

PULLEY PRINT PROGRAM FINAL DOCUMENTATION

VAN GORP CORPORATION

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INTRODUCTION

BACKGROUND

Van Gorp Corporation, based out of Pella, Iowa, manufactures standard and customized pulley systems for clients. Some of Van Gorp's major clients include FedEx and many companies in the mining industry. The pulley systems that these clients use are extremely large and have many working parts. Due to the vast size of these pulley systems, Van Gorp provides custom consultation to its clients. Upon receiving a request to build a custom pulley, Van Gorp uses a software program to calculate the dimensions of over twenty-five of the components that make up the custom pulley. The standards used to properly calculate the component dimensions are currently hard-coded into this program. The program was written in programming language GW Basic more than twenty years ago, and the original author has since left the company. As Van Gorp has refined their processes and standards throughout the years, they have not been able to update the program because it is not very user friendly. This program also uses a Command Line Interface (CLI) which is not user friendly. In addition, the current program does not run natively on 32 or 64-bit computers, leaving an emulated environment as the only option for Van Gorp to run this program on any modern computer.

The primary goal of this project was to replace Van Gorp's existing solution with one that is maintainable, extensible, and is compatible with Van Gorp's current IT environment. In particular, completely updating the code base to a more modern programming language will give Van Gorp the ability to use this program for the foreseeable future. This also allows the company to run the program on their 64-bit computers without the need for special software. Van Gorp also requested the software have a Graphical User Interface (GUI) to replace the current cumbersome CLI. The current CLI asks for user input to questions one at a time whereas a GUI application with forms allows those questions to be condensed reducing the amount of time it takes to enter in the necessary information to calculate the dimension of the pulley.

PROJECT SCOPE

The focus for Phase I of the project was to create a user-friendly interface for the system, convert Van Gorp's Pulley Standards into a format a program could easily read, and produce the correct output for Drum Class Pulleys. Although Van Gorp produces many types of pulleys, we decided to first focus on implementing the logic for the more common and simpler pulleys. This allowed us to verify with Van Gorp that our logic behind building the pulleys was sound. With a solid base we were then be able to expand to other pulley types during the next phase.

At the beginning of Phase II of the project, the team met with Van Gorp to determine any additional requirements for the program. During this phase we added: the ability to overwrite dimensions, support for all required pulley types, a clean bootstrapped user interface and customizability for the pulley standards used in the system. We also surpassed our project's original requirements and improved Van Gorp's efficiency by automating additional steps in the custom pulley creation process. Firstly, we created the ability to integrate our program's output with Van Gorp's Enterprise Resource Planning system. Next, we developed a "Bill of Materials" output for Van Gorp which outputs materials needed and estimated cost of constructing the custom pulley. Lastly, we developed a PDF output that Van Gorp can save or print for their records.

At the completion of this project, a compiled and executable program was delivered to Van Gorp, along with all code, documentation and a user manual for this program. The executable program was delivered, we verified the program was executing properly on their machines.

SYSTEM LEVEL DESIGN

SYSTEM REQUIREMENTS

FUNCTIONAL REQUIREMENTS

PRIMARY

Refactor the program using a newer programming language

- Original program only executed on machines capable of running 8-bit software which forced any 64-bit machine to use an emulator to run the program.
- Old code was written in GWBasic, which made it very difficult to maintain. A newer language is required.

Develop a Graphical User Interface which is easier to use than the current interface

- Original program was a command line interface and many features of the program were no longer in use creating a complicated user interface
- Created a forms-based interface with dropdown menus, checkboxes, etc.

Editing of Engineering Standards

- Current program's engineering standards are hard coded, and many of these standards are outdated.
- Van Gorp wanted the standards to be read in from files that already exist in their workflow.

SECONDARY

Implementing Automation

- Original process was not streamlined. Required manual input from one system to another. The output of the Pulley Print Program must be able to output data in different formats for use with other systems.
- Pulley Print Program must be able to output material information about designed pulley.

Integration with Current ERP System

- Current ERP required manual input of pulley information. New software must be able to output to a file that can be easily read into ERP system.

NON-FUNCTIONAL REQUIREMENTS

Performance

- Program executes quickly and easily
- Computation is minimal, so that other running applications are not affected

Scalability

- Original codebase was "spaghetti code"
- Clean codebase ensures easier readability and bug tracking
- Can easily implement newer features in the future

Reliability

- New program will not crash under any circumstance
- Generated output will be correct
- Recognize invalid input or configurations, according to their standards

Maintainability

- Codebase must be easy to read and understand
- Must be well documented and commented
- Engineering standards must be easy to add, remove or change

Portability

- Application must be easy to install, use, and run on Van Gorp's computers
- No confusing batch files or emulated environments like in the current implementation

Security

- Ensure the company's intellectual property remains safe
- Minimize risk when integrating with ERP system

SYSTEM ANALYSIS

The primary principles behind our design were usability, extendability, and maintainability. Above all else we wanted our program to be usable, meaning that our client can calculate pulley dimensions with this program. To make the design as user-friendly as possible, we created a straight-forward Windows Form which directly displays information to the user as opposed to using a command line interface.

We also wanted our design to be extensible. One of the major reasons Van Gorp was looking to replace their previous version of the Pulley Print Program was because it did not have the capability to easily interface with other pieces of Van Gorp software. By creating a C# .NET Windows Forms application, we leveraged the power of the C# .NET platform to integrate with other Windows-based products including Excel files and Word documents.

Lastly, we wanted our program to be maintainable. C# .NET has well-documented test suites which helped in the verification portions of our project. By also focusing on testing throughout the development cycle as we developed, we were able to ensure our software had a minimal number of bugs. Our use of regression testing helped to ensure all modifications to the software throughout the development process did not break working features.

STANDARDS

DEVELOPMENT STANDARDS

When we initially sat down to lay the groundwork for our development, we established some standards to govern the quality of our coding process. A large portion of this was enforcing the use of StyleCop, a code-health program. StyleCop ensured that all written code abided by a consistent set of rules. This saved us a lot of headache throughout the course of this project, because we had a general idea of what the modules of code would eventually look like, which made it much easier to write code without relying too heavily on knowledge of other modules. Sticking to our design schema (MVC) also helped greatly as it gave us a clear structure to follow and MVC proven to help make development easier.

Additionally, we have consistently enforced good code documentation. Code commenting is crucial in allowing our entire team to easily understand all blocks of code, regardless of who has written it. Due to the nature of this project,

we are often times forced to look at code written by other team members. Being able to quickly understand what the code we are looking at does is very beneficial.

VAN GORP ENGINEERING STANDARDS

A large part of this project was how to properly handle Van Gorp's engineering standards. These standards provide the instructions on how they design their pulleys, and provide the logic for how our program computes dimensions. While this topic covered in more detail in another section, it is important to reaffirm that these standards come from Van Gorp and were a cornerstone of our development.

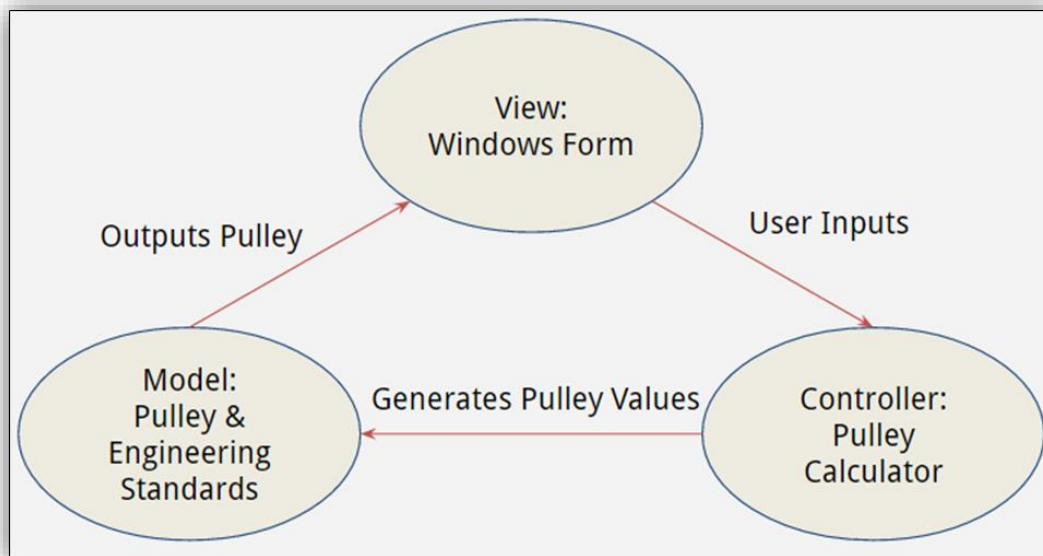
IMPLEMENTATION DETAILS

FUNCTIONAL DECOMPOSITION

MAIN APPLICATION

Our main application is written in C# .NET and designed using Windows Forms. This application runs Van Gorp's newer, 64-bit machines. The application is a standalone executable application which can be installed on any of Van Gorp's systems. The program was designed using Visual Studio and followed an agile development process by which the code for the application was frequently updated. Throughout development, we emphasized the use of a Model-View-Controller design pattern to ensure proper separation of responsibilities for the components of our program:

Figure 1: Model-View-Controller Design Pattern



In addition to separating our application's user interface code from the core application logic, we also separated each function of our application into the following modules:

ENGINEERING STANDARDS MODULE

The engineering standards module is used for reading the excel documents containing the engineering standards. This module's sole responsibility is to read the engineering standards and retrieve the correct standard values for given input pulleys.

PULLEY CALCULATIONS MODULE

The pulley calculations module is used to calculate the dimensions of a pulley's components. This module handles many of the special cases based on the over 20 pulley types Van Gorp produces for their clients.

FLOOR OPERATOR DIRECTIONS MODULE

This module is used to provide directions to Van Gorp's floor operators when constructing the pulley. This includes information on which routers and welders to use when making the parts of the pulley. This module outputs a PDF document with routing directions for the floor operators.

BILL OF MATERIALS MODULE

This module is used to calculate the cost of producing the pulley in terms of raw materials. This module performs calculations to determine the cost, quantity, and volume of material used in each part of the pulley's construction. The program then outputs the desired information in a format useful for Van Gorp's business team.

EXCEL STANDARD INTEGRITY CHECKING MODULE

This module is used to perform data source integrity checks by validating the integrity of each engineering standards excel sheet. Every time the excel documents are modified, this program is in charge of running an integrity check on the engineering standards.

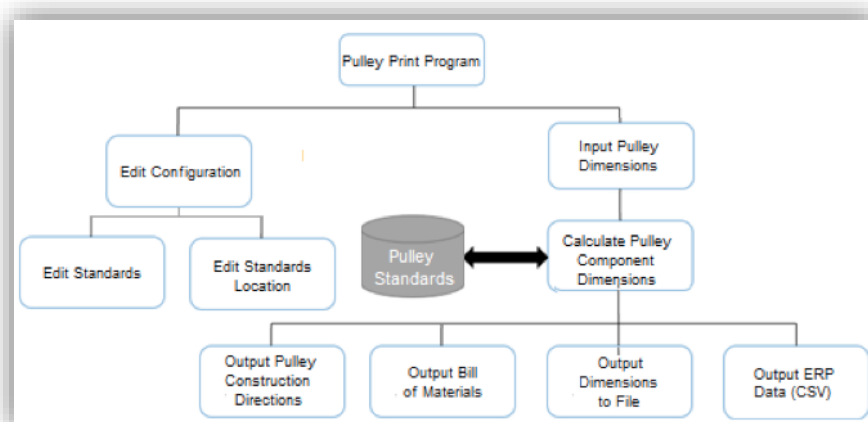
ERP SYSTEM (EXACT MACOLA) CSV EXPORTER MODULE

Van Gorp also has an ERP system currently in place used to keep track of materials used in the construction of the pulleys. The ERP system accepts tab-separated files as a form of batch import into the CSV program. This module of application formats the data so it can be imported into the ERP system.

OPERATIONAL FLOW

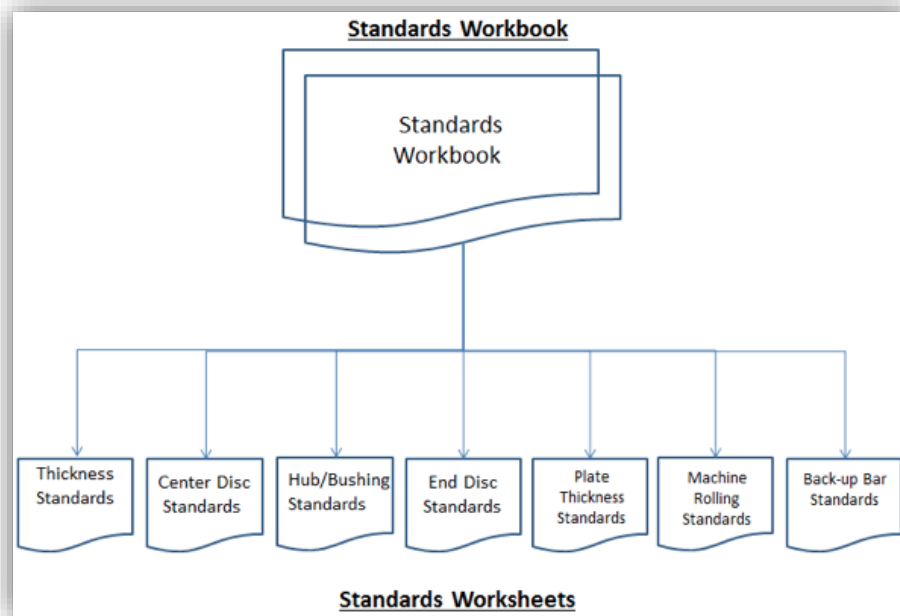
Our Pulley Print Program has the following operational flow. Our program uses a minimalistic user interface with basic functions for editing standards and using the pulley print program to calculate pulley dimensions.

Figure 2: Operational Flow Diagram



Once the user has entered all of the information necessary to construct a pulley, the Pulley Print Program then goes to a pre-defined “standards location” to look for Excel documents containing Van Gorp’s Pulley standards:

Figure 3: Standards Workbook Diagram



IMPLEMENTATION CHALLENGES

The single largest implementation of our design was the previous state of the engineering standards. Firstly, these standards were stored in word documents which meant they were not easily parseable. In addition, standards for certain types of pulleys (such as double drum pulleys) were not formally written down. The standards are also very sensitive documents that are proprietary to Van Gorp, and must remain secure. This poses a problem because they are a crucial part in the computations done by the program, so our program must be able to access these formulas, without compromising their security. Furthermore, they must be easily modifiable if the standards were ever to change. We explored various alternatives that we could use to store these standards and decided to store the information in Excel documents as this would be the most maintainable, low-cost, easily modifiable solution for the engineering standards.

TESTING AND RESULTS

UNIT TESTING

Van Gorp uses the Pulley Print Program to design pulleys ranging from small and inexpensive, to very large and very expensive. This fact caused us to prioritize the accuracy and reliability of our program from the very beginning. Obviously, this includes writing correct, clear, and well documented code. However, we also had to ensure the code output the correct information and did this through testing.

Testing was especially important since our code was written from scratch and not a port of the original program. This meant we had to ensure our logic was the same, and our calculated values aligned. We did this through the creation of automated and manual test cases to ensure that the program always returned correct values. Furthermore, Van Gorp is physically capable of creating an incredibly wide range of pulleys. Therefore we opted for the most coverage we could, which would include all of the most common types/sizes, as well as many less common “edge cases.”

STANDARDS VALIDATION

Although our code is well tested, there is another important dependency of our program: the Excel standards. Our program relies on these standards for all of our calculations, so we needed a way to check the integrity of these files. Adding to the importance of this is the fact that Van Gorp specifically wants these standards extensible, meaning that in the future people will be adding to or editing the standards.

Our solution to ensure the standards are error free before our program does any calculations, is to parse and validate both the Drum and Wing standards sheets. These functions iterate over every used cell of each sheet, and intelligently look for improper cells. This includes checking that the cells are not null, contain the correct types, and that the values are within acceptable ranges. This guarantees that even as the standards are extended in the future, our program can validate the changes and help identify any inconsistencies.

LOGGING

We wanted to keep our program's logic as transparent as possible to Van Gorp. This was especially important, due to how convoluted and difficult the old program was to read. To do this, we implemented a verbose logging system to keep our program from being a "black box," and allow for an easier understanding of what is going on underneath. For every pulley that is calculated, a log file is generated that shows what values were pulled from the standards sheets as well as what calculations were made. In the unlikely event of an error, this will help Van Gorp track down exactly what where the error originated and make corrections.

RESULTS

The purpose of testing from a development standpoint is to verify that each component is working correctly. When changes were made to the program, our tests could make sure that those changes did not break any other functionality in the program. This testing allowed us to catch a few errors during our development process. When we delivered our final product to Van Gorp, we ran several demo calculations with their IT staff and double checked that all of the output was correct. We delivered a working, accurate, and robust program to our clients, thanks to our rigorous development principles.

ALTERNATIVE VERSIONS

PROGRAM

After meeting Van Gorp, understanding how their old software worked and their requirements for the new software, we created a prototype. We wanted to get an idea of what they thought and any changes that could improve their work flow and created a sample form to do this. We presented this to Van Gorp for feedback on whether or not we covered all the information they need when creating a pulley. The feedback we received was very constructive. Van Gorp stated that the user interface was very intuitive. We also determined additional options Van Gorp needed in the software. For example they do not need any information about production date or comments, but did need ways of editing the final output for some fields. The following are screenshots of our prototype that we showed them.

Figure 4: Alternate Version

The figure displays three screenshots of a software application titled "Pulley Print".

- Top Left Screenshot:** Shows the initial form with fields for "Order Number", "Customer", and "Date" (set to Friday, March 13, 2015). Below these are several checkboxes: ☐ WON, ☐ MACH RIMS, ☐ STD, ☐ STD Inset, ☐ Mach Lag, ☐ Static Balance, and ☐ Stainless. There is also an "Output" dropdown menu and a "Next" button.
- Top Right Screenshot:** Shows the second step of the form with fields for "Part Number", "Qty" (set to 0), "Hub" (dropdown), "Hub Size", and "Pulley Type" (dropdown). It includes "Back" and "Next" buttons.
- Bottom Screenshot:** Shows the final step of the form with a "Lagging" checkbox, "Week" field, "Production Date" (Friday, March 13), "Ship Date" (Friday, March 13), and a "Special Operator CDs" checkbox. There is a large "Comments" text area and "Back" and "Submit" buttons.

ENGINEERING STANDARDS STORAGE

A major requirement for this project was to make it extendable in the future. The original program had hardcoded engineering standards in it. This did not allow Van Gorp to easily add or modify the standards if need be. With the new program, we had 3 options to store the standards. We could hard code the standards into the program again. The next option was to store the standards in an SQL database. The engineering standards were stored in word documents which included descriptions, title, and tables with the engineering standard values. After carefully considering all options for storing a SQL Database and Excel Documents were the final two options. We ultimately chose Excel over SQL for four main reasons:

1) Cost

Every single Van Gorp system is equipped with Microsoft office, whereas the cost for an instance of Microsoft SQL Server 2014 costs around \$3,717 per processor core to purchase an in-house server. Because of Van Gorp's security requirements, leasing hosted server space is not an option due to the need to store secure documents on site. This would be an excess cost for a business the size of Van Gorp to incur to support a program which is used anywhere between 5 and 25 times per month. Excel allowed us to meet our requirements for no additional cost.

2) Ability to Port Standards from Word

In order to convert standards. Using SQL Server we would have had to manually input each standard, or copy the standards to a comma-separated-value file for batch import into the SQL Server. The process of manually inputting all engineering standards would be very time-consuming for our team and distract from the core engineering work of developing our application. In addition, the process of copying the standards over to Excel documents is the same process as converting them to CSV files. So we would have been doing twice the work to import these standards into an SQL database.

3) Extensibility

Most of Van Gorp's employees have experience with Microsoft Excel, however very few of them have experience with SQL Server. To add additional standards for new classes of pulleys, Excel documents can be easily modified by most employee. All the employee has to do is add a new row to an Excel document. In the case of SQL Server, this would require a Van Gorp employee to access the database and use the SQL Server database editor program each time a new pulley size is added.

4) User Interface

Many of Van Gorp's Engineering Standards have comments, descriptions, and logic which is written out in plain text in addition to engineering tables. Excel sheets have the ability to have blank headers row with extensive comments and documentation describing the engineering standards. In addition, Excel sheets can be formatted with different fonts, text sizes, bolding, and colors to present the engineering standards in a more readable manner. Database rows and columns do not have this luxury.

Currently, we have created Excel files which contain sheets corresponding to the exact standards specified in Van Gorp's word documents. The sheets are titled based on name of the engineering standards they represent (Ex: ENG-400.09). These sheets are then used as the data source for the engineering standards and parsed by our program to determine the correct values for each measurement of the program. If there is any need to update these sheets with new engineering standards, the parsing logic in the program remains the same and will not affect performance.

To protect the information in these Excel Documents from unauthorized viewing and editing, Van Gorp explicitly said they want to take care of protecting all the Cells and Sheets using the built-in Protected Sheets functions of Excel. We are going to make sure that the program will still function correctly when the Excel sheets are password protected.

CONCLUSION

Overall, our design is structured to meet Van Gorp's requirements, and exceeded their expectations by improving the efficiency of the Pulley Print Program in their workplace. We leveraged the power of a Windows Forms and C# .NET to make our application user-friendly, extensible, and maintainable. We used a data source which meets Van Gorp's needs and provides them with the most cost effect solution. In addition to our rigorous testing procedures, our use of rapid feedback allowed us to develop the right product for Van Gorp Corporation.

OPERATION MANUAL

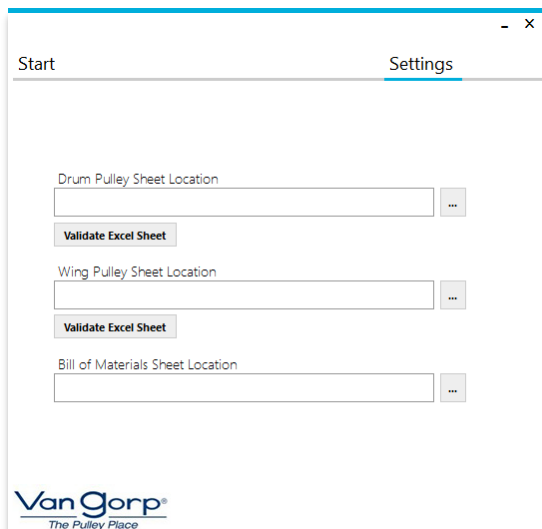
INTRODUCTION

The Pulley Print Program is a tool to help produce the various dimensions and specifications of custom pulleys based on the engineering standards at Van Gorp Corporation. This project was presented to Iowa State's senior design program in the spring of 2014 and completed in the fall of 2015.

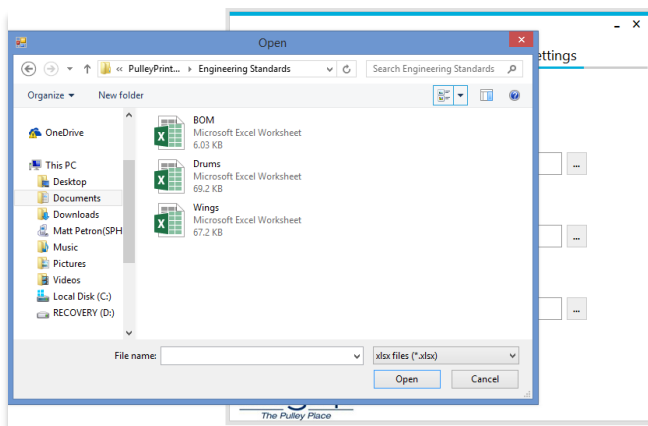
INSTALLATION AND CONFIGURATION

The pulley print program is an executable file that can be run on Windows 7, 8.1, and 10 computers. To install the program, simply copy the folder containing the PulleyPrintProgram onto the windows machine. When the program is opened for the first time, the user must specify where the engineering standards are located. Prior to installation, ensure that the Excel documents used to specify the engineering standards for drum and wing pulleys, as well as the list of bill of material parts are accessible on the machine being used. Follow the steps below to set up the program.

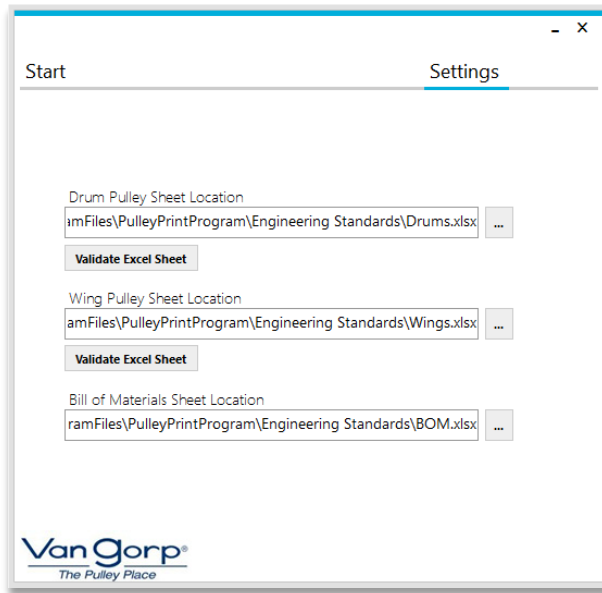
1) Navigate to the settings tab



2) Specify or browse to the specific



3) Select the appropriate sheet and click Open

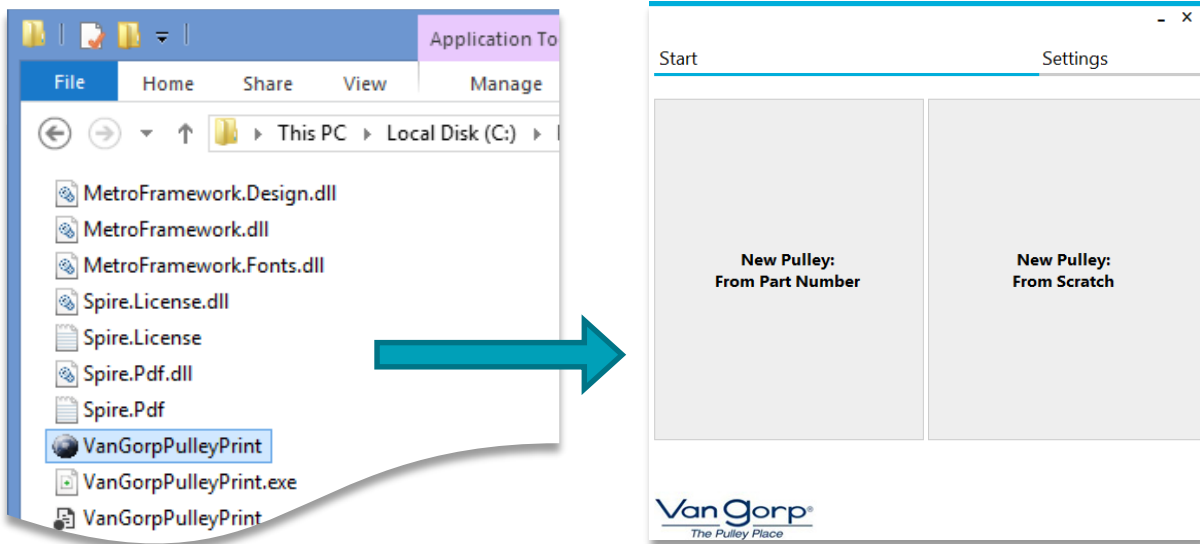


4) Software is ready to use

NOTE: THIS SETUP IS FOR FIRST TIME USE ONLY. THESE SETTINGS WILL PERSIST AFTER CLOSING THE SOFTWARE AND SHOULD NOT BE UPDATED WHEN RUNNING THE PROGRAM UNLESS THE LOCATION OF EXCEL STANDARDS CHANGE

USING THE APPLICATION

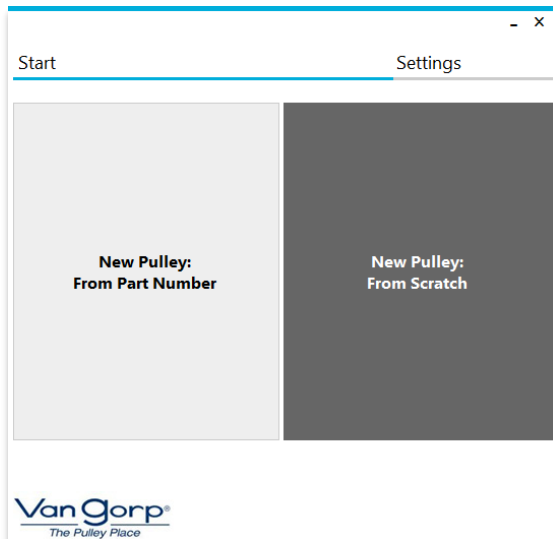
To use the program, launch the PulleyPrintProgram application file. The program will open to the main screen and prompt to create a pulley from scratch or from a part number.



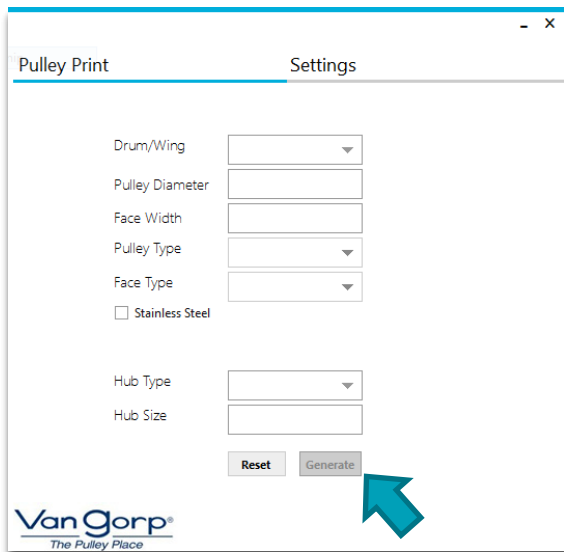
CREATE PULLEY FROM SCRATCH

Creating a pulley from scratch allows you to create a new pulley with no predetermined values. Follow the following steps to create a pulley from scratch.

- 1) Select “New Pulley: From Scratch”



- 2) Enter in pulley specifications
- 3) Click “Generate”



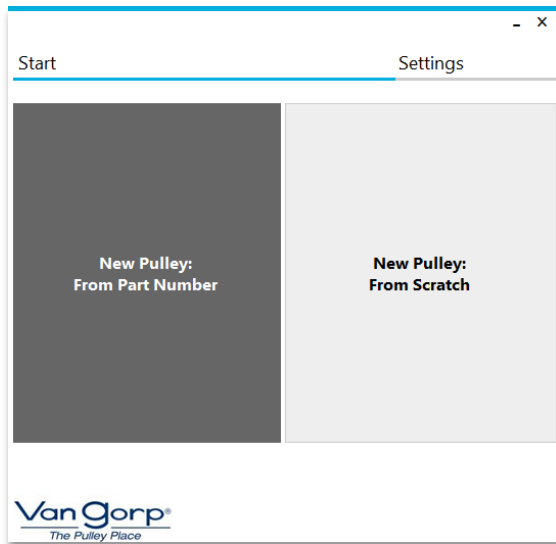
Note: Click “Reset” to return to the main screen

Warning: Clicking Reset will return the program to the main screen. All information entered into the screen shown on the right will be lost

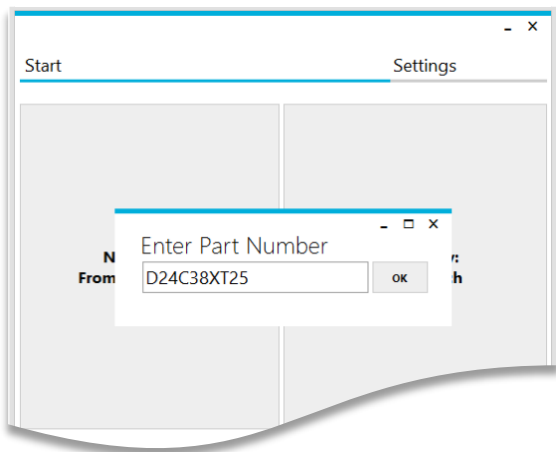
CREATE PULLEY FROM PART NUMBER

Creating a pulley from a part number allows you to load in the values of a known pulley so you can alter it slightly. Follow the following steps to create a pulley from a part number.

- 1) Select "New Pulley: From Part Number"



- 2) Enter a part number in the pop up dialog



- 3) The pulley input form will automatically be displayed and populated with values based on the part number previously entered

4) Alter any values and click the “Generate” button

Pulley Print Settings

Drum/Wing: Drum
Pulley Diameter: 24
Face Width: 38
Pulley Type: HDR
Face Type: Crown
☐ Stainless Steel
Hub Type: XT
Hub Size: 25
Reset Generate
Van Gorp®
The Pulley Place

Note: Click Reset to return to the main screen

Warning: Clicking Reset will return the program to the main screen. All information entered into the screen shown on the right will be lost

OUTPUT

After clicking the “Generate” button on the input screen, a screen will be displayed with the various dimensions and specifications for the pulley specified. This screen can be seen in the figure to the right. Three output types for this information are available to the user, **Macola Output**, **PDF Output**, and **Bill of Materials Output**. More information about each of these outputs can be seen below.

Pulley Print Results/Output Settings

QTY	1	Center Disc QTY	1
Size	24 x 38	Center Disc Thickness	0.25
Style	CR	Center Disc Diameter	23.5 in
Hub	XT	Rim QTY	2
Inset A	1.5625 in	Rim Thickness	0.25
Inset Below A	1.875 in	Rim Width	38 in
Inset B	34.875 in	Rim Length	39 in
End Disc QTY	2	Rim Roll	3L-CR
End Disc Thickness	0.3125	Back-up Bar QTY	4
End Disc Diameter	23.5 in	Back-up Bar Size	0.25 x 1
		Back-up Bar Length	17 in
		Bushing Hub	XT

Export To:

Macola
PDF
B.O.M.
View Log
Van Gorp®
The Pulley Place

MACOLA OUTPUT

The Macola output generates a TSV file that can be used to import the pulley directly into the Macola ERP system. To generate this output, simply click the “Macola” button on the results screen. This will open up a TSV file that can be saved and used at a later time.

PDF OUTPUT

The PDF Output generates the shop packet that can be printed out and given to the floor workers. To generate this output, simply click the “PDF” button on the results screen. This will open up a PDF file that can be saved and printed off at a later time.

BILL OF MATERIALS OUTPUT

The Bill of Materials Output generates the bill of materials needed to produce the pulley. To generate this output, simply click the “B.O.M.” button on the results screen. This will create and open a TSV file containing the bill of materials for the pulley. This file can be found under the “My Documents > PulleyPrintProgram > BOM” folder on the local machine.

ENGINEERING STANDARDS

Standards for Drum, Wing pulleys and the Bill of Materials are stored in three separate files titled Drums.xlsx, Wings.xlsx, and BOM.xlsx. These files are stored in a secure central location. Talk with the network administrator to determine the location of the files if they need to be updated or changed. The following information details how to add or modify new standards.

FORMAT

These files contain a Configuration and Index sheet that will be displayed upon opening. This initial sheet provides the user the ability to quickly jump to any of the standards sheets. This file also provides information to the program about how many header rows or titles rows there are before the standards actually start. This is extremely important as without this information, the program will not be able to determine the difference between titles or modification data and actual standards. The figure below shows the Configuration and Index page:

Figure	Name	Number of Header Rows
ENG400.09-2.1	Standard Drum Pulley Thickness	6
ENG400.09-2.2	Standard Drum Pulley Center Discs	5
ENG400.09-3.1	Xtreme-Class II Drum Pulley Thickness	6
ENG400.09-3.2	Xtreme-Class II Drum Pulley Center Discs	5
ENG400.09-4.1	Mine Duty Drum Pulley Thickness	6
ENG400.09-4.2	Mine Duty Drum Pulley Center Discs	5
ENG400.09-5	XT Hub and Bushing Location	6
ENG400.09-6	QD Hub and Bushing Location	6
ENG400.09-7	TL Hub and Bushing Location	6
ENG400.09-8	End Disc Inset Standards	5
ENG400.09-9	Hub and End Disc Inset	6
ENG400.09-10	Maximum Plate Thickness	5
ENG400.09-11.1	Mild Steel Roll Charts	5
ENG400.09-11.2	Large Straight - Danish	6
ENG400.09-11.3	304 Stainless Steel Roll Charts	5
ENG400.09-11.4	304 Large Straight - Danish	6
ENG400.21-1	Back-up Bar Sizes	6
DoubleDrum	Double Drum Standards	5

The standards are each stored in their own sheet in the appropriate excel file. Each sheet contains a header that states the sheet name and last modified date at the top. Below that there is a table that contains all the standards. To the

right of the table, there are two lines that say “Number of Header Rows.” This is an extremely important value. It defines where the table starts so the program can accurately read all the data. The following figure shows what these sheets look like.

Drums - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW DEVELOPER LOAD TEST TEAM

A2

ENG400.09-2.1: Standard Pulley Thickness

Last Modified: 9/2/2015

HUB

DIA	XT	TL	QD	FW	RIM	ED	CD	Header Row Number
10	XTB20	-	-	>44=78	3/16	5/16	1/4	6
CROWN ONLY	XTB25	W25	SF	>44=78	3/16	5/16	1/4	
	XTB30	K30	E	<=78	3/16	3/8	1/4	
	XTB35	K35	F	<=78	3/16	3/8	1/4	
12	XTB20	-	-	>44=76	3/16	5/16	1/4	
	XTB25	W25	SF	>44=76	3/16	5/16	1/4	
	XTB30	K30	E	<=76	3/16	3/8	1/4	
	XTB35	K35	F	<=76	3/16	3/8	1/4	
	XTB40	K40	JS	<=76	3/16	3/8	1/4	
	XTB45	K45	MS	<=76	-	-	-	
14	XTB25	W25	SF	<=76	3/16	5/16	1/4	
	XTB30	K30	E	<=76	3/16	5/16	1/4	
	XTB35	K35	F	<=76	3/16	1/2	1/4	
	XTB40	K40	JS	<=76	3/16	1/2	1/4	
	XTB45	K45	MS	<=76	3/16	1/2	1/4	
	XTB50	K50	NS	<=76	-	-	-	
16	XTB25	W25	SF	<=76	3/16	5/16	1/4	
	XTB30	K30	E	<=76	3/16	5/16	1/4	
	XTB35	K35	F	<=76	3/16	3/8	1/4	

CONFIG ENG400.09-2.1 ENG400.09-2.2 ENG400.09-3.1 ENG400.09-3.2 ENG400.09-4.1 ...

READY

EDITING CONFIGURATION AND INDEX SHEET

- 1) Open the excel file and browse to the CONFIG sheet if it does not automatically open
- 2) Use the arrow keys to scroll to select the desired cell
- 3) Change the text in that cell
- 4) Save and close the excel

Drums - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW DEVELOPER LOA

A6

ENG400.09-3.1

Configuration & Index

Figure	Name	Number of Header Rows
ENG400.09-2.1	Standard Drum Pulley Thickness	6
ENG400.09-2.2	Standard Drum Pulley Center Discs	5
ENG400.09-3.1	Xtreme-Class II Drum Pulley Thickness	6
ENG400.09-3.2	Xtreme-Class II Drum Pulley Center Discs	5
ENG400.09-4.1	Mine Duty Drum Pulley Thickness	6
ENG400.09-4.2	Mine Duty Drum Pulley Center Discs	5
ENG400.09-5	XT Hub and Bushing Location	6
ENG400.09-6	QD Hub and Bushing Location	6
ENG400.09-7	TL Hub and Bushing Location	6
ENG400.09-8	End Disc Inset Standards	5
ENG400.09-9	Hub and End Disc Inset	6
ENG400.09-10	Maximum Plate Thickness	
ENG400.09-11.1	Mild Steel Roll Charts	
ENG400.09-11.2	Large Straight - Danish	

To edit the Number of Header Rows column:

- 1) Select the appropriate cell to be edited
- 2) Type the equals sign “=”
- 3) Use the scroll bar at the bottom of the page to scroll to the sheet containing the standards
- 4) In that sheet click the cell containing the header number

Figure	Name	Number of Header Rows
ENG400.09-2.1	Standard Drum Pulley Thickness	6
ENG400.09-2.2	Standard Drum Pulley Center Discs	5
ENG400.09-3.1	Xtreme-Class II Drum Pulley Thickness	6
ENG400.09-3.2	Xtreme-Class II Drum Pulley Center Discs	5
ENG400.09-4.1	Mine Duty Drum Pulley Thickness	6
ENG400.09-4.2	Mine Duty Drum Pulley Center Discs	5
ENG400.09-5	XT Hub and Bushing Location	6
ENG400.09-6	QD Hub and Bushing Location	6
ENG400.09-7	TL Hub and Bushing Location	6
ENG400.09-8	End Disc Inset Standards	5
ENG400.09-9	Hub and End Disc Inset	6
ENG400.09-10	Maximum Plate Thickness	5

SAVE THE FILE AND CLOSE WHEN DONE EDITING

EDITING CURRENT STANDARDS

- 1) Open the excel file and browse to the appropriate sheet
- 2) Click on the desired cell
- 3) Type in the new value
- 4) Updated the Last Modified date
- 5) Save and close the file

DIA.	XT	TL	QD	FW	RIM	ED	CD
10	XT25	W25	SF	<=78	3/16	1/2	1/4
CROWN	XT30	K30	E	<=78	3/16	1/2	1/4
ONLY	XT35	K35	F	<=78	3/16	5/8	1/4
12	XT25	W25	SF	<=76	3/16	1/2	1/4
	XT30	K30	E	<=76	3/16	1/2	1/4
12	XT35	K35	F	<=76	3/16	5/8	1/4
	XT40	K40	JS	<=76	3/16	5/8	1/4
	XT45	K45	MS	<=76	-	-	-
14	XT25	W25	SF	<=76	3/16	1/2	1/4
	XT30	K30	E	<=76	3/16	1/2	1/4
	XT35	K35	F	<=76	3/16	1/2	1/4
	XT40	K40	JS	<=76	3/16	1/2	1/4
	XT45	K45	MS	<=76	3/16	1/2	1/4

ADDING NEW LINES TO STANDARDS SHEET HEADER

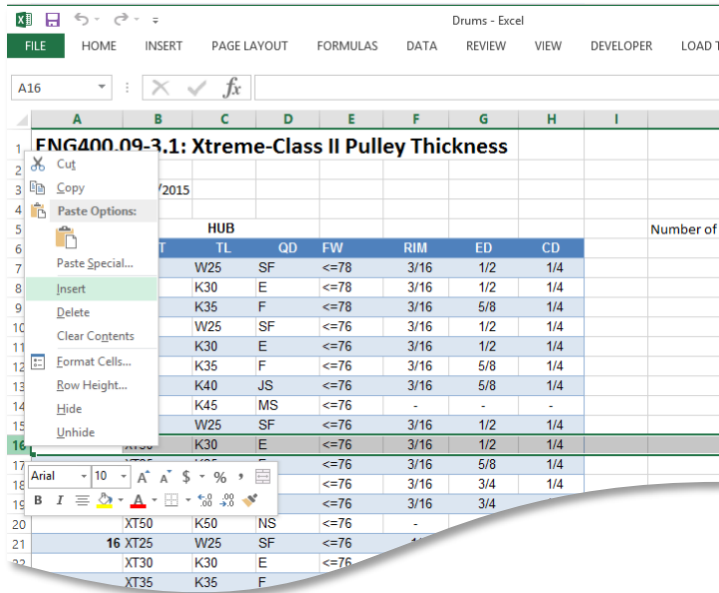
- 1) Open the appropriate excel file and browse to the sheet to be edited
- 2) Right Click any row above the header file
- 3) Click Insert to insert a new row

DIA.	XT	TL	QD	FW	RIM	ED	CD
10	XT25	W25	SF	<=78	3/16	1/2	1/4
CROWN	XT30	K30	E	<=78	3/16	1/2	1/4
ONLY	XT35	K35	F	<=78	3/16	5/8	1/4
12	XT25	W25	SF	<=76	3/16	1/2	1/4
	XT30	K30	E	<=76	3/16	1/2	1/4
12	XT35	K35	F	<=76	3/16	5/8	1/4
	XT40	K40	JS	<=76	3/16	5/8	1/4
	XT45	K45	MS	<=76	-	-	-
14	XT25	W25	SF	<=76	3/16	1/2	1/4
	XT30	K30	E	<=76	3/16	1/2	1/4
	XT35	K35	F	<=76	3/16	1/2	1/4
	XT40	K40	JS	<=76	3/16	1/2	1/4
	XT45	K45	MS	<=76	3/16	1/2	1/4

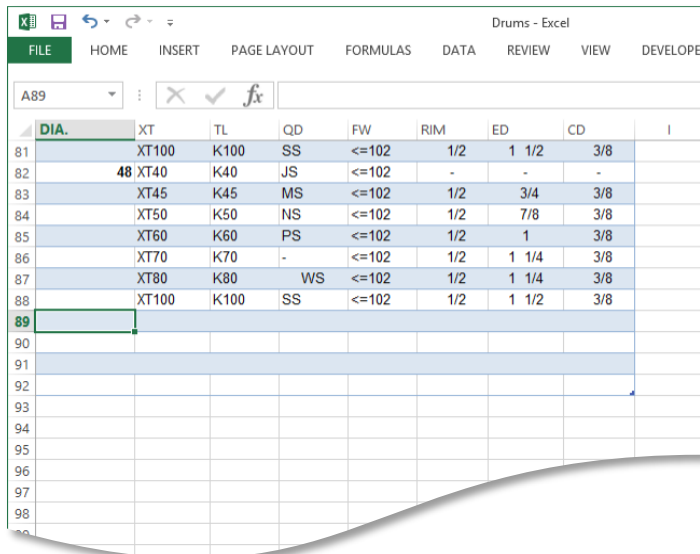
- 4) Save and close sheet after modification

ADDING NEW LINES TO STANDARDS TABLE

- 1) Open the appropriate excel file and browse to the sheet to be edited
- 2) Determine the location the new data will be added
 - If the data is to be added to the end of the table proceed to Step 3
 - If the data is to be added to the end of the table proceed to step 4
- 3) Right click on the line below where the data is to be added and click insert



- 4) Skip to step 6 if the new data was inserted in the middle of the table. Otherwise, Scroll to the bottom of the table.
- 5) Click the bottom right corner of the table and drag it down



- 6) Insert new data
- 7) Update Modified date
- 8) Save and close the file

LOG FILES

A log file is created for each pulley that is generated using the Pulley Print Program, along with each Bill of Materials file that is created. These logs contain information about where the values came from when generating the pulley. This ensures that the user can pinpoint where each value is coming from in the scenario that a value in the pulley is incorrect.

The log file created for the generation of the pulley can be opened from the Results screen by clicking on the “View Log” button, or can be found under the “My Documents > PulleyPrintProgram > Logs” folder.

The log files created when generating the Bill of Materials can be found under the “My Documents > PulleyPrintProgram > BOM Logs” folder.

Pulley Print		Results/Output		Settings	
QTY	1	Center Disc QTY	1		
Size	24 x 38	Center Disc Thickness	0.25		
Style	CR	Center Disc Diameter	23.5 in		
Hub	XT	Rim QTY	2		
Inset A	1.5625 in	Rim Thickness	0.25		
Inset Below A	1.875 in	Rim Width	38 in		
Inset B	34.875 in	Rim Length	39 in		
End Disc QTY	2	Rim Roll	3L-CR		
End Disc Thickness	0.3125	Back-up Bar QTY	4		
End Disc Diameter	23.5 in	Back-up Bar Size	0.25 x 1		
		Back-up Bar Length	17 in		
		Bushing Hub	XT		
Export To:					
				Macola	
				PDF	
				B.O.M.	
				View Log	

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