

### Beyond Abaya

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The knitting industry has evolved rapidly in the last two decades. Technology has advanced to the point that it can replace manual knitting and produce a whole garment by machine (Peterson et al., 2008). This has encouraged collaboration between the fashion industry and other industries, such as the sport and medical industries, and motivated designers to create novel products (West, 2019). Technology expands the limited potential of the manual knitting process, reduces production time and costs, and improves product quality (Spencer, 2001). The Shima Seiki SES-SWG machine is an example of knitting technology used to develop three-dimensional (3D) textures that meet the requirements of fit and comfort (Mahbub et al., 2014). Shima Seiki supports sustainability in two ways. First, its high-resolution, 3D virtual sampling eliminates the need for a design prototype, minimizing the number of production stages and lowering the cost of the product. Second, it enables recycling and reduces waste, thanks to its ability to shape and work with yarns spun from recycled fibers (Shima Seiki, 2020).

This creative project used a Shima Seiki knitting machine to create a unique *abaya*. Abaya is an Arabian Gulf traditional women's garment. It is a loose, full-length dress with long sleeves covering the entire body except for the head (Tashkandi, 2014). The *Beyond Abaya* silhouette was inspired by the *bisht*, an Arab men's gown (usually made of black wool with gold embroidery) worn on specific occasions by elders or men with prestige and position (Al-Mukhtar, 2012). The inspiration for the style was the creative contemporary Abayas of some Saudi designers such as Nihad Bakhrebah, Nouf Alsudairi, and Reema Alsahli.

In Arab Gulf countries such as the United Arab Emirates, Kuwait, Oman, Bahrain, Qatar, and Saudi Arabia, the demand for abayas is high (Kim et al., 2012). Arab women are encouraged to dress modestly because of Islamic beliefs, making it a popular garment. These are also conservative cultures that value traditions and customs (Al-Qasimi, 2010; Kim et al., 2012). In Saudi Arabia, Sharia law requires that women wear an abaya in public. Saudi women are also passionate about clothes and fashion, an interest reflected in their design and purchase of abayas with distinctive colors, fabrics, and trims (Tashkandi, 2014).



Figure 1. KSA's National Emblem

This project offers creative ideas for modern Fall/Winter abaya collections that keep pace with trends in Arab womenswear markets and the knitting industry. The *Beyond Abaya* is an ideal design to be worn in celebrations or events inside the Kingdom of Saudi Arabia (KSA) or abroad when it is the time to represent Saudi Arabia as a country or culture, such as Saudi National Day or international cultural festivals. The *Beyond Abaya* design consists of two pieces: a sleeveless, ribbed maxi dress and a long, kimono-style gown with an opening on both sides to insert the hands. The KSA's national emblem (Figure 1) is used as a digital

print placed on the gown pieces, arranging orderly on the middle-center back piece and randomly on the others. The KSA emblem was adopted in 1950 (Assaf, 2010; Sami, 2019) and contains two elements: a green palm tree that represents originality and prosperity and crossed white swords that represent justice and strength. A JPG image of the emblem was first converted to a jacquard knit structure before being applied to the gown's knitted pieces.

The design was sketched and simulated in CLO3D™ software. The patterns were drafted in US Size 6 using Illustrator software. Due to the difficulty of finding the accurate pattern of the bisht, the designer drafted the patterns based on a combination of female and male patterns of an Arabian Gulf traditional cape (Patternsew, 2017). The patterns had to be modified to match the original silhouette of the bisht. Meanwhile, the designer had to consider the knitting machine's width limit by splitting large pieces into small ones, resulting in seven pattern pieces (five for the gown and two for the fitted dress). Then, all the pattern pieces were exported from Illustrator into JPGs and converted to knitting patterns in the Shima Seiki program. Sample pieces were knitted to test the knitted structure's course and wales densities, defined as "the total number of loops in a measured area" (Spencer, 2001, p.17), so that the resulting knitted pieces would keep the intended pattern dimensions. The ribbed dress was knitted with a seven-gauge machine, and the gown was knitted with a 14-gauge machine. The machine gauge is used to define the "spacing of the needles in the needle bed" (Spencer, 2001, p.4), with smaller numbers being coarser and large numbers being finer.



Figure 2. lace Structure



Figure 3. Cable Structure

The dress was designed with lace structures (Figure 2) at the hem and cables and meshes (Figure 3) on the main body. In order to highlight the structure variations, it was knitted in a solid color. For the gown, a jacquard structure with a one-by-one backing method was chosen, as the multi-color KSA emblem motif could not be achieved by the intarsia method. Before processing to the machine for knitting, it was necessary to avoid problems, such as transfer with overlapped loops, racking wearing out yarn, and transfer with pick up stitch, to maximize the knitting success. Shima Seiki also provides simulation of the final pieces to help check for visual defects and ensure flawless results. Four stitches were added as a seam allowance to each garment before knitting. This facilitated machine sewing the pieces together to achieve the final knitted garments.

Aesthetic handworks were added to the garments as well using gold metallic twisted cords, gold metal pyramid studs, and white multi-shaped pearls. The cords were used to accentuate the seams of the gown. The pearls were applied to highlight the shape of the KSA emblem motifs in the gown and to improve the appearance of the neckline and the hem of the dress. The studs were placed around the neckline area to create a stripe/band that imitated the structure of the stripe in the bisht.

Rendering *Beyond Abaya* design in CLO3D™ software utilized a sustainable practice to generate a realistic virtual prototype of the final look of the design. The 3D simulation software allowed the designer to view the design from different angles in a three-dimensional shape, manipulate it, and make revisions quickly and accurately.

Regarding the design's contribution and innovation, this piece expanded on existing designs that use Shima Seiki technology, with a focus on novelty and sustainability. The designer integrated traditional costumes with technology to revive KSA's national heritage and introduce it to other countries. The designer recommends visualizing the designs in 3D modeling software, such as CLO3D™. Finally, the moral value of the piece is highlighted as the design is zero waste.

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