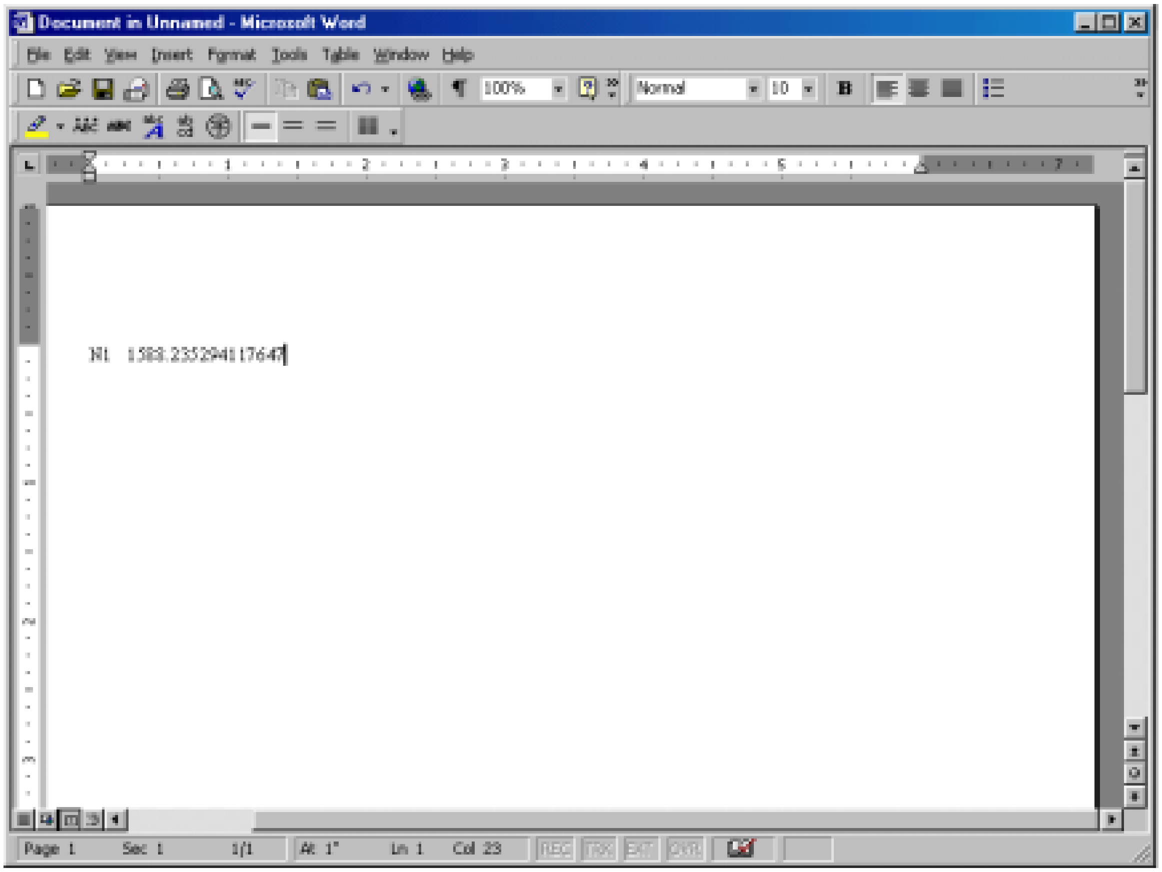


Figure 5.38: The transfer of contents from the Main screen to the design document.

On transferring all the required design parameters from the Main screen to the design document, the designer can add notes regarding the design procedure and finally, save the document to any destination on the desktop by using the *File> Save* command utility of the Microsoft® Word 97 application.

The designer can also observe the change in design parameters in a design equation by using the plotting utility provided by TKSolver. TKSolver can be instantiated by clicking on the *Open TKSolver* menu button shown in Fig. 5.39.

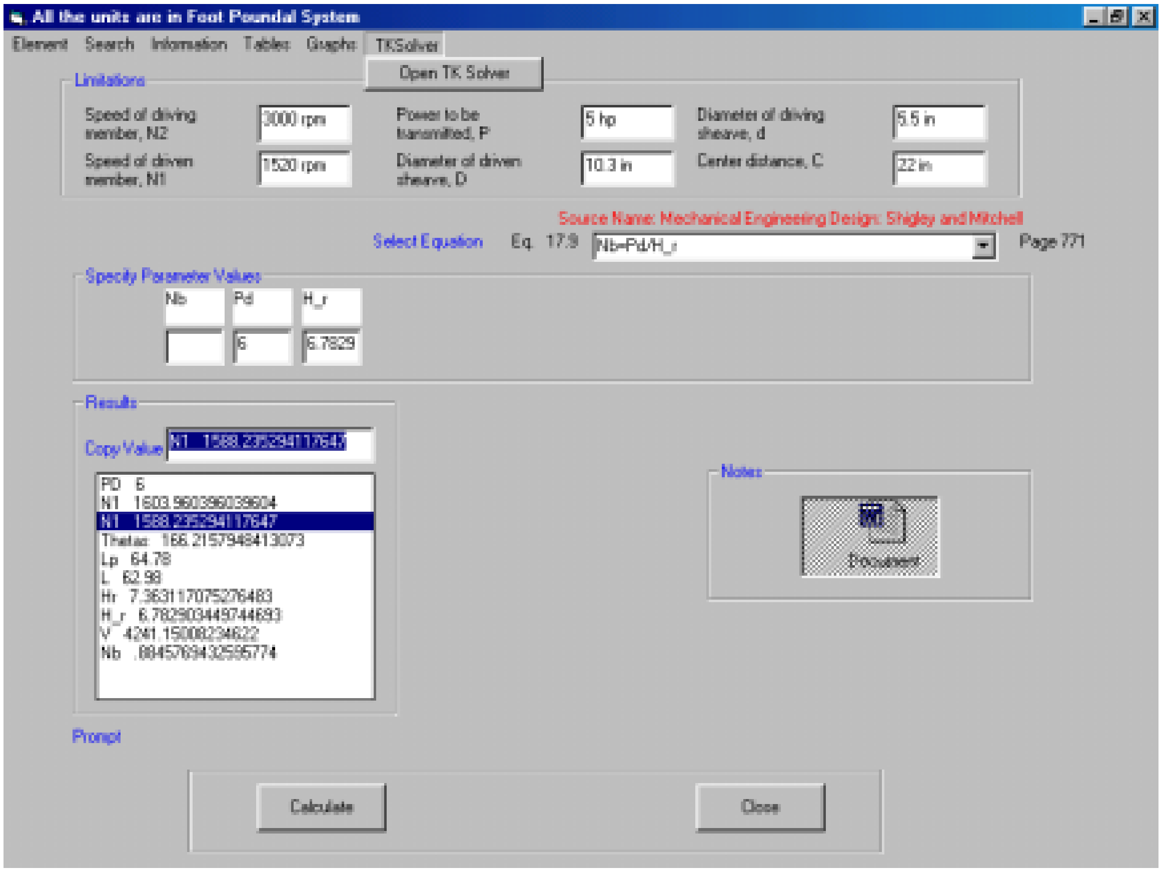


Figure 5.39: TKSolver can be instantiated by clicking the *Open TKSolver* menu item.

The interface for TKSolver is as shown in Fig. 5.40 and is similar to that of a spreadsheet. The designer can enter the design equation of his choice in the Rule sheet.

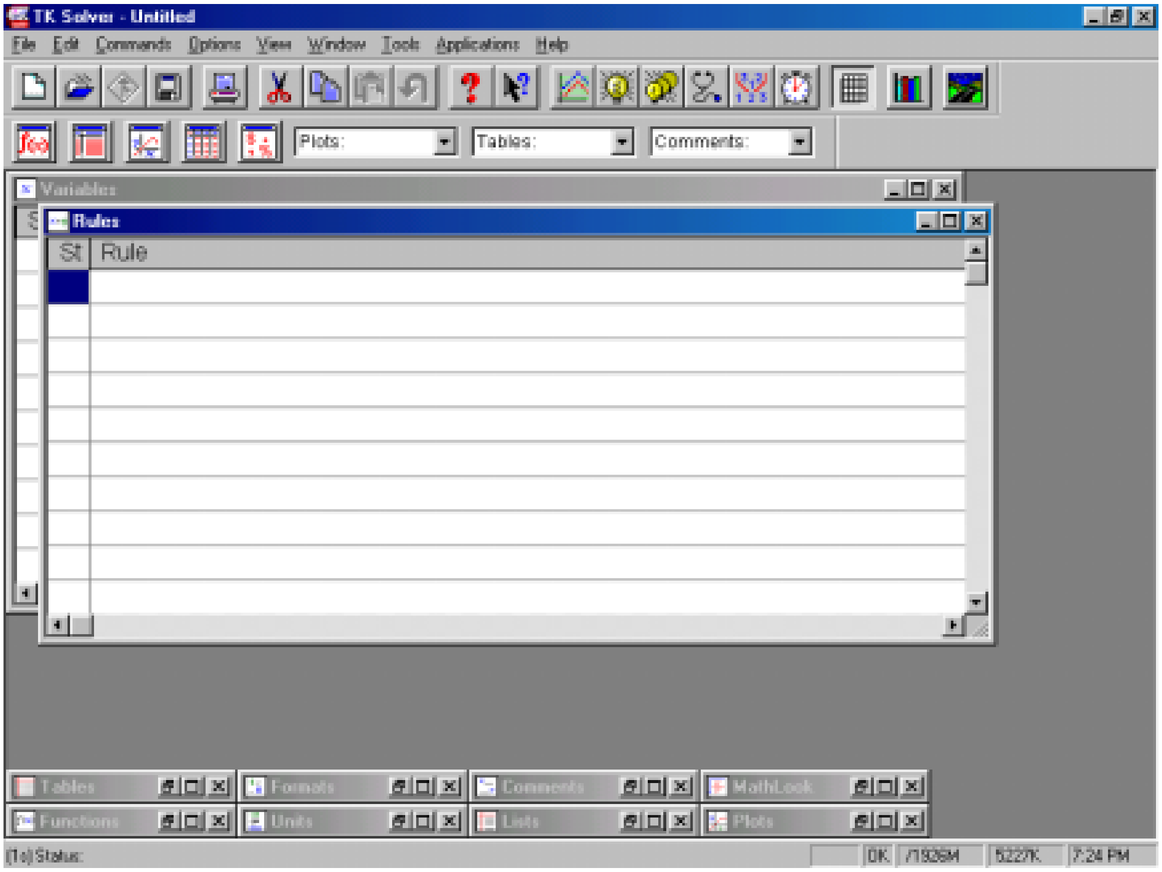


Figure 5.40: The user interface for TKSolver.

The designer can enter a rule of his choice in the Rule column or open any pre-existing equation model. Let us consider the model of Equation 17.3. One can open this equation model by navigating to the “Machine Element Folder” on the desktop using the *File>Open* utility of TKSolver.

Switch to the variable sheet by clicking on the window. Let us consider the case wherein the sheave diameters are fixed and the designer wants to check how the variation in center distance, *C*, affects the angle of contact, *Thetas*, of the V-belt over the sheave.

The values finalized for the diameter of the driven sheave, *D*, and diameter of the driving sheave, *d*, are present in the *Input* section of the Variable sheet. Since, 'C' is the independent design parameter, a test value should be entered in the *Input* section to indicate it. Also, insert '***L***' in the Status field for both *C* and *Thetas*, since a list of values need to be generated for both the dependent and independent design parameters. All the above inputs can be seen in Fig. 5.41.

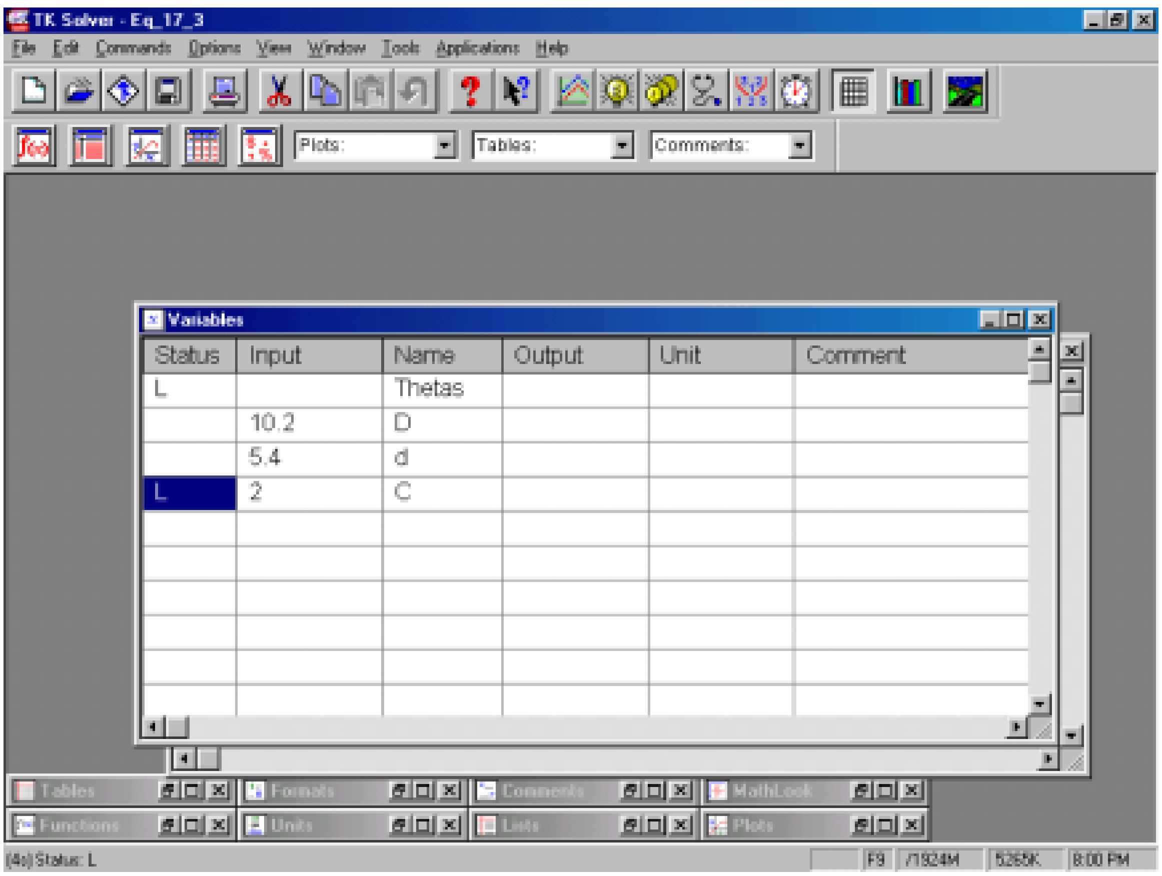


Figure 5.41: The Variable sheet after entering the design parameter values.

In order to fill the input list, place the cursor on the independent variable *C* and select the *List Fill…* option on the **Command** menu. The *List Fill* window presents the designer with the options as shown in the Fig. 5.42.

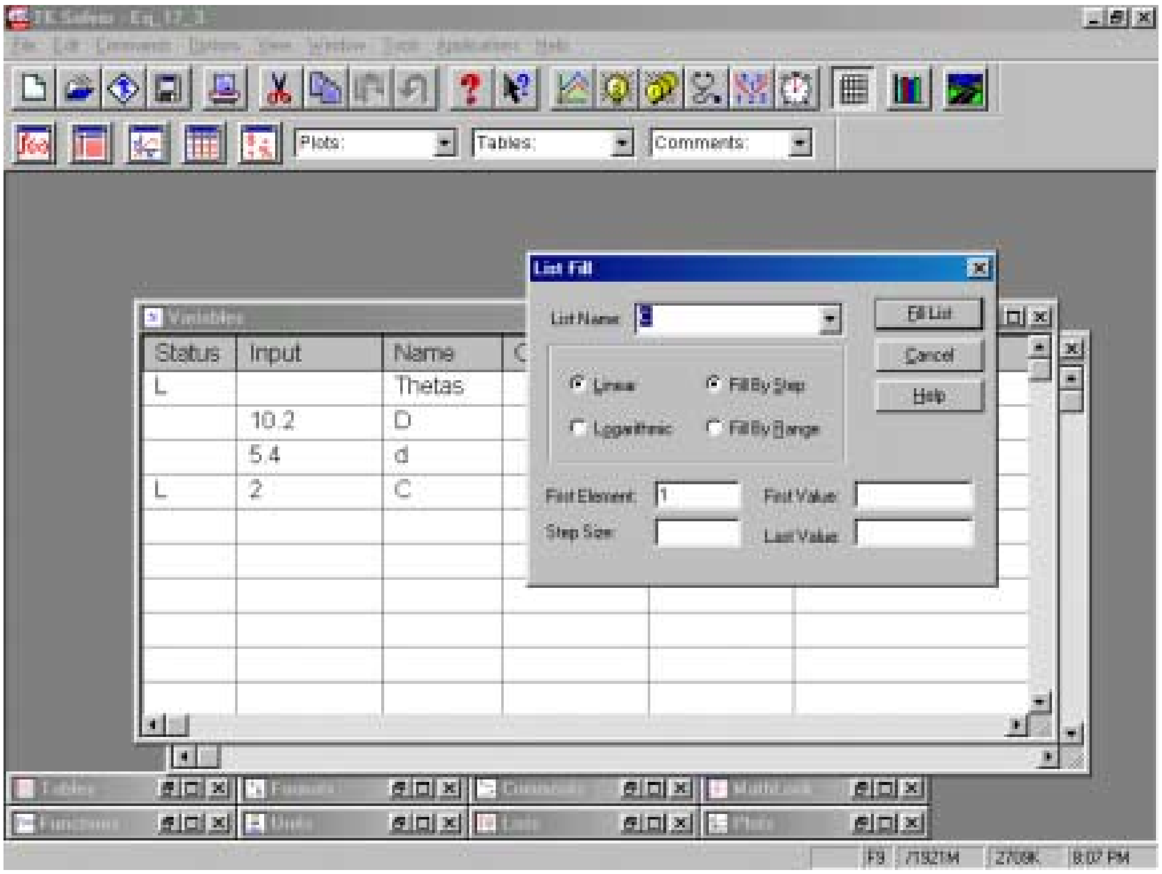


Figure 5.42: The List Fill Window.

There are four ways to fill a list. Let the selection made be Linear, Fill by Step. Fill in the boxes in the List Fill dialog box as shown in Fig. 5.43.

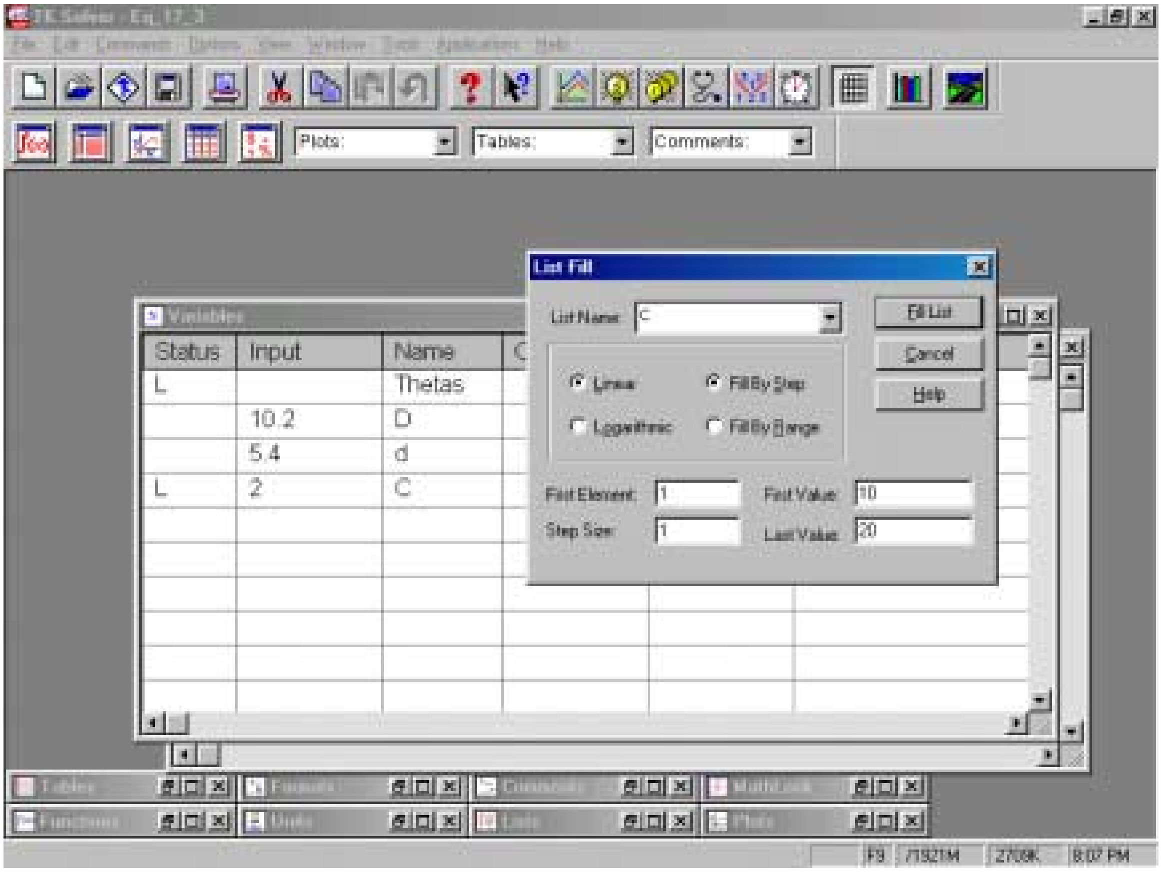


Figure 5.43: The dialog box for List Fill.

Finally, select *Fill List* in the dialog box. We see that *C* now has 11 elements according to the *Element* field on the List sheet. Place the right mouse button on *C* on the List sheet and click the right mouse button once to display the data as shown in Fig. 5.44.

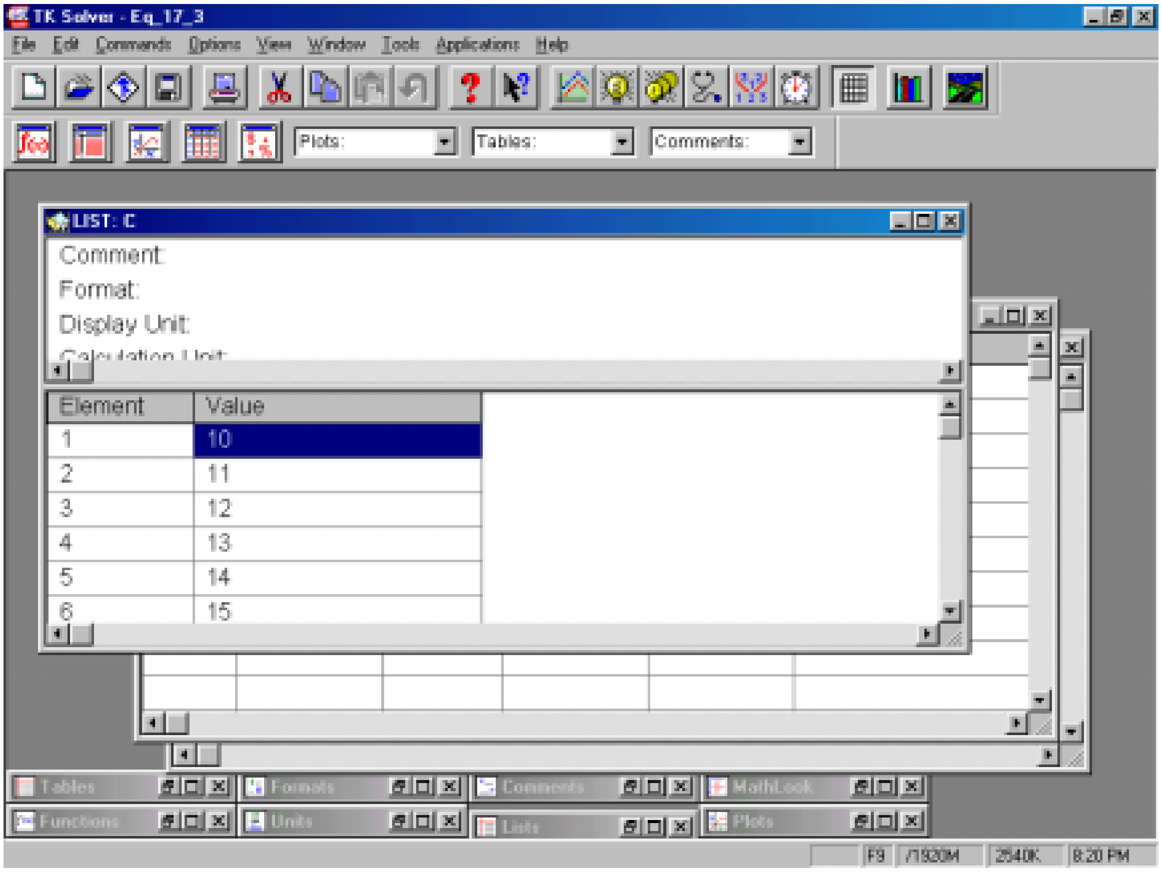


Figure 5.44: First six elements of the *C* list.

The *C* list is now full and the corresponding values for *Thetas* need to be calculated. The design equation provides the linkage between the design parameters. The values for the dependent design parameter, *Thetas*, can be generated by pressing **F10** (or the List solve button on the tool bar) to invoke list solving. Thus, the corresponding calculated values for *Thetas* can be viewed by following the same procedure of placing the right mouse button on *Thetas* on the List sheet and right clicking as shown in Fig. 5.45.

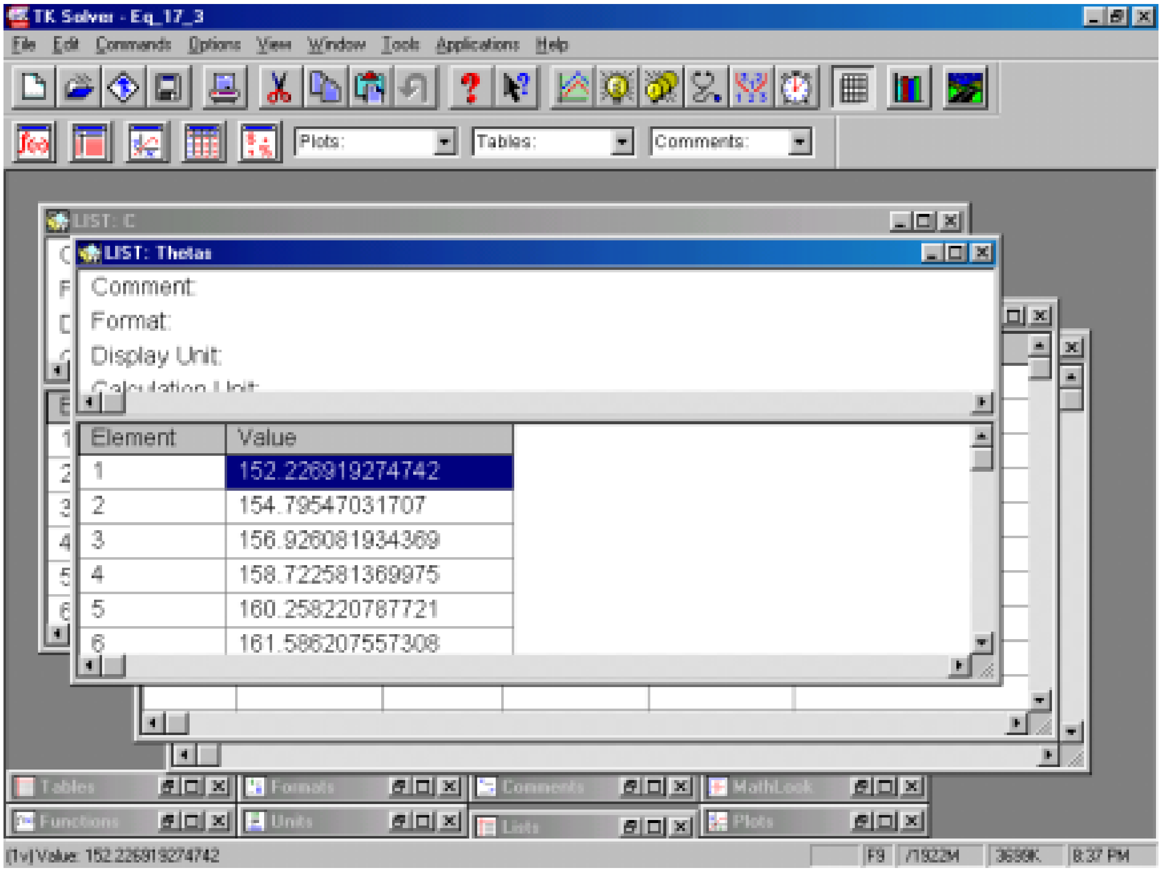


Fig. 5.45: The first six calculated values of *Thetas*.

Now, a table of data needs to be created containing the list values of both the design parameters. Click on the Table sheet and fill the Name and Title section as shown in Fig. 5.46.

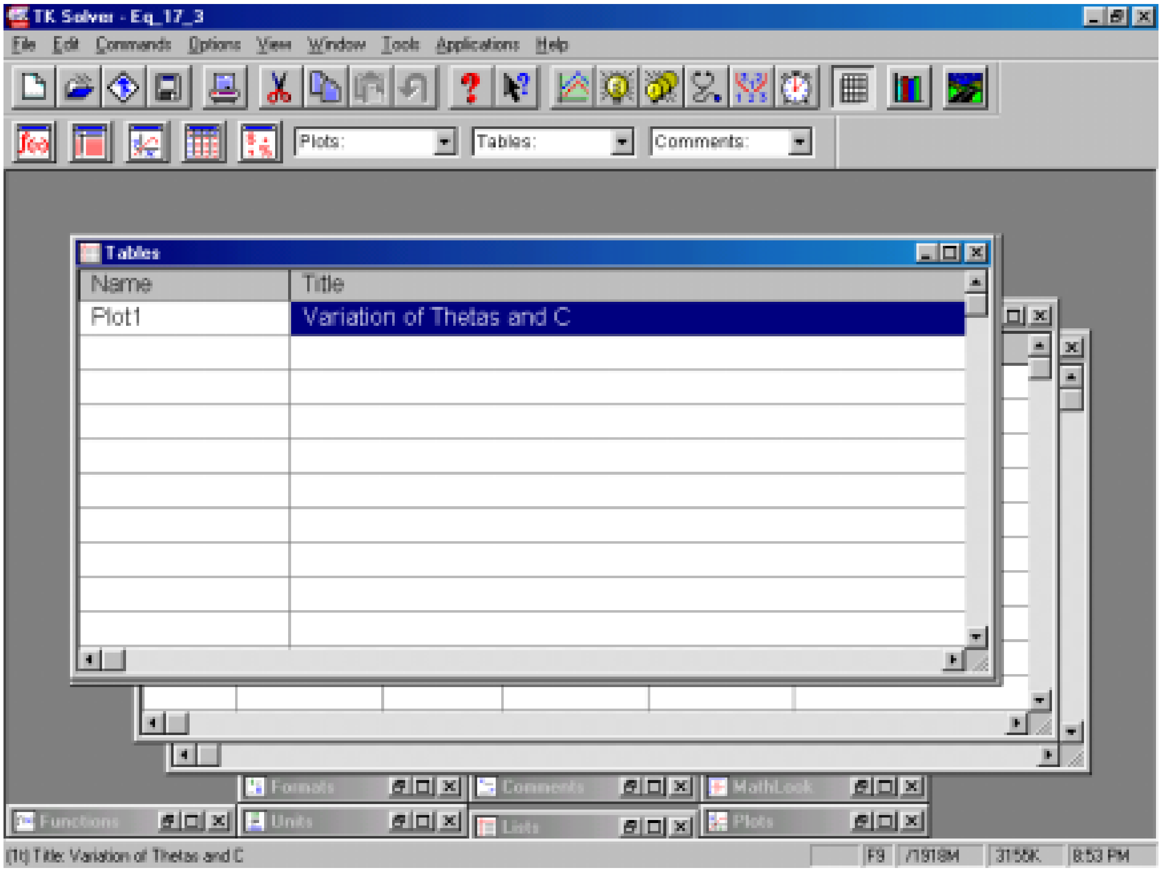


Figure 5.46: The Table sheet.

Further, on right clicking on the Name, *Plot1*, we can specify the lists that make up the data set for the table. Enter the name of the two lists *Thetas* and *C*, as shown in Fig. 5.47.

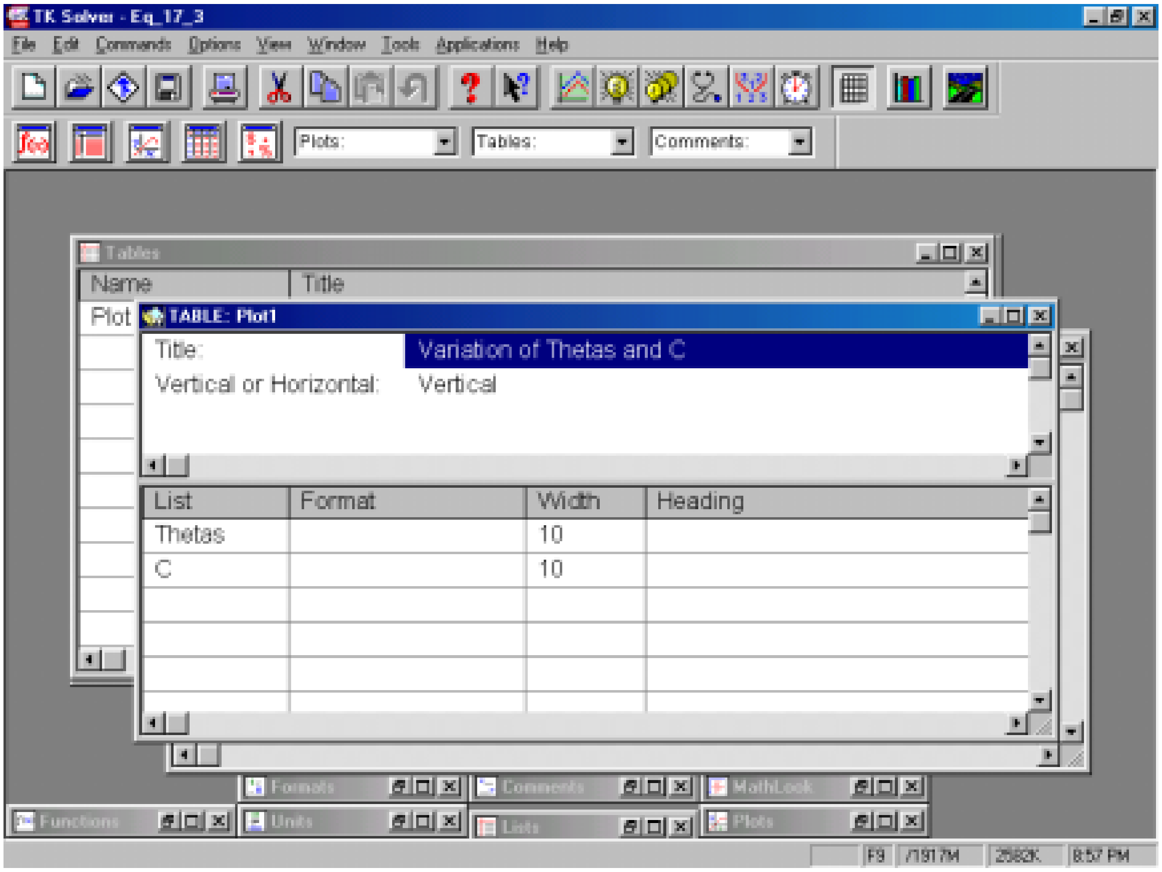


Figure 5.47: The names of the lists comprising the Table.

Now that the table containing values for both the dependent and independent design parameters has been created, the designer can create the plot by clicking on the *Plot Wizard* on the **Tools** menu. The *Plot Wizard* is as shown in Fig. 5.48.

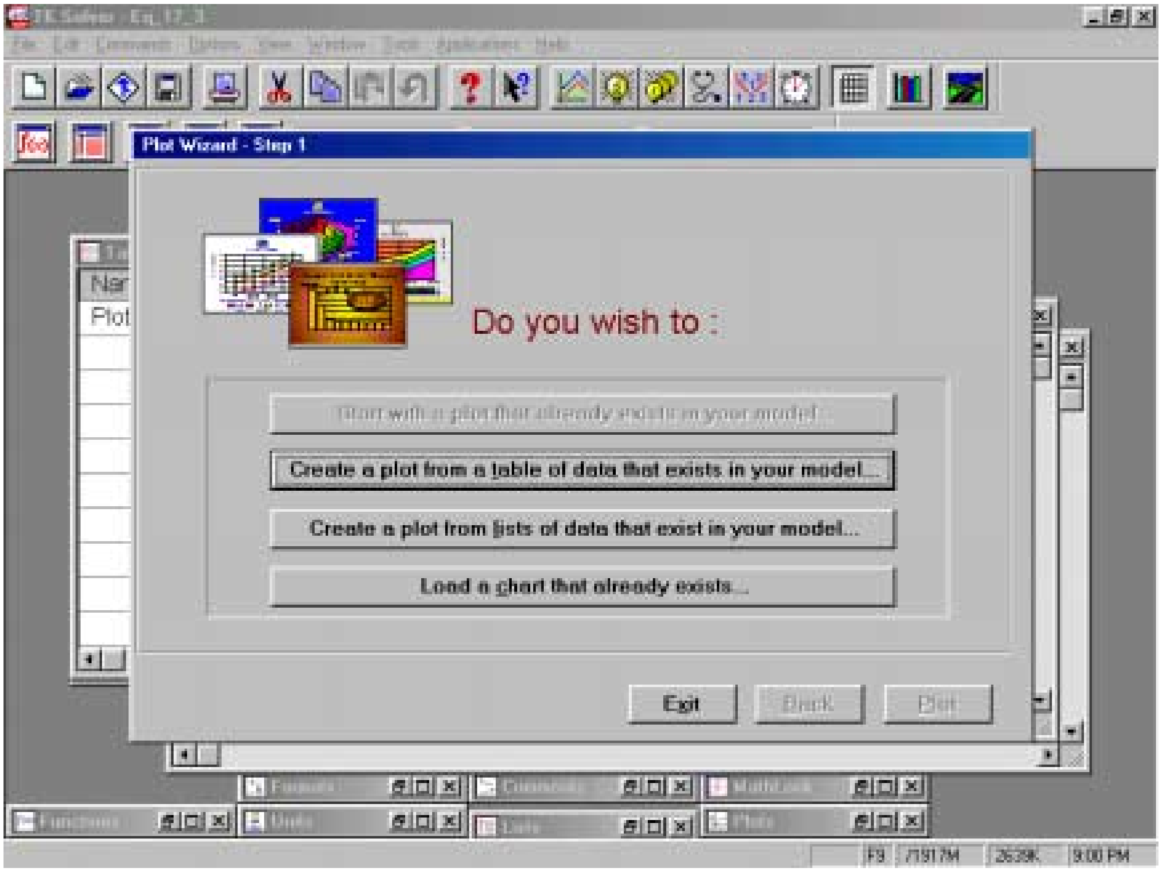


Figure 5.48: The Plot Wizard in TKSolver.

Choose the option *Create a plot from a table of data that exists in your model...* as shown in Fig. 5.49.

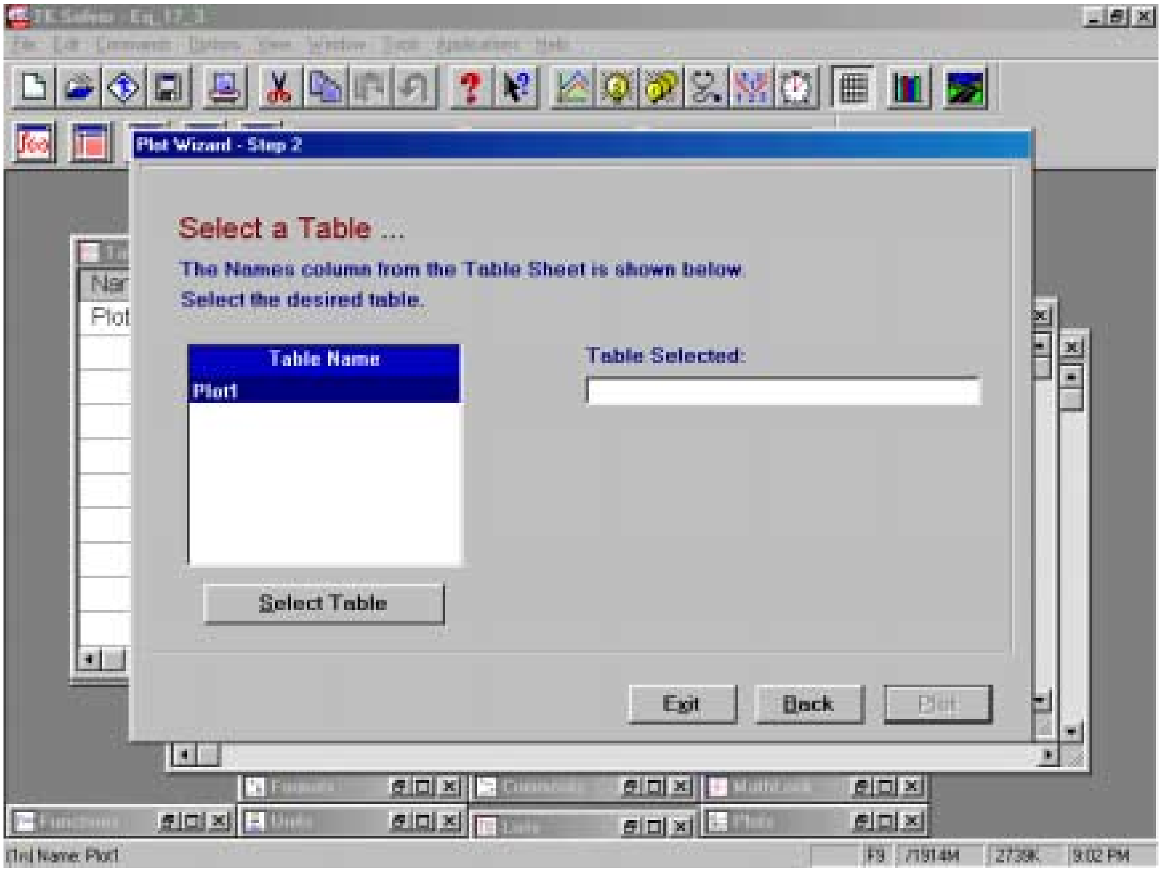


Fig. 5.49: The window for selecting the table in the Plot Wizard.

If more than one table existed, the designer would have to highlight the table by clicking on it and then select the *Select Table* button. As this model consists of only one table, *Plot1*, the table can be selected by clicking the *Select Table* button as shown in Fig. 5.50.

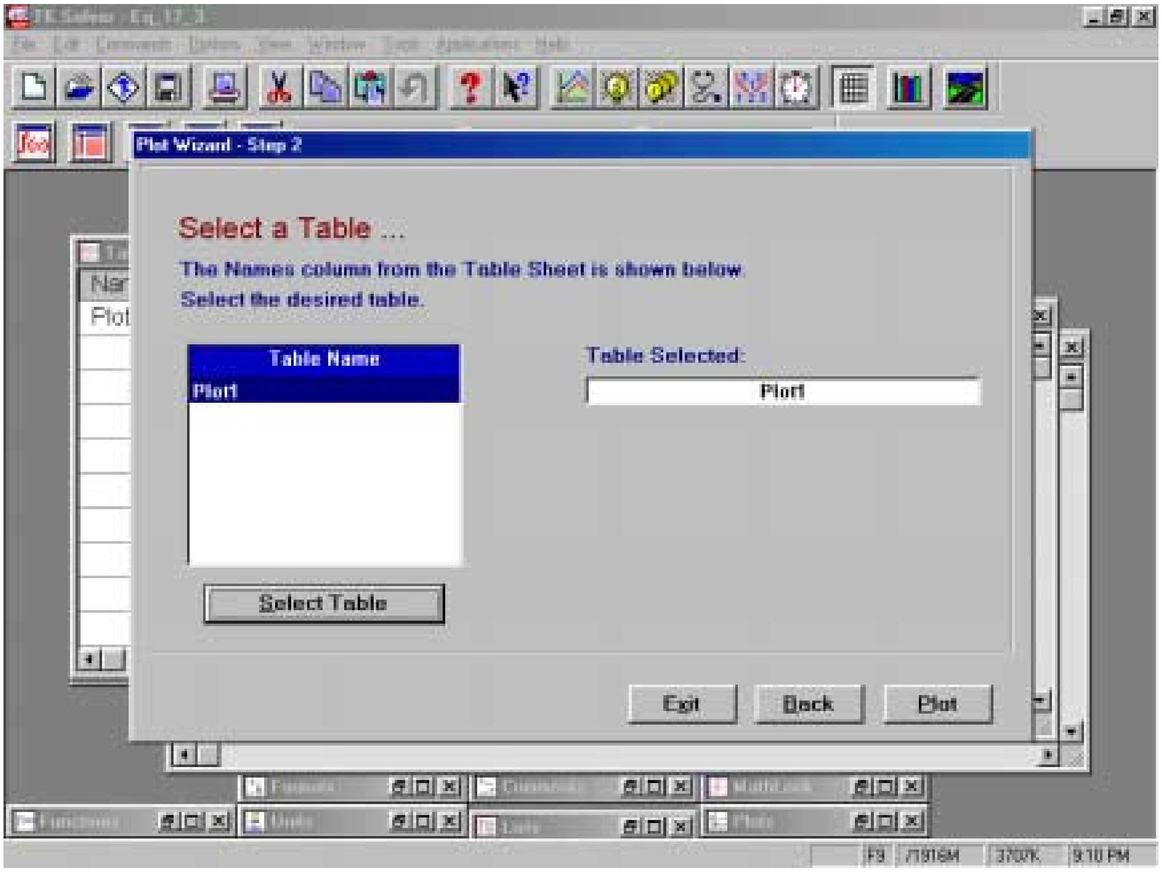


Figure 5.50: The selection of the table to plot.

Now, the *Plot* button can be clicked to give a selection of the various options for plotting the data as shown in Fig. 5.51.

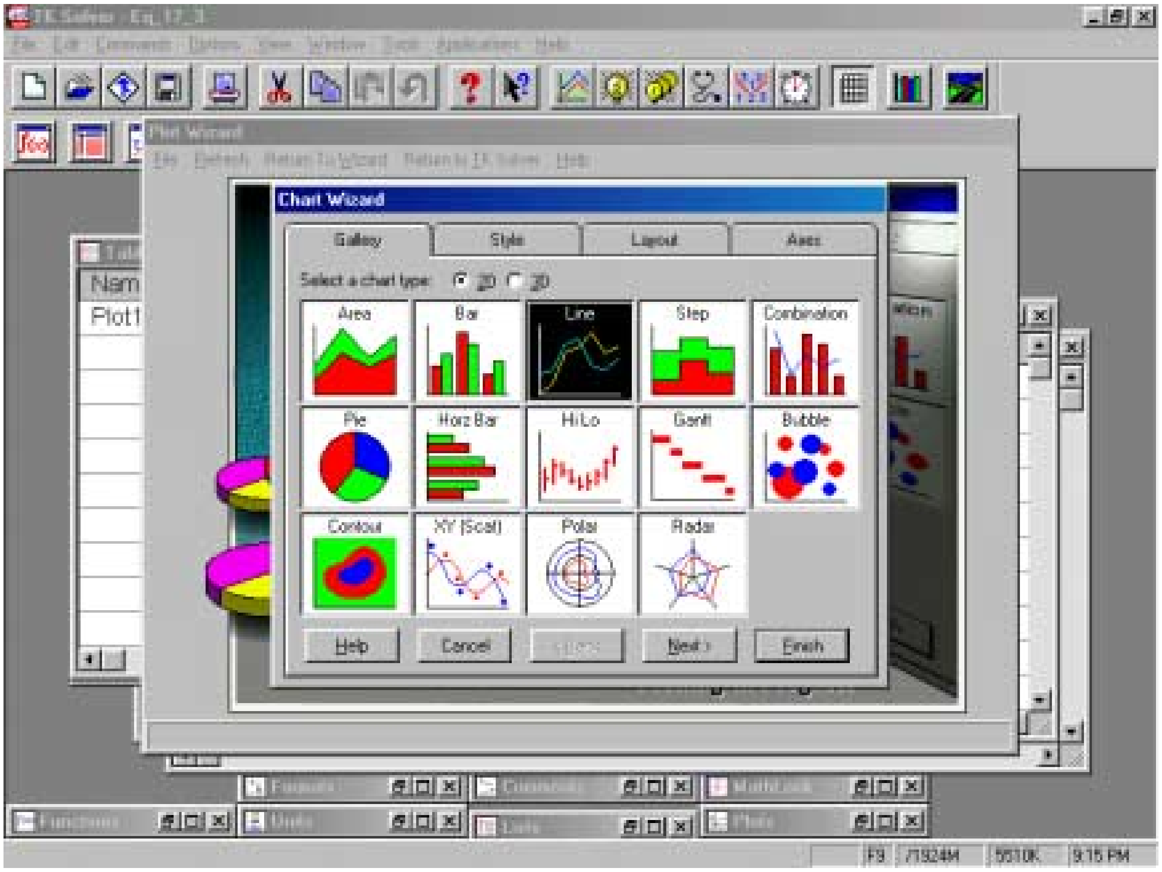


Figure 5.51: The window depicting the various plotting options.

Let us choose a line chart as shown in Fig. 5.51. On clicking the *Style* tab, we can select the style of the plot. Let us choose the style as shown in Fig. 5.52.

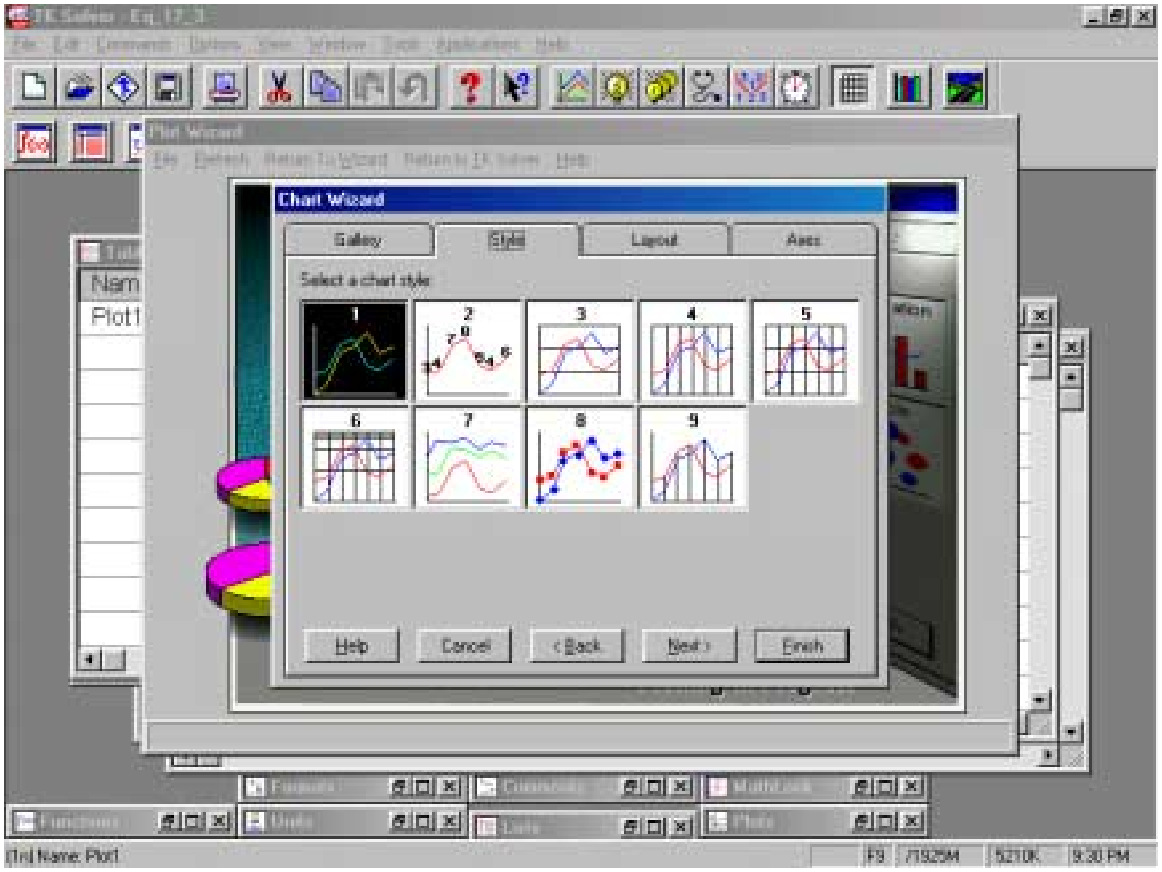


Figure 5.52: The various options under the Style tab.

On clicking the *Finish* button, the corresponding data sets are plotted and resultant plot obtained is shown in Fig. 5.53.

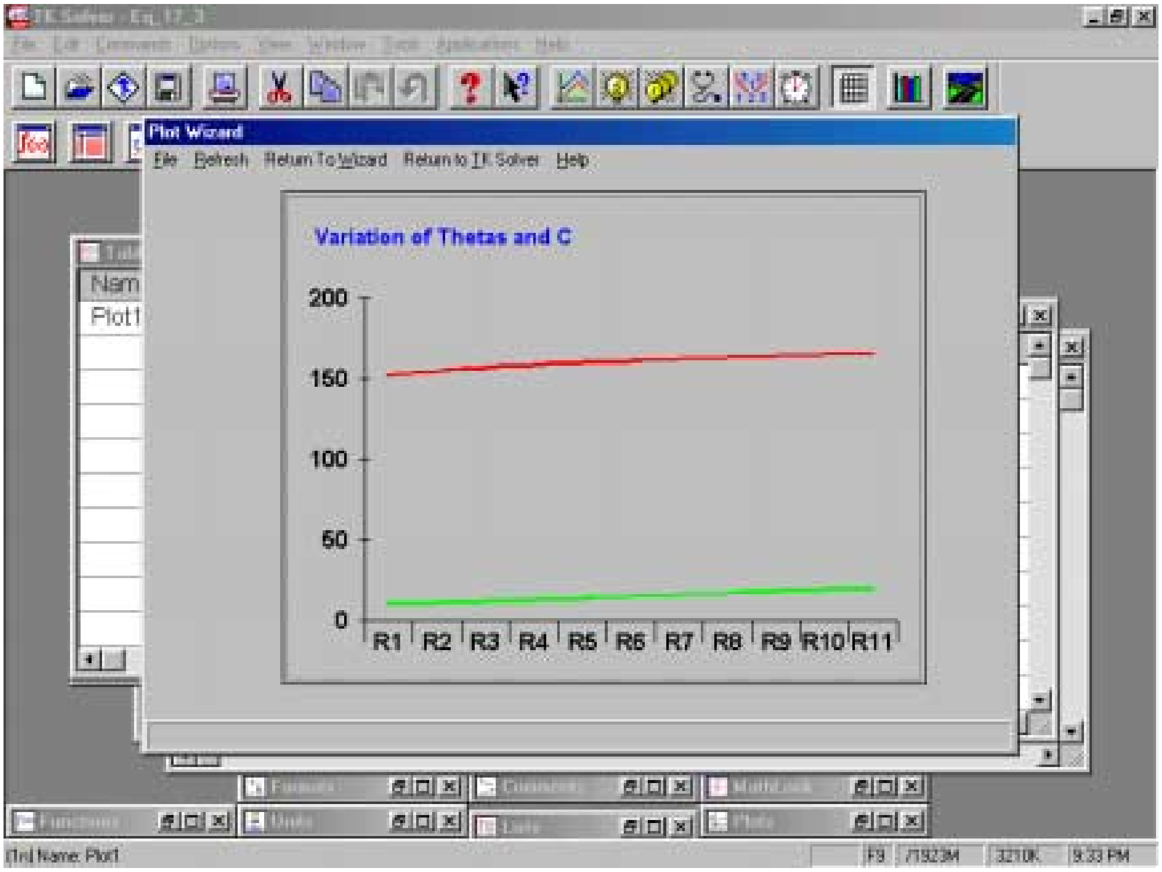


Figure 5.53: The plot for the variation of *Thetas* and *C*.

The designer further has the option of including the plot as a part of the design document by right clicking on the plot to obtain the pull down menu as shown in Fig. 5.54. He can then paste the plot in the design document of his choice by using **Edit** and **Paste Special** utility in Microsoft® Word 97 as shown in Fig. 5.55.

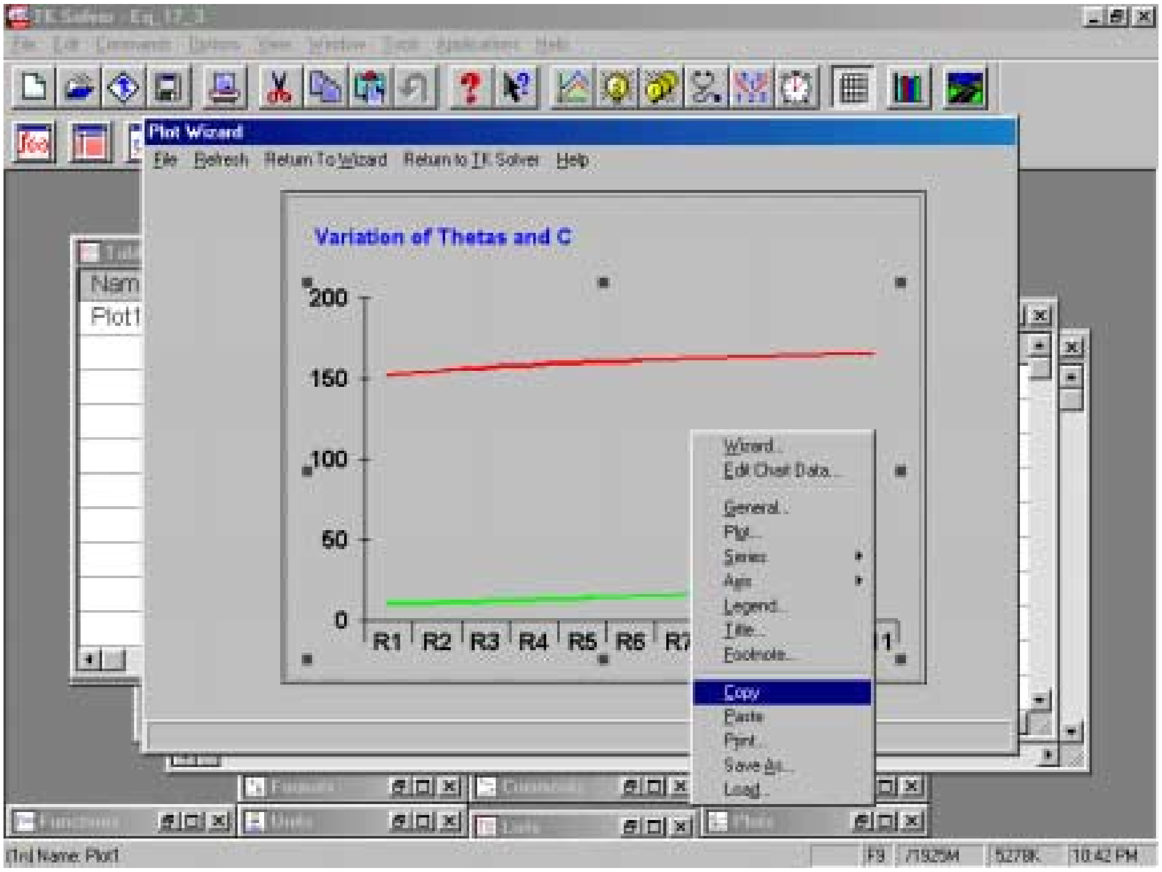


Figure 5.54: Pull down menu for the plot.

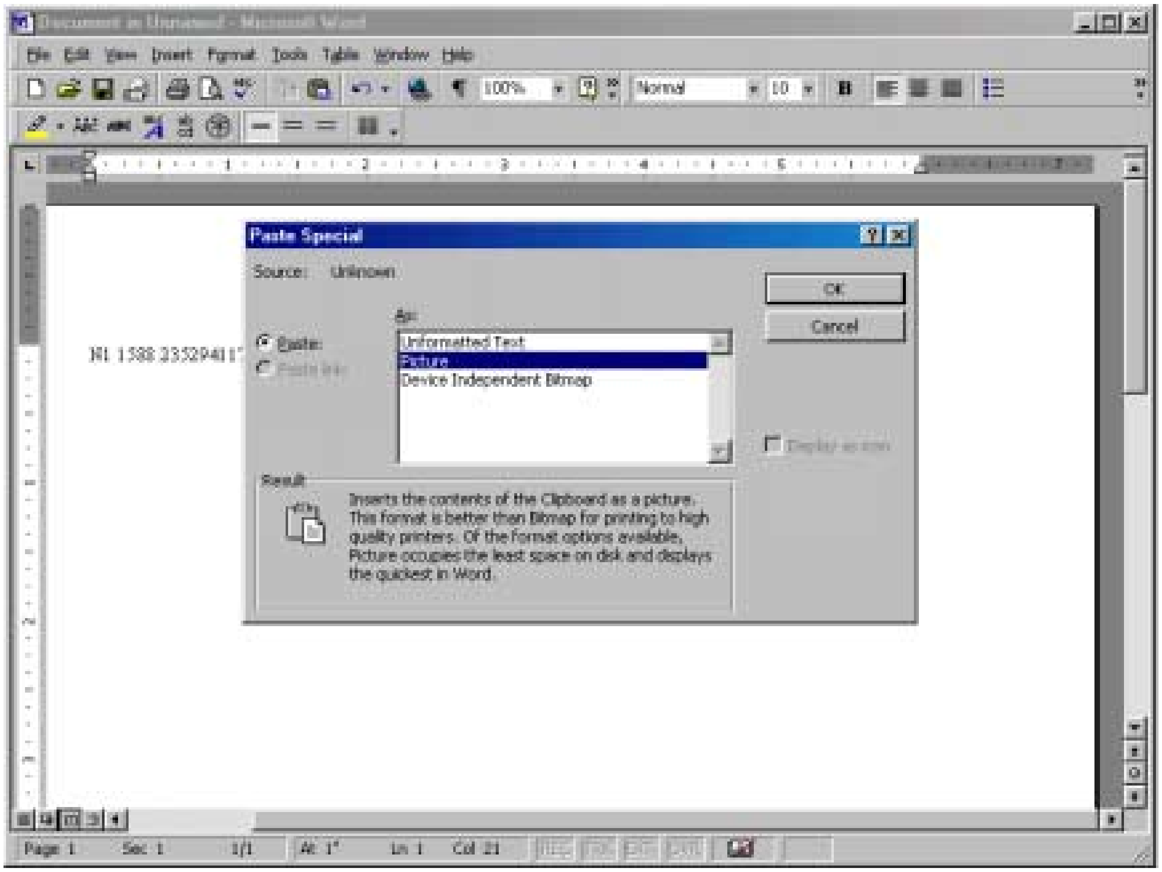


Figure 5.55: The paste special option in Microsoft® Word 97.

The option to be selected is highlighted in Fig. 5.55 and the designer can paste the picture in the design document as shown in Fig. 5.56.

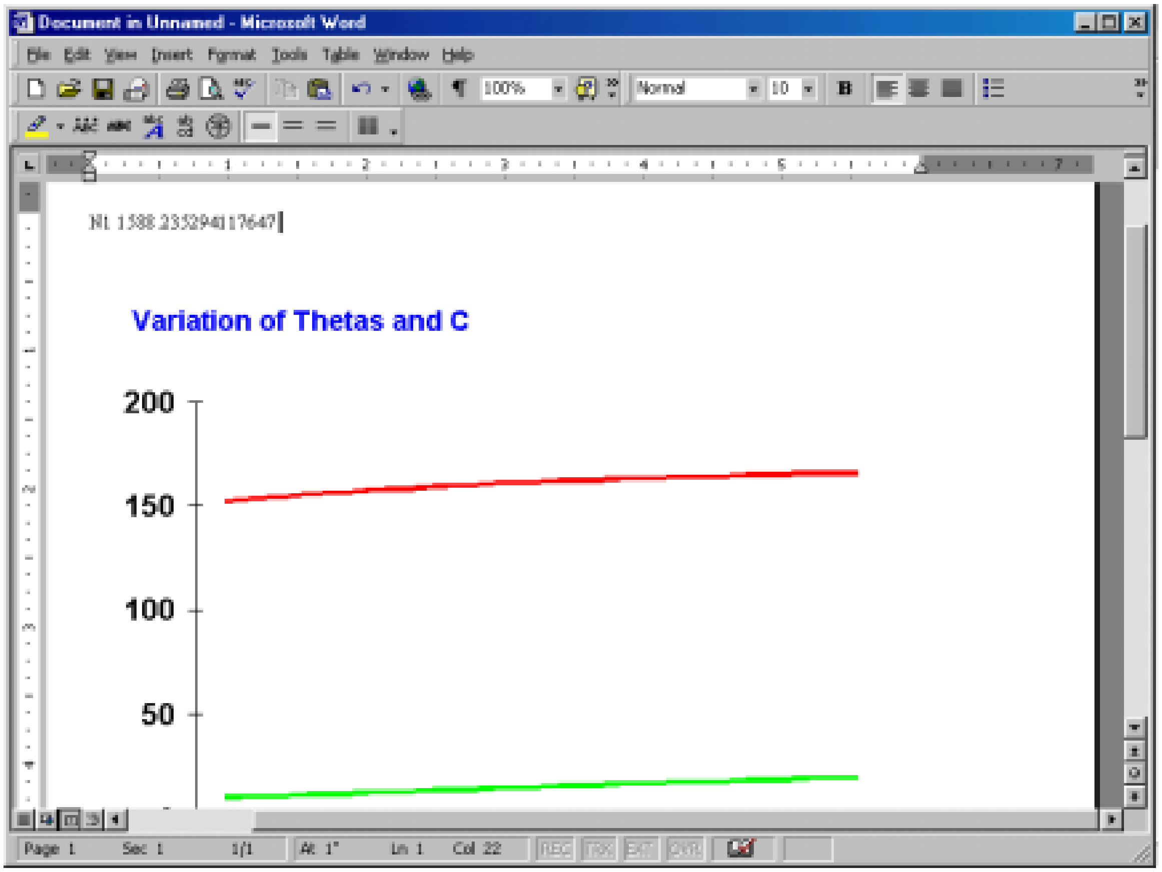


Fig. 5.56: The plot pasted in the design document.

Thus, the designer can have all the design data related to a specific design in one design document and save the document on the desktop for future reference.