

APPLIED TEXTILE SCIENCE AND FASHION ENGINEERING IN THE DEVELOPMENT OF LIFESTYLE APPAREL FOR WOMEN AND MEN

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ABSTRACT

This article explores the interdisciplinary application of textile science, garment engineering, and fashion management in the design and production of contemporary lifestyle garments. Focusing on three key case studies—a women's nightwear set, a women's oversized T-shirt dress, and a men's casual wrap shirt—this study highlights how material selection, ergonomic design, and efficient construction contribute to comfort, durability, and commercial viability. Through systematic analysis of fabric properties, pattern development, garment construction, and cost management, each project demonstrates how engineering precision and fashion aesthetics can co-exist to meet modern consumer expectations.

1. INTRODUCTION

The contemporary apparel industry increasingly demands products that combine scientific performance with consumer-centric aesthetics. Garments today must not only offer comfort and durability but also align with environmental standards and market trends. This article presents a comprehensive exploration of how applied textile science and fashion engineering principles were used in the development of three lifestyle garments:

- (1) A Women's Nightwear Set,
- (2) A Women's Oversized T-shirt Dress, and
- (3) A Men's Casual Wrap Shirt.

Each project integrates fabric engineering, ergonomic design, quality control, and cost optimization to meet functional and visual expectations while supporting sustainable and scalable production.

2. FABRIC ENGINEERING AND MATERIAL SELECTION

2.1 Women's Nightwear Set

100% cotton was selected for its soft hand feel, moisture absorbency, and thermal comfort. Key engineering parameters considered included:

- **GSM:** Optimal for breathability and drape.
- **Yarn Count & Twist:** Finer yarns for skin comfort.
- **Knit Structure:** Interlock or single jersey for flexibility.
- **Shrinkage Control:** Pre-treated using compacting methods.
- **Fabric Testing:** Included tensile strength, colorfastness, and air permeability based on ISO standards.



TOP

BOTTOM

2.2 Women's Oversized T-Shirt Dress

Composed of 100% combed cotton terry fabric, this garment emphasized tactile comfort and visual appeal.

- **GSM:** 190–200, supporting structure and comfort.
- **Yarn Count:** 30s Ne with terry backing for softness.
- **Pre-treatment:** Bio-scouring and compacting to reduce shrinkage.

- **Finishes:** Enzyme and silicon softeners for smoothness.
- **Testing:** Conducted per ISO 105-C06 and ISO 13934 for colorfastness and tensile strength.



2.3 Men's Casual Wrap Shirt

Lightweight, breathable fabrics such as cotton and cotton-linen blends were employed to ensure wearability.

- **GSM:** 120–160 for structure without stiffness.
- **Knit Type:** Interlock for fabric uniformity.
- **Shrinkage Control:** Sanforization applied.
- **Finishes:** Bio-wash and softeners enhanced surface feel and longevity.



3. DESIGN AND PATTERN ENGINEERING

3.1 Women's Nightwear Set

The garment prioritized sleep comfort through:

- Relaxed-fit silhouettes and functional ease.
- Digital or pigment-printed floral motifs for visual appeal.
- Ergonomic grainline construction to minimize distortion.
- Patterns developed manually and through CAD for production efficiency.

3.2 Women's Oversized T-Shirt Dress

Design elements included:

- A straight relaxed silhouette with drop-shoulder sleeves.
- Looney Tunes graphic print on the front panel for brand relevance.
- Vertical pinstripes to elongate the figure visually.
- Contrast ribbed collar and ease allowances designed via CAD (S–XL grading).

3.3 Men's Casual Wrap Shirt

A non-traditional approach that integrated:

- Wrap construction with side ties or concealed buttons.
- Bias-cut areas or darts for mobility and body adaptability.
- Balanced symmetry to maintain visual harmony in closure.
- Pattern precision essential for wrap overlap and fit integrity.

4. GARMENT CONSTRUCTION ENGINEERING

Technical Aspects Across Garments

- **Stitch Type & SPI:** Lockstitch and overlock used across all garments with SPI of 10–12 to ensure strength.
- **Seam Types:** Flat seams (nightwear), flat/lapped seams (T-shirt), French/flat-felled seams (wrap shirt).
- **Thread Type:** 100% cotton or polyester, with 15% wastage factored in.
- **Additional Elements:**
 - Elastic waistbands and lace trims for nightwear.
 - Ribbed collar and structural hem in the oversized T-shirt.
 - Ergonomic closures in the wrap shirt.

Finishing Treatments

All garments underwent finishing treatments like:

- Bio-wash for smoothness.
- Silicon or enzyme treatments for drape and hand feel.
- Proper pressing, labeling, and packaging per export standards.

5. FASHION MANAGEMENT AND COSTING ANALYSIS

Costing Considerations across Projects

- **Fabric Cost:** Calculated based on GSM, fabric width, and consumption.
- **Thread & Trims:** Included 15% wastage allowance.
- **Printing & Finishing:** Based on chemical use and surface area.
- **Labor & Packaging:** Included under indirect overheads.
- **Pre- vs. Post-Costing:** Evaluated to assess profitability and wastage control.

The analysis ensured all garments remained competitively priced while supporting sustainable margins.

6. QUALITY EVALUATION AND TESTING

Each garment underwent rigorous quality assessments:

Parameter	Nightwear Set	Oversized T-Shirt	Men's Wrap Shirt
Colorfastness	ISO 105-C06	AATCC 61	ISO 105-C06
Seam Strength	Manual testing	ISO 13935-2	Visual and tensile checks
Pilling Resistance	Not applicable	ISO 12945-2	Low pilling via bio-wash
Dimensional Stability	Controlled via compacting	Tested after 5 wash cycles	Maintained via pre-shrinking
Stitch Uniformity	Manual inspection	Visual and tactile checks	Operator QA review

All garments met standard quality benchmarks and passed inspection protocols for domestic and export readiness.

7. CONCLUSION

The integrated development of the women's nightwear set, oversized T-shirt dress, and men's wrap shirt underscores the synergy between applied textile science and fashion engineering. Each project successfully balanced aesthetics with performance through:

- Scientifically selected and engineered fabrics
- Ergonomic and user-centric design approaches
- Efficient and sustainable garment construction
- Data-backed costing and rigorous quality testing

These case studies exemplify how apparel engineering today must go beyond style, embracing innovation, comfort, and sustainability to meet dynamic market expectations. As the fashion industry continues to evolve, such interdisciplinary models serve as valuable blueprints for scalable, ethical, and commercially viable apparel design.

8. REFERENCES

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