Abstract: The project's goal was to design an S size men’s shirt, using the Morgan Dynamics software. There are two ways in which new models can be created: drawing or digitizing. In order to use both methods, the front, back and sleeves were designed by Drawing, and the patterns for collar and yoke were done manually and then placed on the digitizing surface. The patterns were captured by a camera and loaded automatically in the MD Visual software. Then the pattern grading and nesting was done by using the MD Best Nest software.

Keywords: Morgan Dynamics, shirt, design, digitizing, grading, nesting

1. INTRODUCTION

The textile industry is continuously changing. In recent years there has been a remarkable transition from 100% Lohn system production, to semi-Lohn, “full-product” and even own production – developing an own brand. Romanian producers are forced to respond increasingly faster to domestic and foreign demand. Meanwhile, prices are dropping while production costs are rising. To manage and thrive in an increasingly competitive market, Romanian companies in the textile industry must be especially well organized, efficient, and able to produce a range of high-quality goods. To meet these challenges, the Romanian producer adapted, placing the greatest emphasis on revamping the factories in order to increase productivity and the product quality. Investments are still made, even if at a slower pace, in upgrading technology and equipment (from sewing machines to cutting machines and CAD-CAM systems).

CAD (Computer Aided Design) software has been in use by designers to create sketches, croquets, patterns and silhouettes. Convergence of CAD technology with web technology is now aiming to increase production efficiency, customer satisfactory degree with modern-cheep-fit garments and reduce delivery times. [3]

Morgan Dynamics CAD software offers an adaptable solution to design patterns. Morgan is a group of companies, headquartered in Coccaglio (Brescia), Italy. The group leader is Morgan Tecnica Spa, which deals with the design and production of cutting machines for the textile industry, and, in general, for all industries where automated fabric spreading and cutting is required (clothing, furniture, upholstery, bed clothing etc.). Meanwhile, Morgan Dynamics srl deals with designing and developing software for the machines produced by Morgan Tecnica, as well as independent software, such as the CAD system. [5]

Morgan Dynamics CAD includes three modules: the MD Pattern Design program, the MD Best Nest program, and the MD Visual program.

The MD Pattern Design program can be used to design models, check product size for conformity with the specifications, check if pieces fit perfectly together for sewing, grade the products. Also, with this program, patterns can be digitized, models sent by email...
or on digital support by clients can be imported into it, or custom models can be created based on the exact measurements of clients. [4]

**MD Best Nest** does the nesting automatically and performs optimizations in the time frame established by the user. Manual nesting can also be done, or combinations of manual work and automation. [4]

The output of the MD Best Nest program is an optimized nesting of the model's patterns, which can be printed on a plotter (in HPGL format) at a 1:1 scale. Also, the optimized nesting corresponding to a customer order is saved in the cutting blueprint based on which that particular model will be cut. [4]

The MD Visual program helps convert patterns for a model made from paper or fabric, into digital format. This requires a camera and a contrast surface (large table with a black surface). The camera is connected to a computer on which the MD Visual program is installed. After the image is captured, the application converts it in geometric shapes and technical elements. [4]

The goal of the project was to design, using the Morgan Dynamics software, a men's shirt, S size, made 100% of cotton.[2]

![Figure 1. Men's shirt](image)

Left front has an ironed placket, 4cm wide.
Right front has a contrasting placket, 2.5cm wide.
The back has pleats and is made from two pieces: inset and tail.
The sleeves have two pleats and flat, 8cm long cuffs.

The collar has two distinct parts, cut separately:
- collar height is triple, in different contrasts, with different sizes;
- collar yoke.

**Contrast piece 1:** button placket; full yoke; the high collar; inner cuffs.
**Contrast piece 2:** middle collar.
The shirt has 14 buttonholes sewn with white thread, of which 10 buttonholes are on the front, in groups of two, and 4 are on the two cuffs.

2. DESIGNING PATTERNS IN MD PATTERN DESIGN

Table 1. The work modes in the MD Pattern Design software [4]

<table>
<thead>
<tr>
<th>PIECE</th>
<th>MODIFY</th>
<th>DRAW</th>
<th>INDUSTRIALIZE</th>
<th>DIGITIZE</th>
<th>GRADE</th>
<th>MEASURE AND CHECK</th>
<th>MADE TO MEASURE</th>
</tr>
</thead>
</table>

There are two ways of creating new models, which are: drawing and digitization. To build this shirt model both methods will be used. The first method will be drawing.

2.1. Designing front, back and sleeves by drawing

Building a new piece is done by drawing lines and points, freehand or by using math functions to establish distances, angles, movements and also by using functions to draw rectangles and squares, circles or ellipses. [4]

For the front, a rectangle was drawn in Drawing mode. While drawing, the app shows the measures of the shape, in the bottom left corner. These can be modified after drawing, by changing the values in the fields. The changes are applied to the shape by pressing the „Apply” button.

In the Modify mode, waypoints were created, to obtain the desired dimensions. After creating the waypoints, the internal guides were created using Industrialize mode, with the Create text guide option.
Afterwards, in \textit{Drawing mode} with the \textit{Draw freehand or using lines and points} option and the \textit{Draw freehand or using curves and points} option, the actual front was designed with the points created earlier.

These steps were repeated to create the back, sleeves and cuff, respectively.

\textbf{2.2. Designing the pattern for the collar through digitizing}

For this part, the Morgan Dynamics Visual program was used, which contains a table with a contrasting surface and with a camera connected to the computer.
First, the pattern for the collar and yoke were done manually, then they were placed on the digitization surface and their captured image was automatically loaded in the MD Visual software.[2]

After the photograph was taken, the image was converted to MDY format and saved.

To bring the captured image into the model project, the „Integrate” option is used.
With the basic patterns in place, the next step was to transform the basic pattern into a model pattern. The model patterns are used as a base for obtaining templates. Templates are graded in order to obtain all sizes in the range. [1]

3. GRADING THE SHIRT

In Grading mode the option "Edit set sizes" was selected. In the pop-up window the sizes for the set were generated, from XS to XXXL. [2]

By pressing the „Generate” button, the newly created sizes were displayed, and then the „Accept” button was pressed.
4. NESTING PATTERNS WITH MD BEST NEST PROGRAM

Launching the MD Best Nest program brought up the main window of the application, where the model was selected. The selection window was displayed and the folder and the „PMGY.mdy” type file were selected, respectively. After selecting the file, a window with all the guide marks of the product was loaded in the preview area, where the fabric type, fabric length, pieces, sizes and number of frames to be cut were selected, and the „Accept” button was pressed.

In the „Properties” table, rotation and flip type, space between the pieces and fabric shrinkage after laundering were selected.

Figure 11. The graded sizes and their respective colors for the back are displayed

Figure 12. The model is loaded

Figure 13. All the guide marks for the men's shirt are displayed

Figure 14. Properties table for the pieces
The next step was to automatically nest the patterns by using the “Automatic nesting” option. The time frame for the operation was established.

![Image of time frame for automatic nesting](image1)

Figure 15. Time frame for automatic nesting

After automatic nesting was completed, the image was saved to a file and sent to the plotter, by using the ”Send file to plotter” button, and was saved as ”PMGS.plt”.

![Image of simple nesting of base fabric](image2)

Figure 16. Simple nesting of base fabric

![Image of sending the model to the plotter](image3)

Figure 17. Sending the model to the plotter

As a final step the model can be sent to the automatic cutting machine, by pressing the “Export file to ISO” button, which produces a file with the ”.cut” extension.

![Image of exporting the file to the automatic cutting machine](image4)

Figure 18. Exporting the file to the automatic cutting machine
The same procedure was applied for nesting adhesive and contrast fabric.

Both simple nesting (just for size S), and combined nesting (sizes S, L, XXXL) were done.

5. CONCLUSION

It was noted that using the simple nesting (size S) for this shirt model leads to a higher fabric consumption than using combined nesting of three sizes (S, L, XXXL), the nesting efficiency for a fabric 1.45m wide being 81.32% for size S and 84.69% for three nested sizes.

Collar digitization was done in just a few minutes using the camera, while using the classic digitization system would have required approximately 30 minutes.
6. REFERENCES


