DEVELOPMENT OF SWEAT PROTECTIVE CAMISOLE INBUILT WITH BRASSIER

A PROJECT REPORT

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ABSTRACT

Intimate garments are clothes worn under other clothes, often next to the skin. They keep outer garments from being soiled by bodily secretions and discharges, shape the body, and provide support for body parts. Since it is in closer contact to the body, it requires material which is skin friendly. The intimate apparel worn should give proper fit and comfort to the wearer.

Sweat is a fluid which affects the comfort property, causes yellowing on its surface and even degrades the fabric. These problems are caused mainly by the microbes present in the sweat, which also is the reason for development of odour, irritation and infections. Sweating cause great embarrassment due to sweat soaked clothing. Thus sweat management becomes essential and if made available in a cost effective way, it can also become an affordable necessity for all the consumers at various stratas.

Some of the remedies for sweat protection, available in the market are under arm pads, absorbent tissues, sweat protective camisoles etc. Pads and tissues give protection only to the under arms and camisole though it gives sweat protection to a larger area, it requires an additional lingerie to be worn for better fit. The objective of our study is to develop a sweat protective camisole incorporated with the features of a brazier. This will be cost effective and will also improve the comfort of the wearer.

Undergarment sweat management for women can be boiled down to the dress shield. There are disposable dress shields that can be taped or sewn into your outer garment, washable dress shields that come in varying degrees of protection. The choice of clothes gets reduced for a person who has excessive underarm sweating. To overcome these problems sweat management apparels are coming into existence. Considering the discomfort for the women in wearing a lingerie under a sweat protective camisole, a camisole cum brassier is developed.

A lingerie trend research has been done in the Coimbatore market through a retail survey and brand survey and details regarding brands available, textile materials used , available fit, colors and style features, sizing details, consumer preferences, general complaints etc have been consolidated. As per the survey and owing to their higher comfort properties, cotton/lycra and Modal/lycra single jersey knitted fabric have been selected for the developed lingerie.

A combination of functional finishes which comprised of anti microbial, hydrophobic and hydrophilic finishes, were given to the selected fabrics finally targeting to give the required sweat protection.

To analyze and compare the comfort properties of the two selected fabrics crease recovery, abrasion resistance, wettability, wickability, pilling test, perspiration test, air permeability ,water vapour and permeability tests have been done both on the finished and unfinished fabrics. 3 lingerie designs were developed in the best styles and the mostly sold sizes in the market, incorporating the features of a brassier to give better fit, comfort and under arm sweat protection. After the pattern development, fit analysis and grading the 3 lingerie designs were constructed in the finished fabrics. Modal/lycra sweat protected fabric exhibited better comfort and anti microbial properties than cotton/lycra sweat protected fabric. Sweat protective finishes applied on the selected 2 fabrics have considerably improved the comfort properties and sweat protection properties of the selected fabrics. The developed camisole cum brazier is also cost effective when compared to the existing sweat protective products in the market. This product would provide better solution for all type of garments and is hoped to gain more attraction in future.

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INTRODUCTION

INTRODUCTION:

The Lingerie industry is witnessing robust growth. The key factors driving the Lingerie market is the increasing size of the organized retail, growing urbanization, growing consumer class, increasing per capita disposable income and changing lifestyle. At present ,lingerie as a product category has a wide product base to offer ,while innovative developments serving as its backbone. In the modern consumer market, meeting the consumer needs is the key factor for success and the only way to determine the needs is to measure them by subjective methods and find out the relationships between subjective results and physically measurable parameters. A retail survey and a brand survey would help in consolidating the comfort features of a lingerie.

Fit and comfort are the most important criteria for the lingerie design. The basic comfort problems of people were mostly related to ease of movement, sweating and garment fit. Sweat degrades the fabric quality, causes yellowing and the stain doesn't go off easily. The chemical structure of the fabric gets affected ,thus reducing the durability. Sweat mainly contains water, minerlas and urea. The minerals generally present in sweat are sodium, potassium, calcium and magnesium. Perspiration is basically odourless but it takes an unpleasant smell when it comes into contact with the microbes on the skin.

Sweating cause great embarrassment due to soaked clothing. Some women use various strategies in order to keep their underarm sweat under control like using pads shields absorbent tissues and frequent clothing changes which helps in minimizing the severity of the odor arising of sweat and thus allowing to work comfortably. These products do not give protection to the entire garment. The camisoles available in the market have a disadvantage of wearing a brassier additionally below them for the bust support which in turn would reduce the comfort of the wearer. The objective of the project would be to develop a camisole inbuilt with brazier to give a better sweat management for a wider area, provide comfort to the wearer and protect outer garments from sweat. This product would be cost effective and would give better comfort. This product is expected to replace the existing sweat management products in the market which gives protection only to the armpits. The proposed product is expected to be a commercial success

LITERATURE REVIEW

2. LITERATURE REVIEW:

2.1 MARKET RESEARCH :

2.1.1 INTRODUCTION :

Marketing research is "the function that links the consumers, customers, and public to the marketer through information. Information used to identify and define marketing opportunities and problems; generate, refine, and evaluate marketing actions; monitor marketing performance; and improve understanding of marketing as a process. Marketing research specifies the information required to address these issues, designs the method for collecting information, manages and implements the data collection process, analyzes the results, and communicates the findings and their implications."Marketing research is the systematic gathering, recording, and analysis of data about issues relating to marketing products and services. The goal of marketing research is to identify and assess how changing elements of the marketing mix impacts customer behavior. The term is commonly interchanged with market research; however, expert practitioners may wish to draw a distinction, in that market research is concerned specifically with markets, while marketing research is concerned specifically about marketing processes.

Marketing research is often partitioned into two sets of categorical pairs, either by target market:

- Consumer marketing research, and
- Business-to-business (B2B) marketing research

Or, alternatively, by methodological approach:

- Qualitative marketing research, and
- Quantitative marketing research

Consumer marketing research is a form of applied sociology that concentrates on understanding the preferences, attitudes, and behaviors of consumers in a market-based economy, and it aims to understand the effects and comparative success of marketing campaigns. The field of consumer marketing research as a statistical science was pioneered by Arthur Nielsen with the founding of the ACNielsen Company in 1923.

Thus, marketing research may also be described as the systematic and objective identification, collection, analysis, and dissemination of information for the purpose of assisting management in decision making related to the identification and solution of problems and opportunities in marketing.

A market survey is a systematic collection, recording, analysis and interpretation of data relating to the existing or potential market for a product or services. A market survey is an important requirement for initiating any successful business. The objective of a market survey is to collect information on various aspects of the business. This survey is a tool through which we can minimize risk. After the market survey, the results must be analyzed in order to finalize a business plan.

A market survey is a useful tool for contact with the market. The systematic and intelligent use of this tool can reduce risks of decision making under conditions of uncertainty

Through a market survey we can obtain information in the following areas:

- size of market
- pattern of demand
- buying habits and motives
- past and present trends for this or other products

The following five steps in doing a market survey were also discussed in the session:

Step1: Define objectives and specify information to be collected

- Identifying sources of information
- Assessing time and costs required for the survey
- Selecting methodology
- Preparing an action plan

Step 2: Select a sample

- Determining where to conduct the survey
- Determining when to conduct the survey

Step 3: Prepare a questionnaire for the survey

Step 4: Collect data and analyze the information obtained

Step 5: Prepare a report based on data analyzed

2.1.2 CLASSIFICATION OF MARKETING RESEARCH:

Organizations engage in marketing research for two reasons: (1) to identify and (2) solve marketing problems. This distinction serves as a basis for classifying marketing research into problem identification research and problem solving research.

Problem identification research is undertaken to help identify problems which are, perhaps, not apparent on the surface and yet exist or are likely to arise in the future like company image, market characteristics, sales analysis, short-range forecasting, long range forecasting, and business trends research. Research of this type provides information about the marketing environment and helps diagnose a problem.

Standardized services are research studies conducted for different client firms but in a standard way. For example, procedures for measuring advertising effectiveness have been standardized so that the results can be compared across studies and evaluative norms can be established. Customized services offer a wide variety of marketing research services customized to suit a client's specific needs. Each marketing research project is treated uniquely.

- Limited-service suppliers specialize in one or a few phases of the marketing research project. Services offered by such suppliers are classified as field services, coding and data entry, data analysis, analytical services, and branded products. Field services collect data through mail, personal, or telephone interviewing, and firms that specialize in interviewing are called field service organizations. These organizations may range from small proprietary organizations which operate locally to large multinational organizations with WATS line interviewing facilities. Some organizations maintain extensive interviewing facilities across the country for interviewing shoppers in malls.
- Coding and data entry services include editing completed questionnaires, developing a coding scheme, and transcribing the data on to diskettes or magnetic tapes for input into the computer. NRC Data Systems provides such services.

- Analytical services include designing and pretesting questionnaires, determining the best means of collecting data, designing sampling plans, and other aspects of the research design. Some complex marketing research projects require knowledge of sophisticated procedures, including specialized experimental designs, and analytical techniques such as conjoint analysis and multidimensional scaling. This kind of expertise can be obtained from firms and consultants specializing in analytical services.
- Data analysis services are offered by firms, also known as tab houses, that specialize in computer analysis of quantitative data such as those obtained in large surveys. Initially most data analysis firms supplied only tabulations (frequency counts) and cross tabulations (frequency counts that describe two or more variables simultaneously). With the proliferation of software, many firms now have the capability to analyze their own data, but, data analysis firms are still in demand.
- Branded marketing research products and services are specialized data collection and analysis procedures developed to address specific types of marketing research problems. These procedures are patented, given brand names, and marketed like any other branded product.

TYPES OF MARKETING RESEARCH:

Marketing research techniques come in many forms, including:

- Ad Tracking – periodic or continuous in-market research to monitor a brand's performance using measures such as brand awareness, brand preference, and product usage. (Young, 2005)
- Advertising Research – used to predict copy testing or track the efficacy of advertisements for any medium, measured by the ad's ability to get attention (measured with Attention Tracking), communicate the message, build the brand's image, and motivate the consumer to purchase the product or service. (Young, 2005)
- Brand equity research - how favorably do consumers view the brand?
- Brand association research - what do consumers associate with the brand?
- Brand attribute research - what are the key traits that describe the brand promise?

- Brand name testing - what do consumers feel about the names of the products?
- Commercial eye tracking research - examine advertisements, package designs, websites, etc. by analyzing visual behavior of the consumer
- Concept testing - to test the acceptance of a concept by target consumers
- Cool hunting - to make observations and predictions in changes of new or existing cultural trends in areas such as fashion, music, films, television, youth culture and lifestyle
- Buyer decision processes research - to determine what motivates people to buy and what decision-making process they use
- Copy testing – predicts in-market performance of an ad before it airs by analyzing audience levels of attention, brand linkage, motivation, entertainment, and communication, as well as breaking down the ad's flow of attention and flow of emotion. (Young, p 213)
- Customer satisfaction research - quantitative or qualitative studies that yields an understanding of a customer's satisfaction with a transaction
- Demand estimation - to determine the approximate level of demand for the product
- Distribution channel audits - to assess distributors' and retailers' attitudes toward a product, brand, or company
- Internet strategic intelligence - searching for customer opinions in the Internet: chats, forums, web pages, blogs... where people express freely about their experiences with products, becoming strong opinion formers.
- Marketing effectiveness and analytics - Building models and measuring results to determine the effectiveness of individual marketing activities.
- Mystery consumer or mystery shopping - An employee or representative of the market research firm anonymously contacts a salesperson and indicates he or she is shopping for a product. The shopper then records the entire experience. This method is often used for quality control or for researching competitors' products.
- Positioning research - how does the target market see the brand relative to competitors? - what does the brand stand for?
- Price elasticity testing - to determine how sensitive customers are to price changes

- Sales forecasting - to determine the expected level of sales given the level of demand. With respect to other factors like Advertising expenditure, sales promotion etc.
- Segmentation research - to determine the demographic, psychographic, and behavioural characteristics of potential buyers
- Online panel - a group of individual who accepted to respond to marketing research online
- Store audit - to measure the sales of a product or product line at a statistically selected store sample in order to determine market share, or to determine whether a retail store provides adequate service
- Test marketing - a small-scale product launch used to determine the likely acceptance of the product when it is introduced into a wider market
- Viral Marketing Research - refers to marketing research designed to estimate the probability that specific communications will be transmitted throughout an individual's Social Network. Estimates ofSocial Networking Potential (SNP) are combined with estimates of selling effectiveness to estimate ROI on specific combinations of messages and media.

All of these forms of marketing research can be classified as either problem-identification research or as problem-solving research.

There are two main sources of data - primary and secondary. Primary research is conducted from scratch. It is original and collected to solve the problem in hand. Secondary research already exists since it has been collected for other purposes. It is conducted on data published previously and usually by someone else. Secondary research costs far less than primary research, but seldom comes in a form that exactly meets the needs of the researcher.

A similar distinction exists between exploratory research and conclusive research. Exploratory research provides insights into and comprehension of an issue or situation. It should draw definitive conclusions only with extreme caution. Conclusive research draws conclusions: the results of the study can be generalized to the whole population.

Exploratory research is conducted to explore a problem to get some basic idea about the solution at the preliminary stages of research. It may serve as the input to conclusive research. Exploratory research information is collected by focus group interviews, reviewing literature or books, discussing with experts, etc. This is unstructured and qualitative in nature. If a secondary source of data is unable to serve the purpose, a convenience sample of small size can be collected. Conclusive research is conducted to draw some conclusion about the problem. It is essentially, structured and quantitative research, and the output of this research is the input to management information systems (MIS).

Exploratory research is also conducted to simplify the findings of the conclusive or descriptive research, if the findings are very hard to interpret for the marketing managers.

2.1.3 METHODS AND THEIR APPLICATIONS:

While there are many ways to perform market research, most businesses use one or more of five basic methods: surveys, focus groups, personal interviews, observation, and field trials. The type of data you need and how much money you're willing to spend will determine which techniques you choose for your business.

1. Surveys: With concise and straightforward questionnaires, you can analyze a sample group that represents your target market. The larger the sample, the more reliable your results will be.

- In-person surveys are one-on-one interviews typically conducted in high-traffic locations such as shopping malls. They allow you to present people with samples of products, packaging, or advertising and gather immediate feedback. In-person surveys can generate response rates of more than 90 percent, but they are costly. With the time and labor involved, the tab for an in-person survey can run as high as $100 per interview.
- Telephone surveys are less expensive than in-person surveys, but costlier than mail. However, due to consumer resistance to relentless telemarketing, convincing people to participate in phone surveys has grown increasingly difficult. Telephone surveys generally yield response rates of 50 to 60 percent.

- Mail surveys are a relatively inexpensive way to reach a broad audience. They're much cheaper than in-person and phone surveys, but they only generate response rates of 3 percent to 15 percent. Despite the low return, mail surveys remain a cost-effective choice for small businesses.
- Online surveys usually generate unpredictable response rates and unreliable data, because you have no control over the pool of respondents. But an online survey is a simple, inexpensive way to collect anecdotal evidence and gather customer opinions and preferences.

2. Focus groups: In focus groups, a moderator uses a scripted series of questions or topics to lead a discussion among a group of people. These sessions take place at neutral locations, usually at facilities with videotaping equipment and an observation room with one-way mirrors. A focus group usually lasts one to two hours, and it takes at least three groups to get balanced results.

3. Personal interviews: Like focus groups, personal interviews include unstructured, open-ended questions. They usually last for about an hour and are typically recorded.

Focus groups and personal interviews provide more subjective data than surveys. The results are not statistically reliable, which means that they usually don't represent a large enough segment of the population. Nevertheless, focus groups and interviews yield valuable insights into customer attitudes and are excellent ways to uncover issues related to new products or service development.

4. Observation: Individual responses to surveys and focus groups are sometimes at odds with people's actual behavior. When you observe consumers in action by videotaping them in stores, at work, or at home, you can observe how they buy or use a product. This gives you a more accurate picture of customers' usage habits and shopping patterns.

5. Field trials: Placing a new product in selected stores to test customer response under real-life selling conditions can help you make product modifications, adjust prices, or improve packaging. Small business owners should try to establish rapport with local store owners and Web sites that can help them test their products.

2.1.4 TYPES OF QUESTIONNAIRES:

Different kinds of closed and open-ended questions that can be used in surveys are listed below:

Closed-ended questions

Four types of closed-ended questions are most commonly used: rating scale, forced choice, dichotomous and demographic/firmographic questions (firmographic data is concerned with company or industry type, size, etc.). It should be noted that by making sure that the scales of a question are the same for all questions, the ratings can be directly compared with each other.

Rating scale questions

Respondents assess the issue based on a given dimension. Three frequently used types of rating scale questions are Likert-type scales, balanced scale and semantic differential.

1. Likert-type scales

- Value: This is a good measure of overall attitude toward a product or service, or of attitudes toward specific facets of a product or service.
- Strengths: It is quick and flexible for analysis, and enables easy comparison with competitors.
- Weaknesses: It is susceptible to error because it does not address the issue of "why" and requires clear, complete development work before the survey is launched in order to identify all necessary facets to be measured.

2. Balanced scale

- Value: It attempts to predict future purchase behavior.
- Strengths: It is quick and flexible for analysis.

- Weaknesses: It does not address the issue of "why" and requires clear, complete development work before the survey is launched in order to identify all necessary facets to be measured.

3.Semantic differential

- Value: It can assess an intuitive or conceptual response to a product or service.
- Strengths: It is quick and flexible for analysis, and enables easy comparison with competitors.
- Weaknesses: Depending on the abstraction of items, it can create respondent resistance. It does not address the issue of "why" and requires clear, complete development work before the survey is launched in order to identify all necessary facets to be measured.

4. Forced-choice questions

Respondents must choose among a set of alternatives.

5. Paired comparisons

Respondents must choose between two alternatives.

- Value: It can assess rank ordering of objects and identify degree of difference between objects. It also forces discrimination among objects.
- Strengths: It is quick and avoids uncertainty. It also forces discrimination among alternatives.
- Weaknesses: There are a limited number of options and can be fatiguing for the respondent. It does not address the issue of "why" and tends to have decreased reliability for mid-range responses.

6. Forced preference

With this type of question, respondents are required to choose among several alternatives. There are two types of forced-preference questions: 1) The forced-preference ranking

approach requires sequential ranking from high to low until all factors are ranked. 2) The alternation ranking approach requires rank ordering that alternates between most favourite and least favorite until all factors are ranked.

- Value: It enables identification of "best" and "worst".
- Strengths: It is quick and forces discrimination among alternatives.
- Weaknesses: There are a limited number of objects and can be fatiguing for the respondent. It doesn't answer "why" questions, and has decreased reliability for mid-range responses.

7. Dichotomous questions

Respondents must choose between two alternatives.

- Value: It enables identification of quality.
- Strengths: It is quick and does not allow ambivalent answers.
- Weaknesses: It does not allow for a certain degree of sensitivity and differentiation.

8. Demographic/firmographic questions

Demographic/firmographic questions are asked at the conclusion of the study for classification purposes in analysis.

- Value: It enables researchers to place respondents into categories.
- Strengths: It is quick.
- Weaknesses: Some questions (e.g., salary) may be considered offensive to respondents and generally, it does not address the issue of "why".

9. Open-ended questions

There are two types of open-ended questions: free response and free response with pre-codes.

A. Free response

- Value: It allows respondents to define central issues and enables the development of closed-ended questions. It can also collect a respondent's actual words/response.
- Strengths: It addresses the issue of "why" and fully represents a respondent's understanding of an object.
- Weaknesses: It takes more time than closed-ended questions.

B. Free response with pre-codes

- Example: "What do you see as the strengths of this product? a) You don't have to use it with other products; b) Ease of application; c) It is effective; d) Other (specify); e) None; f) Don't know."
- Value: It allows respondents to define central issues.
- Strengths: It takes less time than free response and addresses the issue of "why".
- Weaknesses: It takes more time than closed-ended questions.

2.1.5 RETAIL SURVEYING :

Retail Market Research is conducted so that retailers might learn more about their target demographic and how to meet their needs and wants. It is also done to learn about opinions, trends, and the competition.

Conducting research prior to launching new products or services is vital. Moreover, getting consumer opinions about current products can provide many growth opportunities. Ultimately, the goal is to improve sales, and market research is the key as it sheds light on areas where the best ROI can be realized.

Retail Market Research Benefits:

- Learn about retail trends
- Improve marketing / advertising efforts
- Gauge interest in new products or services
- Locate new customers
- Improve products / services / retention

2.1.6 BRAND SURVEYING :

Brand positioning is the process by which organizations attempt to create an outstanding identity or image in the minds of their target market for its product, brand or organization. It is the relative competitive comparison their product occupies in a given market as perceived by the target market.

Purpose of Brand Positioning Surveys / Brand Research:

Surveys are a big part of a successful brand positioning strategy that will help you out-maneuver competing brands, and rise to the top and/or stay at the top of your industry.

With watchful research, a winning strategy can be prepared to carefully plan and time your brand position. For instance, being first-of-a-kind on the market is not necessarily a winning brand positioning strategy for a product launch. Sometimes in order to be in the strongest brand position, arriving second-to-market may more effectively exceed first-to-market expectations. Of course, these strategies will vary according to your company and product specifics. Ultimately, it is these kinds of approaches, along with improvements, that will aim to differentiate your brand from competitors and make it the superior brand that comes to mind when considering your products or services.

Types of Brand Positioning Surveys and Research

1. Brand Awareness Research Survey
2. Brand Identity Research Survey
3. Brand Image Research Survey
4. Brand Loyalty Research Survey
5. Brand Perception Research Survey
6. Brand Strategy Research Survey
7. Brand Tracking Research Survey

2.2 INTIMATE WEAR:

2.2.1 INTRODUCTION:

Intimate apparels are clothes worn under other clothes, often next to the skin. They keep outer garments from being soiled by bodily secretions and discharges, shape the body, and provide support for parts of it. In cold weather, long underwear is sometimes worn to provide additional warmth. Some undergarments are intended for erotic effect. Special types of undergarments have religious significance. Some items of clothing are designed as underwear, while others, such as T-shirts and certain types of shorts, are appropriate both as undergarments and as outer clothing. If made of suitable material, some undergarments can serve as nightwear or swimsuits.

Undergarments are generally of two types, those that are worn to cover the torso and those that are worn below the waist, though garments which cover both also are available. Different styles of undergarments are generally worn by women and men. Undergarments commonly worn by women today include brassieres and panties (known in the United Kingdom as knickers), while men often wear briefs, boxer briefs or boxer shorts. Items commonly worn by both sexes include T-shirts, sleeveless shirts (also called singlets or tank tops), bikini underwear, thongs, and G-strings.

2.2.2 CLASSIFICATION OF INTIMATE WEAR:

Brassier :

A brassiere or a bra as it is most commonly known is used to support, cover and elevate the breasts. The specific degree in which the bra frames the breasts varies between style, fashion, functionality and the type of fabric. Many of the different designs were created mainly in order to hide the straps but some were created specifically to be more risque and expose a bit more. The bra more than any other type of underwear has the most amount of types which can include full coverage, backless, convertible, front-fastening, halter, longline, minimizing, padded, plunge or u-plunge, racerback, sports/athletic, strapless, strapless-backless, bandeau. The following bra styles are more associated with the term lingerie such as the balconette, cupless, demi cup, underwired, wireless, peephole and of course the push-up. Adhesives are also becoming more popular as the technology is getting much better.

Thongs :

If you want to emphasize your perfect bottom, thongs and G-strings are perfect for you. Both are very similar, as they keep the cheeks of your bottom exposed with only a string or a thin cloth holding them from one end to the other. If you look up its history, thongs were one of the oldest forms of clothing originally worn by men to hide their anatomy but thongs are commonly used by women many times to hide their panty lines while wearing tight fitting or light colored clothing. There are many types of thongs.

Baby Doll:

A babydoll nightie is a short, soft gown or negligee which sometimes could be sleeveless and many times comes with built-in bra-like cups. It is very sweet looking yet very sexy. It has a soft flowing skirt and is usually made of silk, nylon or a sheer material. A baby-doll fully exposes the woman's legs, and some styles emphasize or deliberately expose the breasts as well. Babydolls usually come with a matching panties since it is short enough to expose your underwear. This style is perfect for women of all ages. For younger women, it brings out the natural sweetness of youth, and for the successful, made-up woman, it provides a young, sweet look any man or woman will appreciate.

Garters and Garter Belts:

Garters were created mainly to hold up your stockings but with the advent of elastic their main purpose of why they are worn today is for fashion or more to the point, to be sexy! The garter belt is a band worn directly on the skin around the waist. The belt has between four and eight straps that dangle to strap onto sexy stockings or thigh-highs. When you purchase a garter belt it usually comes with a thong as a set and can be worn with or without a bra. Since garters and garter belts are not really necessary for function many consider this a very erotic piece.

Camisole:

The camisole is a short, loose-fitting sleeveless top that has a length that goes to the waist. A camisole can sometimes be cropped to expose the midriff. They also can be a bit longer too but always shorter than a chemise. It can be worn like a slip underneath a sweater, or it can be worn with a jacket. If you don't have much lingerie in your wardrobe, buying more of these which you can wear as a top can give you a big boost in your lingerie collection. It is sexy and erotic, whether worn with jeans outside the home or with matching panties inside the bedroom.

Teddy:

A teddy is more like a combination of a camisole and panty in one piece. Think of a one-piece bathing suit but sexier and you have a good idea what a teddy is. It is typically made with a silky or sheer type of material. A teddy was once known as a camiknicker a named coined from the combination of camisole and knickers. Some teddy's do come in two pieces so usually it comes with a matching pair of skimpy panties you can wear with it. Common styles of teddies include embroidered, halter, lace, leather, peek-a-boo, sheer, print, and pvc vinyl.

Chemise:

One of the simplest of all lingerie pieces is the chemise, a short gown that falls just above the knees. In the olden days it was also called a shift and was the only article of clothing that was laundered frequently. Very similar to the babydoll however the chemise fits tighter to the body. Its silky material drops naturally around your body, giving you that sexy, refined look.

Bustier:

A bustier is a form-fitting strapless bra that goes down all the way to the waist. Its primary function is to push up the bust by tightening up against the midriff. It can be made out of silk or any other kind of silky cloth. This look can be very sexy, as it is designed to push up your breast line to make your breasts look fuller and create more cleavage. The boning material used to support the breasts also aid in creating a slimming figure in your waist. Bustiers are traditionally tightened at the back via lacing, hook and eye closures and/or zippers. For those of you on the more adventurous side when it comes to sex, bustiers have been suggested as the best lingerie for erotic asphyxiation.

Peignoir:

A peignoir is a very long gown that goes all the way to the ankles. It is usually made of silk and gives you that sophisticated look. They are often worn without underwear. This not-so-covered up look can be very alluring. The reserved yet dazzling image it eludes to can excite any man's fancy.

Nightgown:

A nightgown or nightie, which is a short version of a nightgown is one of the simplest forms of lingerie. Usually made for comfort while you sleep, a nightgown can come in a variety of styles and fabrics, with sleeves of any type to being sleeveless, various heights for the neckline, backless and made from silk, satin or nylon. A nightgowns length can be down

to the hip like a babydoll or all the way to the floor (a negligee) but mainly being around knee length.

Slip:

A slip is mainly worn to prevent chafing of the skin from harsh fabrics such as wool but also to prevent fine fabrics from sweat. A full slip hangs from the shoulders and a half slip hangs from the waist and was called in the older days a petticoat. A half slip is many times used in conjunction with a camisole as an alternative to a full slip and can definitely fall into the lingerie category.

2.2.3 TYPES OF BRASSIERS AND THEIR FUNCTIONS :

1. Push-Up Bras

Push-up bras give your bust an extra oomph by pushing together and lifting the bust for a fuller, sexier look. The science behind these bras: bra cups specially angled to boost your assets. Push-up bras are great for a smaller bust - they create cleavage where there wasn't any before! Push-up bras often come with underwires and removable pads for extra lift and volume.

2. Padded Bras

Padded bras help to create a more voluptuous silhouette by enhancing the bustline with thicker paddings. The result is a natural-looking boost. The thicker paddings of padded bras add a natural enhancement to your bust and can increase your bustline by as much as 1 cup size. Many push-up bras come padded, and the pads are removable.

3. Underwire Bras

Underwire bras have flexible wires lining the cup bottom. These wires provide lift and support for a more shapely curve. Every woman can benefit from underwires. They add lift to smaller breasts and provide the needed support for the full-bosomed. Women with a C cup or larger (especially after childbirth) should be wearing underwires to prevent sagging breasts.

4. Demi Bras

Also called half-cup bras, demi bras offer a barely-there coverage with cups that cover just beyond the nipples (instead of the entire bust). The bare minimum cutting looks great on small- to average-bosomed women. Demi bras are ideal for wearing under tops with wide scooping necklines, or tops with low plunging necks because of their half-cups and wider-set straps.

5. Convertible Bras

Convertible bras have detachable bra straps and usually come with half-cups for the most versatility in matching different necklines. The straps can be removed, worn crisscross-, toga-, or halter-style to ensure that no straps peek through the top you are wearing.

6. Full-Cup Bras

Full-coverage or full-cup bras cover the entire bosom, and so offer more support and coverage than demi bras. These are a better choice for busty women because of the maximal support they provide.

7. Minimizer Bras

Minimizer bras are designed to reduce the bustline and are a great fix for full-figured women who wish to have a trimmer bosom. They work by redistributing tissue evenly to create a slimmer yet believeable silhouette.

8. T-Shirt Bras:

T-shirt bras, also known as seamless bras, are as their name implies, without seams on the cups. They are ideal for wearing underneath clingy tops and tight-fitting baby tees for a smooth, sleek and rounded look.

9. Sports Bras:

Sports bras are worn during sports and workouts. They help to reduce those embarrassing bounces while providing maximum support.

10. Maternity and Nursing Bras:

These bras are worn by mums-to-be and nursing mothers and provide the necessary support. The cups can be opened or pulled down, making breast-feeding more convenient.

2.3 SWEAT PROTECTION :

2.3.1 SWEAT :

Perspiration (sweating, transpiration, or diaphoresis) is the production of a fluid consisting primarily of water as well as various dissolved solids (chiefly chlorides), that is excreted by the sweat glands in the skin of mammals. Sweat contains the chemicals or odorants 2-methylphenol (*o*-cresol) and 4-methylphenol (*p*-cresol), as well as a small amount of urea. Sweat itself is not the cause of body odor, but rather the bacteria on the skin which feed on the sweat.

In humans, sweating is primarily a means of thermoregulation, although it has been proposed that components of male sweat can act aspheromonal cues.

Evaporation of sweat from the skin surface has a cooling effect due to the latent heat of evaporation of water. Hence, in hot weather, or when the individual's muscles heat up due to exertion, more sweat is produced. Sweating is increased by nervousness and nausea and decreased by cold. Animals with few sweat glands, such as dogs, accomplish similar temperature regulation results by panting, which evaporates water from the moist lining of the oral cavity and pharynx. Primates and horses have armpits that sweat like those of humans. Although sweating is found in a wide variety of mammals, relatively few, such as humans and horses, produce large amounts of sweat in order to cool down.

Sweating allows the body to regulate its temperature. Sweating is controlled from a center in the preoptic and anterior regions of the brain'shypothalamus, where thermosensitive neurons are located. The heat-regulatory function of the hypothalamus is also affected by inputs from temperature receptors in the skin. High skin temperature reduces the hypothalamic set point for sweating and increases the gain of the hypothalamic feedback system in response to variations in core temperature. Overall, however, the sweating response to a rise in hypothalamic ('core') temperature is much larger than the response to the same increase in

average skin temperature. The process of sweating decreases core temperature, whereas the process of evaporation decreases surface temperature.

There are two situations in which the nerves will stimulate the sweat glands, causing perspiration: during physical heat and during emotional stress. In general, emotionally induced sweating is restricted to palms, soles, armpits, and sometimes the forehead, while physical heat-induced sweating occurs throughout the body

FIG 1: SWEAT

2.3.2 COMPOSITION OF SWEAT :

Sweat contains mainly water. It also contains minerals, lactate, and urea. Mineral composition varies with the individual, their acclimatisation to heat, exercise and sweating, the particular stress source (sauna, etc.), the duration of sweating, and the composition of minerals in the body. An indication of the minerals content is sodium (0.9 gram/liter), potassium(0.2 g/l), calcium (0.015 g/l), magnesium (0.0013 g/l). Also many other trace elements are excreted in sweat, again an indication of their concentration is (although measurements can vary fifteenfold) zinc (0.4 milligrams/liter), copper (0.3–0.8 mg/l), iron (1 mg/l), chromium (0.1 mg/l), nickel (0.05 mg/l), lead (0.05 mg/l). Probably many other less-abundant trace minerals leave the body through sweating with correspondingly lower concentrations. Some exogenous organic compounds make their way into sweat as exemplified by an unidentified odiferous "maple syrup" scented compound in several of the species in the mushroom genus *Lactarius*. In humans, sweat is hypoosmotic relative to plasma.

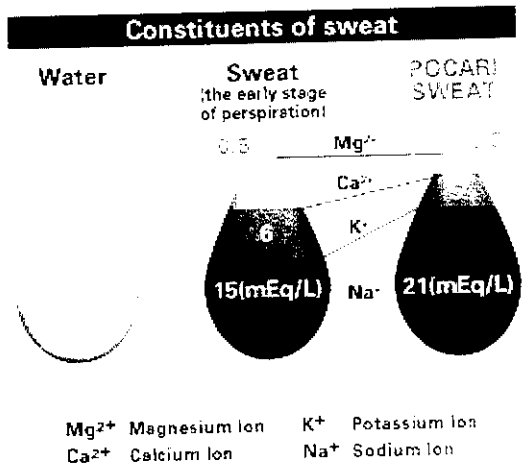


FIG 2: COMPOSITION OF SWEAT

2.3.3 IMPACT OF SWEAT ON GARMENTS:

- Sweat weakens the fabric.
- It causes yellowing on the surface of the fabric and the stain doesn't go off easily.
- It degrades the fabric and so it reduces its durability.
- It affects the chemical structure of fabric.
- When it absorbs sweat the fabric loses its original colour.
- Excessive sweating can cause embarrassing sweat patches on clothes, body odour and inability to maintain hygiene.

2.3.4 METHODS OF SWEAT PROTECTION:

Sweating cause great embarrassment due to soaked clothing. Some women use various strategies in order to keep their underarm sweat under control like using pads shields absorbent tissues and frequent clothing changes which helps in minimizing the severity of the odor arising of sweat and thus allowing to work comfortably.

2.3.4.1 EXISTING UNDER ARM PADS:

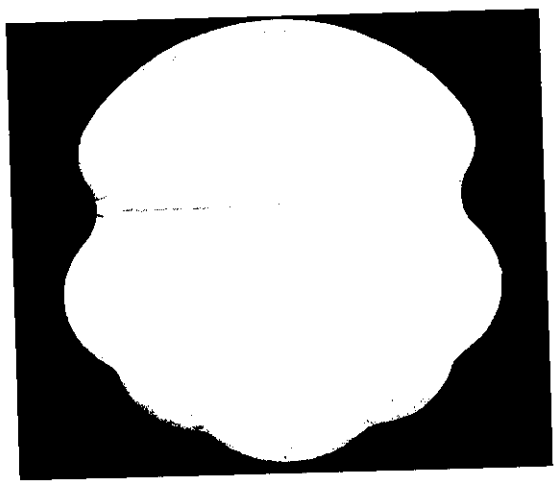
Some sweat pads are available in the markets, but they can be used only for the armpits. They are called as under arm pads. There are two types of under arm pads. They are:

1. Disposable under arm pads.
2. Washable under arm pads.

DISPOSABLE UNDER ARM PADS:

It is a disposable, thin, self sticking under arm dress pad that solves the under arm sweat issues. Theses disposable under arm sweat pads absorb the sweat and odour. This is incredibly inexpensive and comfortable liner and is designed to fit all the sizes.

FIG 3: DISPOSABLE UNDER ARM PADS



WASHABLE UNDER ARM PADS:

These are washable under arm pads that can be reused. They come in pairs and can be permanently sewn in the clothing. It is comfortable, soft and made of cotton. It is suitable for all types of fabrics.

FIG4:WASHABLE UNDER ARM PADS

2.4 COMMONLY USED TEXTILES FOR LINGERIES:

2.4.1 FIBERS USED FOR LINGERIES:

Acetate

A manufactured fiber refined from cotton filaments and/or wood pulp, and acetic acid that has been extruded through a spinneret and then hardened.

Bamboo

Bamboo fabric is made from the pulp of the bamboo grass. It is light and strong, has excellent wicking properties, and is to some extent antibacterial. The use of bamboo fiber for clothing was a 20th century development, pioneered by several Chinese corporations.

Bamboo is highly water absorbent, able to take up three times its weight in water. In bamboo fabric, this translates to an excellent wicking ability that will pull moisture away from the skin so that it can evaporate.

Cotton

A natural fiber that grows in the seedpod of the cotton plant. Fibers are typically 1/2 inch to 2 inches long. The longest staple fibers-- longer than 1 1/2 inch, including the Pima and Egyptian varieties-- produce the highest quality cotton fabrics.

Combed Cotton

Cotton in which a combing process removes the short fibers and any debris that may be with the fiber when it was in the field. This results in a cleaner, more uniform and lustrous yarn.

Coolmax- polyester fibre :

A polyester fiber designed to move moisture away from the body and out onto the surface of the garment for quick absorption. This leaves the wearer feeling cooler and dryer. Coolmax is also fast drying, resists fading, and doesn't wrinkle or shrink. Because of the movement of moisture, wearing Coolmax indoors without airflow to properly evaporate can cause puddling, since Coolmax does not absorb. Coolmax works best outdoors where there is airflow to evaporate body moisture.

Elastane

Elastane is just another name for an old fiber: Spandex. The word "elastane" is used in Europe while "spandex" is used in the United States. Elastane/spandex trade names are Lycra and Dorlastan.

Italian Nylon

A very high quality knit fabric with 4-way stretch that comes from Italy. Italian nylon includes some lycra to give great stretch and recovery, good strength, abrasion resistance and long germ resistance to body acids.

Lycra

A trademark of DuPont, Lycra is the spandex fiber produced by DuPont. It is lightweight and soft, but stronger and more durable than rubber. Lycra can be stretched over 500% without breaking, and can be stretched repeatedly and still recover to its original length. It provides lightweight freedom of movement in foundation garments. It is quick to dry and accepts dyes very well. Garments with lycra do not pill or hold static.

Lyocell

Lyocell is a cellulose fabric obtained by an organic solvent spinning process. This fabric is a sub-category of rayon. Tencel is the trademark name for lyocell.

Nylon

A completely synthetic fiber, nylon is known for its superior flexibility and excellent resilience. Quick-drying nylon fabric is naturally hydrophobic and resistant to shrinkage and wrinkling. Developed in the 1930s by scientists at Du Pont, nylon was the first truly synthetic fiber to be commercialized. Nylon fibers have the luster of silk and their tensile strength is higher than that of wool, silk, rayon or cotton. Nylon washes easily, dries quickly, needs little pressing, and holds its shape well since it neither shrinks nor stretches. Another name for nylon is now polyamide.

Polyester

This is both the name of a fabric and a fiber. A manufactured fiber introduced in the early 1950s, it is second only to cotton in worldwide use. Its ability to stretch and resist wrinkling makes it a popular fabric for lingerie. Polyester has high strength (although somewhat lower than nylon), excellent resiliency, and high abrasion resistance. Low absorbency allows the fiber to dry quickly.

Rayon

A silk-like fabric made from wood pulp, cotton linters, or other vegetable matter. It is a comfortable fabric against the skin and absorbs moisture. It is not a strong fabric.

Spandex

A synthetic fiber made from polyurethane. It is lightweight, highly elastic, strong, durable and non-absorbent to water and oils. Spandex is a great alternative to people who are allergic to latex. In Europe, they call this elastane.

2.4.2 FABRIC CONSTRUCTIONS USED FOR LINGERIES:

WARP KNITTING:

Warp knitting is a family of knitting methods in which the yarn zigzags along the length of the fabric, i.e., following adjacent columns ("wales") of knitting, rather than a single row ("course"). For comparison, knitting across the width of the fabric is called weft knitting.

Since warp knitting requires that the number of separate strands of yarn ("ends") equals the number of stitches in a row, warp knitting is almost always done by machine, not by hand.

Types:

Warp knitting comprises several types of knitted fabrics, including tricot, raschel knits, and milanese knits. All warp-knit fabrics are resistant to runs and relatively easy to sew.

- **Tricot** is very common in lingerie.
- **Milanese** is stronger, more stable, smoother and more expensive than tricot and, hence, is used in better lingerie. Milanese is now virtually obsolete.
- **Raschel knits** do not stretch significantly and are often bulky; consequently, they are often used as an unlined material for coats, jackets, straight skirts and dresses.

The largest outlet for the Raschel Warp Knitting Machine is for lace fabric and trimmings.

WEFT KNITTING:

Weft-knit fabrics may also be knit with multiple yarns, usually to produce interesting color patterns. The two most common approaches areintarsia and stranded colorwork. In intarsia, the yarns are used in well-segregated regions, e.g., a red apple on a field of green; in that case, the yarns are kept on separate spools and only one is knitted at any time. In the more complex stranded approach, two or more yarns alternate repeatedly within one row and all the yarns must be carried along the row, as seen in Fair Isle sweaters. Double knitting can produce two separate knitted fabrics simultaneously, e.g., two socks; however, the two fabrics are usually integrated into one, giving it great warmth and excellent drape.

➢ **Jersey fabric** :

These fabrics are weft knitted and characterized by distinct but flat vertical lines on the face and dominant horizontal ribs on the other side. It was originally made of wool, but is now made of wool, cotton, and synthetic fibres. The fabric can be a very stretchy Single knitting, usually light-weight, jersey with one flat side and one piled side. When made with a light weight yarn, this is the fabric most often used to make T-shirts and lingeries. Or it can be a double knitted jersey (interlock jersey), with less stretch, that creates a heavier fabric of two single jerseys knitted together to leave the two flat sides on the outsides of the fabric, with the piles in the middle.

The following types of Jersey can be distinguished:

- Single Jersey fabric
- Double Jersey
- Interlock Jersey
- Jacquard Jersey
- Clocqué Jersey

2.5 SPECIALITY FINISHES RENDERING COMFORT PROPERTIES TO LINGERIES:

ANTIMICROBIAL FINISH:

The inherent properties of the textile fibres provide room for the growth of microorganisms. Besides, the structure of the substrates and the chemical processes may induce the growth of microbes. Humid and warm environment still aggravate the problem. Infestation by microbes cause cross infection by pathogens and development odour where the fabric is worn next to skin. In addition, the staining and loss of the performance properties of textile substrates are the results of microbial attack. Basically, with a view to protect the wearer and the textile substrate itself antimicrobial finish is applied to textile materials.

Antimicrobial textile products continue to increase in popularity as demand for fresh smelling, skin friendly, high performance fabrics goes on. Modern performance fabrics are required in many specialist applications, sports textile is one example. These need to exhibit high degrees of performance in terms of longevity and durability, and by imparting antimicrobial properties to the fabric. These properties can be improved as well as increasing the comfort and hygiene factor making them more pleasant to wear. Odour can be neutralized and skin problems caused by microbial growth reduced thus emphasizing the hygiene nature of the treated product.

HYDROPHOBIC FINISH:

The water proof refers to the finish that block interstices of fabric by forming a hydrophobic film on its surface thereby making it impermeable to air. The water repellant finish is permeable to air but not to water and so garment made from such treated fabric are comfortable to wear.

This finish gives hydrophobic feature to the substrate. There are 3 main product groups for this finish. 1 Metal salt paraffin dispersion; polysiloxane; Fluorocarbon polymers. When finishing with these products, the surface of the goods must be covered with molecules in such a way that their hydrophobic radicals are ideally positioned as parallel as possible facing outwards. Aluminium salt paraffin dispersions are positively charged products due to the trivalent aluminium salt. This produce a counter polar charge on the fibre surface which is significant for the adsorption of the product. After drying, the fat radicals forms a so- called "brush" perpendicular to the fibre surface which prevents water drops from penetrating into the fibre. Polysiloxanes forms a fibre- encircling silicone film with methyl groups perpendicular to the surface. The oxygen atoms are facing towards the fibre. The film formation and direction of the methyl groups are responsible for the hydrophobic properties of the finish. Fluro carbons polymers also form a film where the fluro carbon radicas are perpendicular to the fibre axis thus prevents wetting of the fibre surface. Their high hydrophobic and oleophobic action is explained by the extremely low inter facial tension of the flurocarbon chain towards all chemical compounds. When finishing with those products, the surface of the goods must be covered with the molecules in such a way that their hydrophobic radicals are ideally parallel and facing outwards. While paraffin dispersions and

polysiloxanes only provide hydrophobic effects, the fluro carbon products also exhibit oleophobic action.

HYDROPHILIC FINISH:

Hydrophilic property is an important aspect of any fabric meant for apparels, which decides the comfort level of that fabric. Every human being sweats during different activities. An important future of any fabric is how it transports this water out of the body surface so as to make the wear feel comfortable. The most important factor in determining how much water (or perspiration) can be absorbed by a fabric is the fabric thickness. The drying time is dependent mainly on how much water is absorbed by a fabric and, therefore, by the thickness of a fabric. The drying time and energy required to evaporate water from a wet garment depends on the amount of water absorbed and not on the fibre type.

A knitted fabric has high pores in its structure because of lower cover factor and it will have good liquid transmission, better than the woven fabric. Yarns have more inter-fibre space (less twisted yarn) gives wider diameter capillary, this will result into poor wicking action. After the hydrophilic finishing treatment, it helps to increase the wicking action.

The term hydrophilicity is obtained from hydro (water) and philic (loving) which literally means the tendency of a substance to attract water.Cotton is naturally hydrophilic due to the presence of –OH group in its cellulose chain. These –OH group form hydrogen bonds with the –H present in water, to ensure an attraction of the water molecule to the cellulose fiber. It is known that silicones are inherently hydrophobic (water-repellent), When a fabric is finished with silicone(or any other softener, for that matter), the hydrophilicity of the fabric is decreased. This phenomenon can be altered when the silicone has an organo functional modification that allows the silicone itself to interact with water much in the same way as cellulose does. The silicones can not confer hydrophilicity to a fabric which is inherently hydrophobic .It can only interact with water to an extent where it does not interfere with the hydrophilicity of the fabric itself. This naturally leads us to the conclusion that the hydrophilicity of the fabric is better at lower dosages, whereas the handle imparted by a silicone softener Improves at higher dosage, which reduces the hydrophilicity of the fabric, so that search for the compromise between softness and hydrophilicity continues.

ANTIBACTERIAL FINISH:

Spores of fungi and bacteria exist everywhere and under hot and humid conditions. Those rapidly multiply feeding on their hosts. These micro organisms attack the natural fibres as well as the finishes applied to these and cause mildew and rotting damages. Natural fibre such as cotton are more susceptible than synthetics because their porous hydrophilic structure retains water, oxygen and nutrients, providing a perfect environment for bacterial growth. The enzymes that degrade cotton are cellulose and cellobiase and these reduce strength and produce coloured and foul smelling spots and even holes on the exposed fabric.

METHODOLOGY

3. METHODOLOGY:

3. 1 OBJECTIVE :

To develop a camisole inbuilt with brazier to give a better sweat management for a wider area, provide comfort to the wearer and protect outer garments from sweat.

3.2 RETAIL AND BRAND SURVEY:

A survey has been taken from nearly 25 retail outlets in Coimbatore to consolidate the trends, features, brands and styles of the lingerie available in the market. Two interview schedules (given in the **APPENDIX I & II**) were prepared, with one concentrating on identifying the retailer's information and another focusing on gathering information on individual brands which are available in the market.

BRAND SURVEY:

A survey on brand is conducted to get more insight into the different styles, fit and special features available in each brand. Apart from those information, the fast moving style, colour and size of individual brands are also obtained. The variation in the features that impart fit and comfort to the wearer has been studied and questionnaire has been prepared. The questionnaire is enclosed as **APPENDIX 1**.

3.3 SELECTION AND SOURCING OF FABRIC:

The fabric which has good comfort property, aesthetics, breathability, absorbency, elasticity, durability, light weight can only manage sweat effectively. By considering the mentioned features in a fabric and from the consolidated result of the survey modal lycra and cotton lycra jersey knitted fabrics have been selected.

Cotton: Cotton absorbs liquid well, in a large capacity. Cotton fabric can absorb up to 27 times its weight in water. This makes cotton clothing comfortable, because it absorbs sweat.

Cotton fabric allows air to flow through freely. The fabric absorbs sweat and releases it on its surface. This is often described as the fabric "breathing," and is considered an asset in clothing, particularly in warm climates.

Modal: Modal is a man made regenerated fibre. Also recognized for heat and/or burn resistance.

Modal® is a bio-based fiber made by spinning reconstituted cellulose from beech trees. It is about 50% more hygroscopic, or water-absorbent, per unit volume than cotton is. It is designed to dye just like cotton, and is color-fast when washed in warm water.

Lycra: The chief characteristic of Lycra is its ability to stretch several times its size and return to its original shape. It's also lightweight, durable, easily dyed, and resists pilling and abrasion. It is also naturally moisture wicking, which is the ability to pull moisture away from the wearer's skin to keep the wearer dry; a feature that has now become the basis for an entire segment of modern apparel. It has also remained popular for under garments for both men and women. Presence of lycra in the garment will provide a good fit with lesser number of seam lines in the garment, ease of wear and comfort.

Hence cotton lycra with a composition of 95% cotton and 5% lycra and modal lycra with composition 97% modal and 3% lycra has been sourced for the study.

3.4 SELECTION OF FINISHES:

The proposed lingerie should absorb the sweat that comes out of the human body and shouldn't transfer that to outer garment, only then it can manage and protect th e outer garment. So, on one side , the fabric should have good absorbency as well in the face side it should have good repellency property. As the fabric keeps the sweat in it should have the ability to kill the microbes and control the microbial growth in the lingerie. So that it can protect the wearer from allergies, and also from other skin diseases. To achieve all these properties the fabric has to be finished with the following finishes.

- Antimicrobial finish
- Hydrophilic finish
- Hydrophobic finish

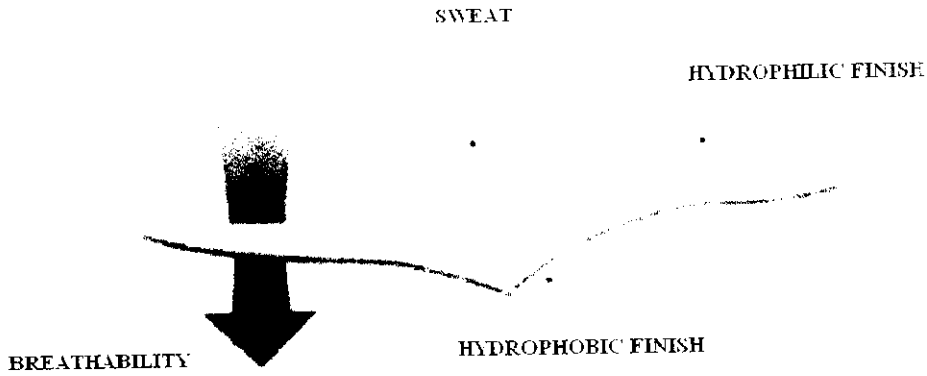


FIG 5 : DEVELOPED FABRIC

Antimicrobial finish:

In order to control the infestations of the microbes and to arrest the metabolic activities in the microbes which lead to odor formation and fabric quality deterioration, anti microbial finish has been selected to apply on the fabric.

Hydrophilic finish:

This finish has been selected so that the fabric on the back side which is closer to the skin could absorb the sweat effectively and leave the skin dry to give comfort to the wearer.

Hydrophobic finish:

Hydrophobic finish when applied on the face side and to the side which is in close contact with the outer garment, it prevents sweat from penetrating to the outer garment and affecting the comfort properties.

1.6.5 APPLICATION OF FINISHES:

The selected finishes were applied on to the selected fabrics in the order of antimicrobial finish by exhaust method to the whole fabric, followed by the hydrophilic finish by padding mangle to the whole fabric and finally hydrophobic finish on the face side of the fabric alone by coating method. The photograph of the finished fabric is enclosed as **APPENDIX III.**

ANTIMICROBIAL FINISH:

Almost all the materials are in danger of being attacked and damaged by microbes. Textiles are especially vulnerable to microbe related problems, human body or to different environmental conditions such as wind and weather. Infestation by microbes causes cross infection by pathogens and development of odour to the fabric. In addition the staining and loss of performance properties are the results of microbial attack.

Antimicrobial treatments for textile materials is necessary to fulfill the following objectives:

- To avoid cross infection by pathogenic micro organisms
- To control the infestations by microbes
- To arrest the metabolism in microbes in order to reduce the formation of odour.
- To safe guard the textile products from staining, discolouration, quality detoriation and loss of strength.

RECIPIE:

Sanitized T96-21	1.00%
pH	5
MLR	1:10
Application	Exhaust

Dry	100 degree C 5mins

PROCEDURE :

Sanitized T96-21 is diluted in distilled water with MLR maintained as 1:10 and the pH is adjusted to 5. Later the fabric is dipped into the solution. After the treatment the excess solution is removed and then dried at $100^{o}C$ for 5minutes.

HYDROPHILIC FINISH:

Hydrophilic finishes that promote absorption or transport of water and aid in fibre wetting and soil removal in a textile construction. The finish is applied to both sides of the fabric using padding mangles. But after the application of hydrophobic finish on the face side, hydrophilic property can been seen only on the back side of the fabric.

RECIPIE:

Sandroperm RPU	30g/l
Solusoft TOW	20g/l
pH	5
application	padding
dry	120 degree C, 5 min

PROCEDURE :

Sandroperm RPU and Solusoft TOW are mixed in a beaker with distilled water. The pH is adjusted to 5. The prepared solution is then poured on the top of the padding mangles. The anti microbial treated fabric is passed between the rollers as the fabric passes between the rollers both the sides of the fabrics are finished with the chemicals. The finished fabric is then dried at a temperature of 120 ^{o} C for 5 minutes.

HYDROPHOBIC FINISH:

Water repellant finishes are those which permit the fabric to continue to breathe after treatment, whereas water proof treatments completely seal the spaces between individual yarns, as in the case of rubberized or unsaturated fatty acid cured fabrics (oil clothes).

Sweat absorbed by the back side of the fabric should not reach the outer garment. To achieve this property, the fabric treated with antimicrobial finish and hydrophilic finish should be given with hydrophobic finish on the face side. The finish is applied by coating or printing method.

RECIPE:

NuvaHPU	80g/l
Thickener CA	x% (to get the consistency of paste)
pH	5
application	printing and coating
dry	120 degree C, 5 min
cure	150 degree C ,5min

PROCEDURE :

Nuva HPU is mixed with water and then stirred using electrical stirrer. While stirring the thickener CA is added drop by drop until the consistency of paste is achieved. The paste is then coated onto the fabric using printing technique. The coated fabric is then allowed to dry at 120 ° C for 5 minutes and then cured at 150 ° C for 5 minutes.

3.6 ANALYSIS OF THE COMFORT PROPERTIES OF THE SELECTED FABRICS BEFORE AND AFTER APPLICATION OF SELECTED FINISHES:

The lingerie fabrics used should be analyzed for their comfort properties. These lingerie fabrics are tested under two conditions before finishing and after giving specialty finishes.

3.6.1 CREASE RECOVERY :

Preparation of the test specimen: five samples of size 1"*2" are cut to make the test.

PROCEDURE :

Crease Resistance:

The resistance offered by a textile material for creasing during use is called Crease resistance.

Crease Recovery Angle:

The measure of crease resistance specified quantitatively in terms of crease recovery angle.

Sample size is 2"x 1" cut.The sample is folded exactly into half and is loaded (nprmally 2 kg weights) for 2 minute.One limb of the specimen is holded using a tweeze and is monted on the clamp of the crease recovery tester.The specimen is allowed to recover for 2 minutes.After 2 minute the circular dial is rotated in order to coincide the specimen and the knife edge.By observing the angle at which the specimen and knife edge, it gives crease recovery angle.

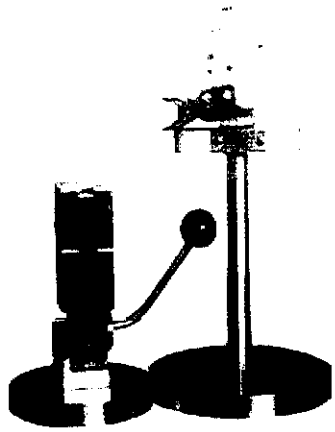


FIG 6: CREASE RECOVERY TESTER

3.6.2 ABRASSION RESISTANCE :

A test to stimulate and measure the performance of textile yarns, fabrics, floor coverings in use.

There are three types of abrasion- flex abrasion,Edge abrasion and Flat abrasion.

PROCEDURE:

According to the ASTM standard(ASTM D4966-89),sample size of 1.5" is cut using template weighed and mounted on a mushroom shaped holder.The abradent material may be in the form of emery paper, sand paper, canvas etc.cut the abradent material to the size of %'x5" using the template provided.Place the abradant on the abrading angle .Now mount the mushroom holder in its position. Set the counter with required no of cycles. Start the machine and after the required number of cycles is completed the machine will stop.

The weight loss% is calculated by using the following formula,

= ((Original weight-weight loss)\original weight)x 100

Fabric's abrasion resistance is calculated by using the formula ,100-weight loss%

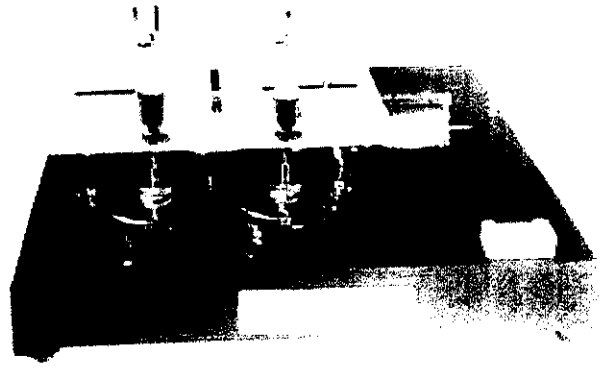


FIG 7 : ABRASSION TESTER

3.6.3 PILLING TEST:

Pilling is a surface defect of textiles caused by wear, and is considered unsightly. It happens when washing and wearing of fabrics causes loose fibres to begin to push out from the surface of the cloth, and, over time, abrasion causes the fibres to develop into small spherical bundles, anchored to the surface of the fabric by protruding fibres that haven't broken. The textile industry divides pilling into four stages: fuzz formation, entanglement, growth, and wear-off. Pilling normally happens on the parts of clothing that receive the most abrasion in day-to-day wear, such as the collar, cuffs, and around the thighs and rear on trousers.

PROCEDURE:

For this test four specimens each 125mm X 125mm are cut from the fabric. A seam allowance of 12mm is marked on the back of each square. In two of the samples the seam is marked parallel to the warp direction and in the other two parallel to the weft direction.
The samples are then folded face to face and a seam is sewn on the marked line. This gives two specimens with the seam parallel to the warp and two with the seam parallel to the weft. Each specimen is turned inside out and 6mm cut off each end of it thus removing any sewing distortion. The fabric tubes made are then mounted on rubber tubes so that the length of tube showing at each end is the same. Each of the loose ends is taped with poly (vinyl chloride) (PVC) tape so that 6mm of the rubber tube is left exposed. All four specimens are then placed in one pilling box. The samples are then tumbled together in a cork-lined box. The usual

number of revolutions used in the test is 18,000 which take 5 hours. Pilling is graded according to the grade table.

Pilling Grades:

Rating	Description	Points to be taken into consideration
5	No change	No visual change
4	Slight change	Slight surface fuzzing
3	Moderate change	The specimen may exhibit one or both of the following: (a) moderate fuzzing (b) isolated fully formed pills
2	Significant change	Distinct fuzzing and/or pilling
1	Severe change	Dense fuzzing and/or pilling which covers the specimen.

Interference and analysis

The given fabric is rated as 4 comparing with the standard specimen photographs.

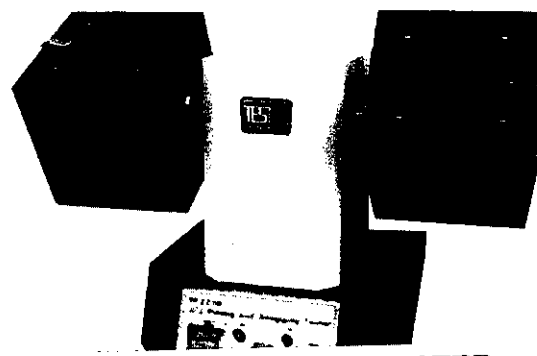


FIG 8 : ICI PILL BOX TESTER

3.6.4 WATER VAPOUR PERMEABILITY:

Testing procedure:

The water vapour permeability is an important property in the clothing systems. The human body cools itself by sweat production and evaporation during periods of high activity. The clothing must be able to remove this moisture in order to maintain comfort and reduce the degradation of thermal insulation caused by moisture build up.

As per ASTM E 96 , the specimen is sealed over the open mouth of a dish containing water and placed in the tester. Five samples are prepared and kept in the respective dish holder under standard testing atmosphere. After a period of time to establish equilibrium successive weighing of the dish are made and the rate of water vapour transfer through the specimen is calculated. The water vapour permeability index is calculated by expressing the water vapour permeability (WVP) of the fabric as a percentage of WVP of a reference fabric which is tested along side the test specimen.

Each dish is filled with sufficient distilled water to give a 10mm air gap between the water surface and the fabric. Adhesive is applied to the rim of the dish and the specimen which is 96mm is diameter, is carefully placed on top with its outside surface uppermost. A dish which is covered with reference fabric also set up in the same way. All the dishes are placed in the standard atmosphere and allowed to stand for atleast 1 hour to establish equilibrium. Each dish is then weighed to nearest 0.001g and the time noted. After a suitable time the dishes are reweighed and the time noted again. The water vapour permeability is calculated The ASTM (ASTM E 96) moisture vapour test is one of a number of test methods for moisture vapour transmission rate.

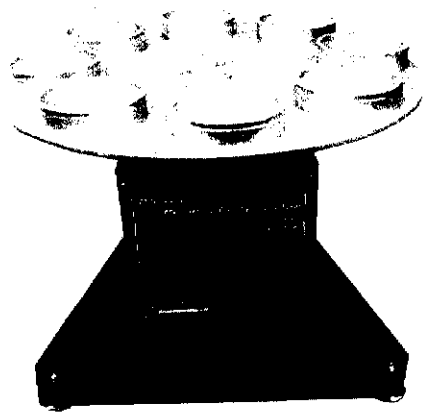


FIG 9 : WATER VAPOUR PERMEABILITY TESTER

3.6.5 WETTABILITY:

Wettability is the actual process when a liquid spreads on a solid substrate or material. Wettability can be estimated by determining the contact angle or calculating the spreading co efficient. Wetting or spreading of a liquid on a solid surface or the material depends on the solid surface properties as well as the liquid used. Five specimens one prepared at 150mm dia. Each specimen is held taught over a 150mm embroidery hoop which in mounted at 45° to the horizontal. A funnel which is fitted with a standard nozzle containing 19 holes of a specified diameter is held 150mm above the fabric surface. 250ml of distilled water is pared into the funnel to give a continuous shower onto the fabric. After the water spray has finished the hoop and specimen are removed and tapped twice smartly against a solid object on opposite points of the frame, the fabric being kept horizontal. This removes any large drops of water. The fabric is then assigned a spray rating either using the photographic standards. (American Association of Textile Chemist and colorist scale)

Grade	Description
1	Complete wetting of the whole of the sprayed surface
2	Wetting of more than half the sprayed surface
3	Wetting of the sprayed surface only at small discrete areas.
4	No wetting but adherence of small drops to the sprayed surface.
5	No wetting of and no adherence of small drops to the sprayed surface.

3.6.6 AIR PERMEABILITY TEST:

PROCEDURE:

As per ASTM D 737- 04 test the specimens in the standard atmosphere for testing textiles. Handle the test specimens carefully to avoid altering the natural state of the material. Place each test specimen onto the test head of the test instrument, clamp it and perform the test.

Make tests at water pressure differential of 125 Pa (12.7 mm or 0.5 in. of water). Feed the required information such as the area for the samples, pressure, etc. (modal lycra- 10cm^2, cotton lycra- 50cm^2) Read and record the individual test results in lts/min.

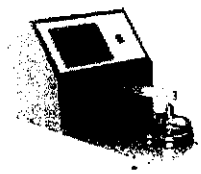


FIG 10: AIR PERMEABILITY TESTER

3.6.7 SPRAY RATE TEST:

To determine the surface wetting resistance of fabrics. Comprising a metal framework allowing distilled water to be sprayed through a nozzle onto a test specimen at 45° and 150mm below the nozzle. The appearance of the specimen is compared against an optional photographic scale.

The Spray Test is a simple method to determine the resistance of any fabric, which may or may not have been given a water resistant or water-repellent finish, to surface wetting by water. It is not intended to predict water proofness, since it does not measure the penetration of water through fabric. 250ml of distilled water is sprayed centrally onto an inclined test specimen for 20 to 25 sec. Stringent quality control of the nozzle hole pattern, combined with accurate height setting above the specimen, ensure a consistent spray flow and formation, critical to the requirements of the International standards. The spray rating is determined by comparing the appearance of the tested specimen with descriptive standards and photographs. The AATCC Spray Test Rating Chart is available for this purpose.

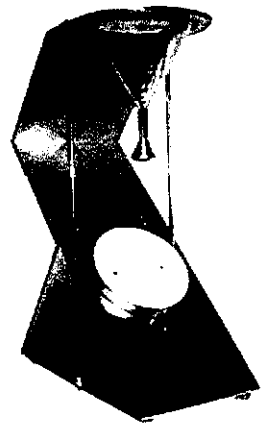


FIG 11: SPRAY RATE TESTER

1.6.6.8 PERSPIRATION TEST:

Preparation of the specimens: attach the specimen measuring 40mm*40mm to a piece of multifibre adjacent fabric also measuring 40*40mm,by sewing along one of the shorter sides with the multifibre next to the face of the fabric.

Preparation of the test solution:

0.5 g of l-histidine monohydrochloride monohydrate.

5g of sodium chloride.

2.5 g of disodium hydrogen orthophosphate dehydrate

pH 8

Lay out the composite specimen smooth in a flat bottomed dish and cover with the solution with a liquor ratio of 50:1 and allow it to remain in the solution for 30 min. Pour off the solution and wipe the excess liquid off the specimen. Place the composite specimen between two of the acrylic plates which are placed on the frame of perspirometer. Apply loads and pour off any excess liquid. Place the perspirometer containing the specimens in an oven for 4 hrs at 37 degree Celsius +- 2 degree Celsius. After the particular time, open the stitches and dry them in air at a temperature not exceeding 60 degree Celsius. Access the change in shade of the sample and the staining on the adjacent fabric with the grey scale.

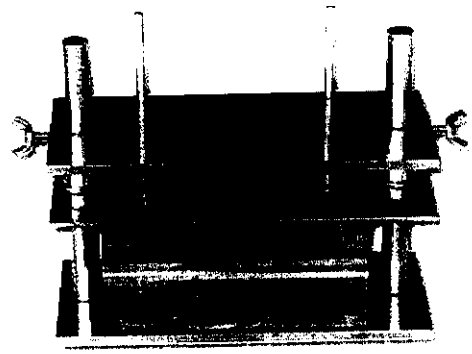


FIG 12: PERSPIROMETER

3.6.9 WICKABILITY:

Transport of water in fabric can take place in two ways, one is along the plane of the fabric and the other is perpendicular to the plane of the fabric. Hence wicking can happen in two ways:

A) Longitudinal wicking (along the plane)
B) Transverse wicking(perpendicular to the plane)

Procedure :

Cut your fabric into small strips of the same size. Using the pen, mark a line 1 cm from the bottom of the fabric. Mark a second line 2 cm higher than this. Weigh each fabric sample and record the mass in the table. Pour at least 1 cm depth of water into the Petri dish. Mix in a few drops of food dye.Carefully clamp the top of a fabric sample so that it hangs vertically. Place the Petri dish of coloured water under the fabric and carefully lower the fabric into the coloured water until the first line reaches the surface. Start the stop watch..When the coloured water reaches the second line, stop timing. Make a record of the time taken to reach the line, in the table. If, after 10 minutes, the coloured water has not reached the second line, record the distance is has travelled.

3.7 DESIGN AND CONSTRUCTION OF THE LINGERIE:

3.7.1 SELECTION OF STYLE: Based on the survey and by considering the problems faced by the customers by using the existing sweat management products, three designs have been selected by critical analysis of parameters like present trends in the market, feasibility for mass production and cost effectiveness. The designs would also give maximum comfort and fit to the wearer along with sweat protection. The working diagrams of the selected styles are enclosed as **APPENDIX IV.** The constructed garments designs are enclosed as **APPENDIX V.**

3.7.2 PATTERN PREPARATION :

MEASUREMENTS REQUIRED :

Measurement (inches)	S	M	L	XL	XXL
Bust	30	32	34	36	40
Band size	32-34	34-36	36-38	38-40	42-44

DESIGN 1 :

DRAFTING PROCEDURE :

BODICE:

1. Draw a line AB – ¼ bust + ½" seam allowance.
2. Draw BC – full length.
3. Draw DC = AB, and AD = BC.
4. Mark E – ½ shoulder from A.
5. Mark F- 1/12 chest from B.
6. Connect EF to get front neck line.
7. Mark G _ ½ " above F.
8. Join E and G to get back neck line.

9. Mark AH – ¼ shoulder + ½"
10. Mark I – ½ " below H.
11. Mark AJ – ¼ chest.
12. JK = AH.
13. Join IXKJ to get back arm hole.
14. Mark Y at a distance of ¼" from X.
15. Join IYKJ to get the front arm hole.
16. Mark L at a distance of ½" from D.
17. Join J and L to get the side seam.
18. Mark M at a distance of 2" from C.
19. Mark M' at a distance of 2 ½ " from L.
20. Join M and M' with an inward curve to get the yoke.

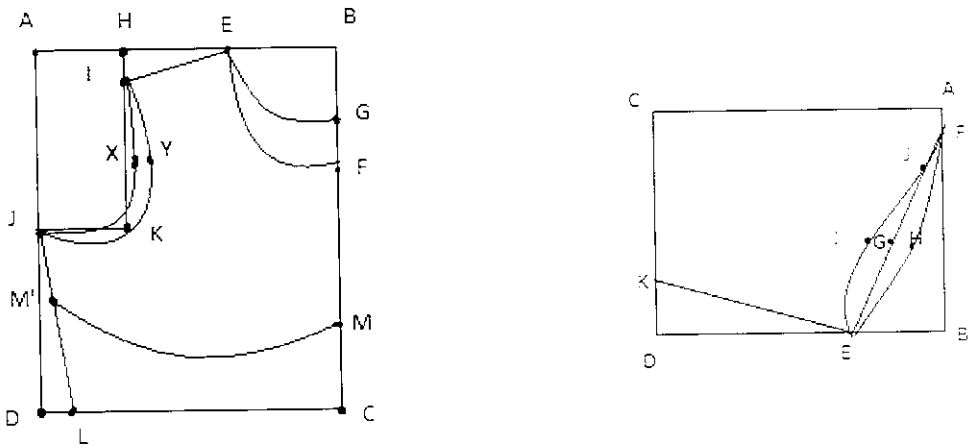


FIG 13 : DRAFTING PATTERN FOR DESIGN 1

SLEEVE :

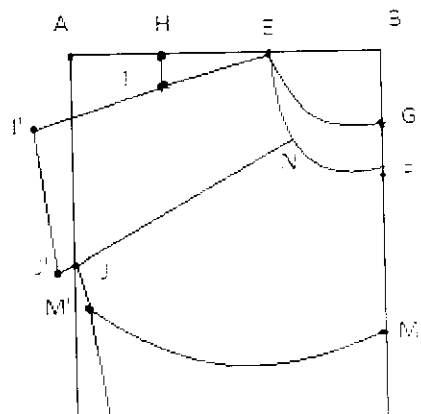
1. Draw AB- 1/8chest + 2 ½ ".
2. Draw AC – sleeve length + ¼"
3. AB= CD. Join DB.
4. BE = 1/8 chest.
5. AF = 1". Join EF.

6. G is the mid way of E and F.
7. H and I= 3/4th " from G.
8. Shape EHFA (back arm scye)
9. Shape EIJA (front arm scye)
10. KC = ½ sleeve round = ½ ".
11. Join and shape EK.

DESIGN 2:

1. Draw a line AB – ¼ bust + ½" seam allowance. Draw BC – full length.
2. Draw DC = AB, and AD = BC.
3. Mark E – ½ shoulder from A. Mark F- 1/12 chest from B.
4. Connect EF to get front neck line.
5. Mark G _ ½ " above F. Join E and G to get back neck line.
6. Mark AH – ¼ shoulder + ½". Mark I – ½ " below H.
7. Mark L at a distance of ½" from D.
8. Join J and L to get the side seam.
9. Mark M at a distance of 2" from C.
10. Mark M' at a distance of 2 ½ " from L.
11. Join M and M' with an inward curve to get the yoke.
12. Extend I to I'- required sleeve length. I' to J' – ½ sleeve round + ½ ".
13. Join J' and J. Extend J to N (running diagonally to neckline).

FIG 14 : DRAFTING PATTERN FOR DESIGN 2

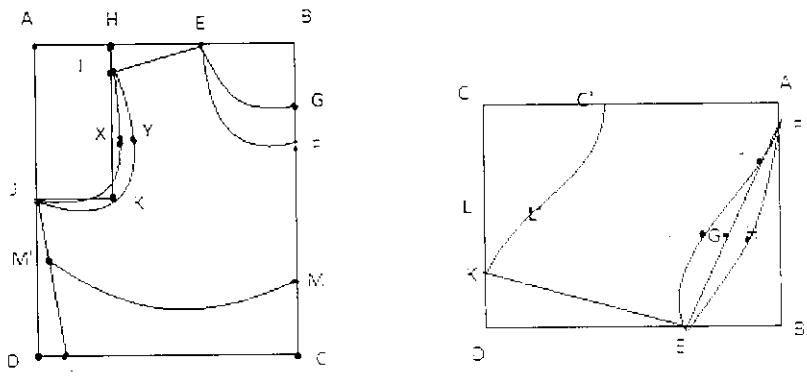


DESIGN 3:

BODICE :

1. Draw a line AB – ¼ bust + ½" seam allowance.
2. Draw BC – full length.
3. Draw DC = AB, and AD = BC.
4. Mark E – ½ shoulder from A.
5. Mark F- 1/12 chest from B.
6. Connect EF to get front neck line. Mark G _ ½ " above F.
7. Join E and G to get back neck line.
8. Mark AH – ¼ shoulder + ½". Mark I – ½ " below H.
9. Mark AJ – ¼ chest. JK = AH.
10. Join IXKJ to get back arm hole.
11. Mark Y at a distance of ¼" from X.
12. Join IYKJ to get the front arm hole.
13. Mark L at a distance of ½" from D.
14. Join J and L to get the side seam.
15. Mark M at a distance of 2" from C.
16. Mark M' at a distance of 2 ½ " from L.
17. Join M and M' with an inward curve to get the yoke.

FIG 15 : DRAFTING PATTERN FOR DESIGN 3



SLEEVE:

1. Draw AB- 1/8chest + 2 ½ ".
2. Draw AC – sleeve length + ¼"
3. AB= CD. Join DB.
4. BE = 1/8 chest.
5. AF = 1". Join EF.
6. G is the mid way of E and F.
7. H and I= 3/4th " from G.
8. Shape EHFA (back arm scye)
9. Shape EIJA (front arm scye)
10. KC = ½ sleeve round = ½ ".
11. Join and shape EK.
12. Mark C' at a distance of 2" from C.
13. Mark L- ½ of CD.
14. Mark L'- 1 ½ " inwards from L.
15. Shape KL 'and C'.

3.7.3 DESIGN FIT ANALYSIS :

If a garment has excess ease or too little ease, the grain lines go out of position, wrinkles appear and the garment may lack balance. In order to avoid all these problems a garment has to be checked for its fit before construction. The fit analysis was done by preparing a sample garment and wearing it on a mannequin and the following standards of fit were checked.

Ease : Ease is the difference between the actual body measurement and the garment measurement at any given point. Excess ease causes folds across the loose area giving a baggy appearance. A garment constructed with optimum amount of ease will be of the right size.

Line : lines to look for in fitting are the basic silhouette seams, circumference seams and design lines. The shoulder seam should be straight, the circumference lines should form smooth curves following the natural body curves.

Grain : the length wise grain should be perpendicular to the floor and the cross wise grain should be parallel to the floor. When a garment is worn, the fabric grain lines must fall correctly in proper places on the figure.

Set : a garment is said to have a smooth set if it has no undesirable wrinkles. If a garment is tight around its circumference cross wise wrinkles occur above and below the tight area.

Balance: for a good fit, the garment should look balanced from left to right and front to back.

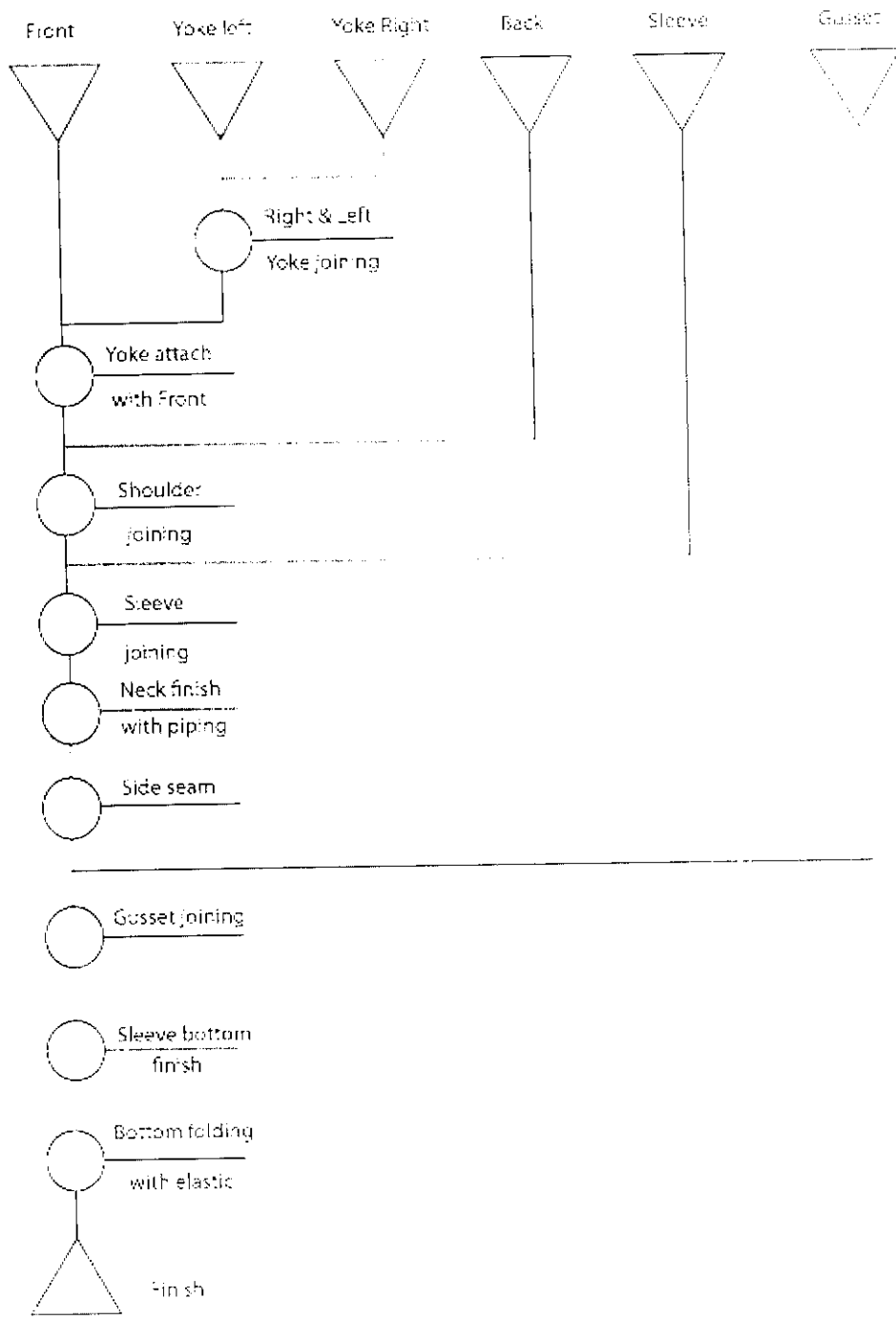
The selected design was checked for 'standards for good fit'. Fitting changes are, marked on the right side with bell pins and the alterations are transferred to the wrong side

1.7.4 GRADING :

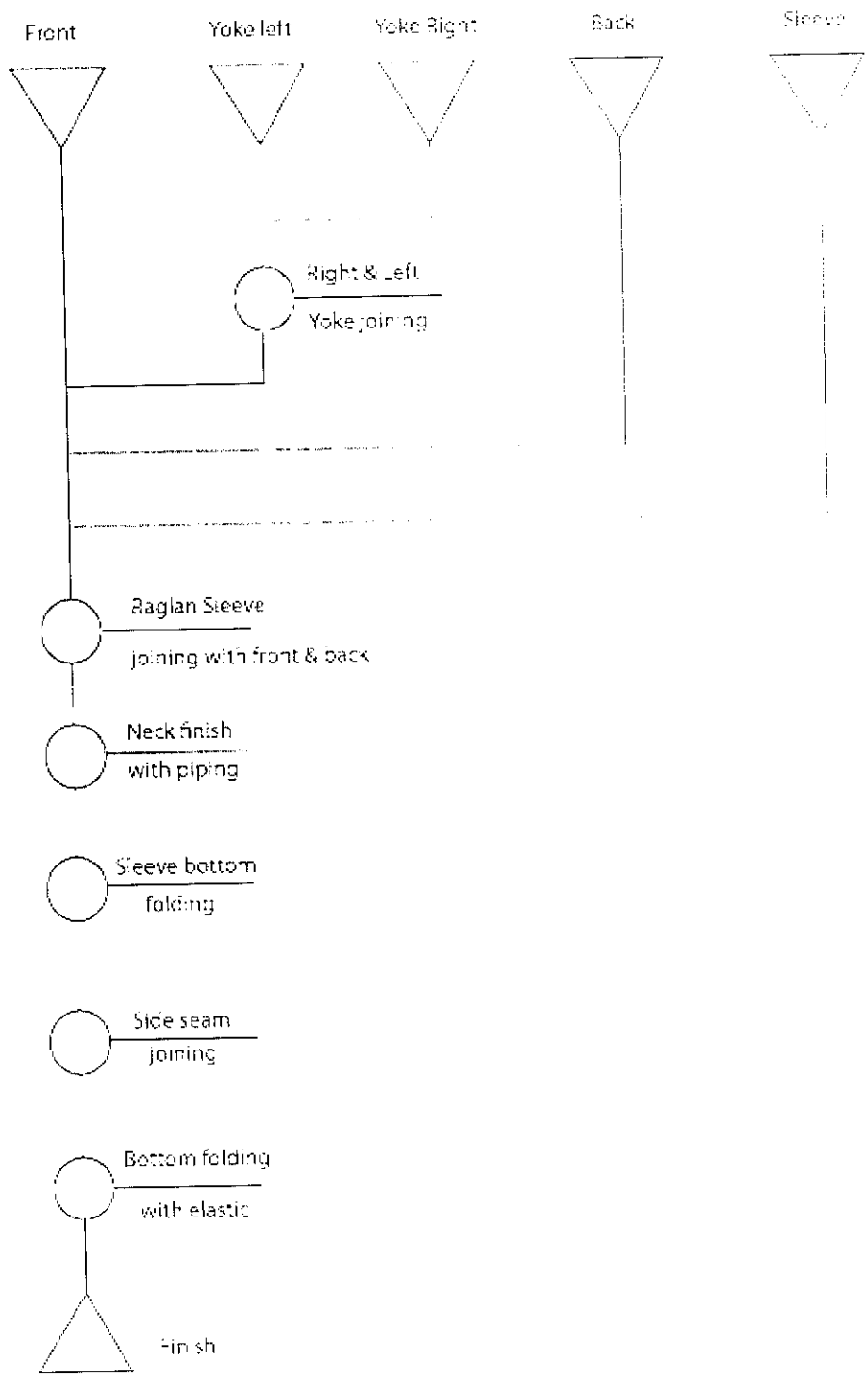
Size 34 has been graded to sizes 32 and 36 based on the size chart. . Size 34 is considered as the standard size and grading is done for one size above and below the standard size.

3.7.5 CONSTRUCTION OF THE CAMISOLE WITH INBULIT BRASSIER

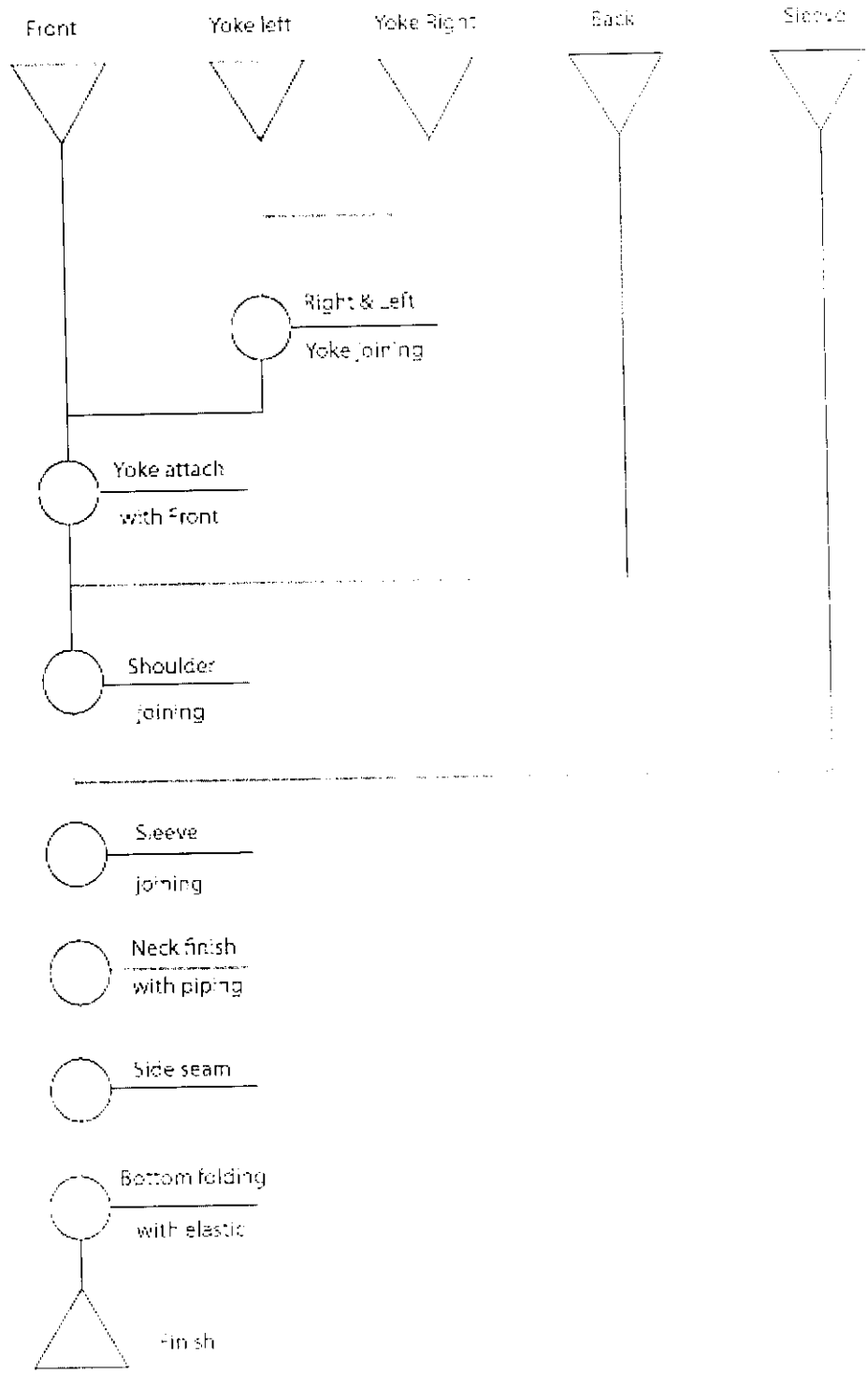
DESIGN 1:



DESIGN 2:


Front
Yoke left
Yoke Right
Back
Sleeve
Right & Left
Yoke joining
Raglan Sleeve
joining with front & back
Neck finish
with piping
Sleeve bottom
folding
Side seam
joining
Bottom folding
with elastic
Finish

DESIGN 3:


Front
Yoke left
Yoke Right
Back
Sleeve
Right & Left
Yoke joining
Yoke attach
with Front
Shoulder
joining
Sleeve
joining
Neck finish
with piping
Side seam
Bottom folding
with elastic
Finish

3.8 PERFORMANCE ANALYSIS:

The constructed camisole's performance is analyzed by checking the anti microbial property of t and by doing wear study.

3.8.1 ANTI MICROBIAL TEST:

Kirby-Bauer antibiotic testing (KB testing or disk diffusion antibiotic sensitivity testing) is a test which uses antibiotic-impregnated wafers to test whether particular bacteria are susceptible to specific antibiotics. A known quantity of bacteria are grown on agar plates in the presence of thin wafers containing relevant antibiotics. If the bacteria are susceptible to a particular antibiotic, an area of clearing surrounds the wafer where bacteria are not capable of growing (called a zone of inhibition).

This along with the rate of antibiotic diffusion are used to estimate the bacteria's sensitivity to that particular antibiotic. In general, larger zones correlate with smaller minimum inhibitory concentration (MIC) of antibiotic for that bacteria. This information can be used to choose appropriate antibiotics to combat a particular infection.

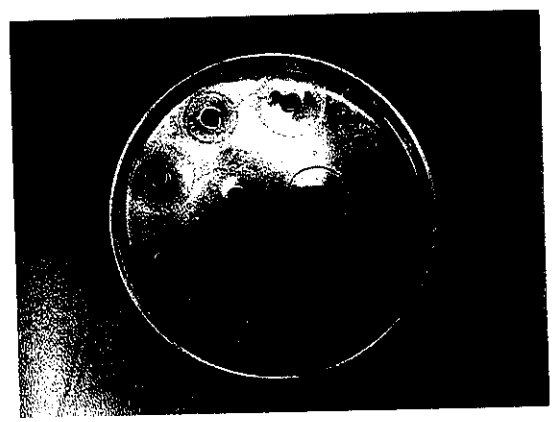


FIG 17 : ANTI MICROBIAL TEST

3.8.2 WEAR STUDY :

To know the other performances like comfort property, fit, feel, absorbency of sweat by lingerie, protection of outer garment from sweat can be analyzed by giving the samples to few people. They are asked to wear the camisole and outer garments for 6 hrs, to know its performance. Feed back form is given to find their experience about the camisole.

RESULTS AND DISCUSSION

4. RESULTS AND DISCUSSION:

4.1 CONSOLIDATION AND ANALYSIS OF RETAIL AND BRAND SURVEY: RETAIL SURVEY

4.2 TEST RESULTS OF UNFINISHED FARICS AND THE FINISHED FABRICS.

4.3 COSTING.

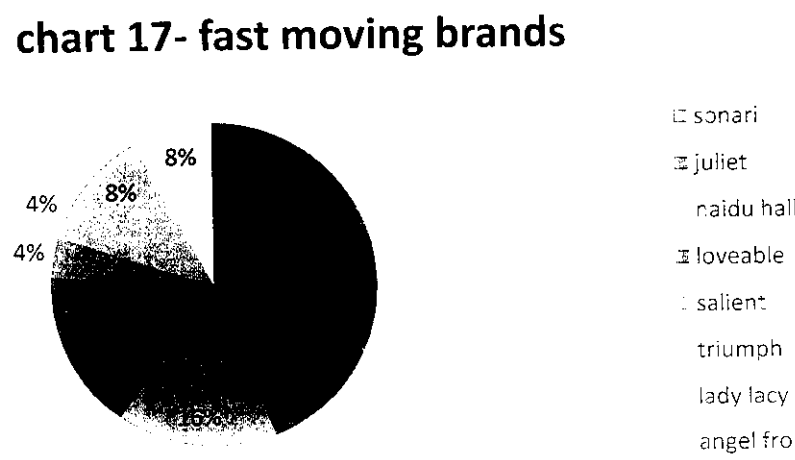
4.4 WEAR STUDY

4.1 CONSOLIDATION AND ANALYSIS OF RETAIL AND BRAND SURVEY: RETAIL SURVEY :

Available brands in the market :

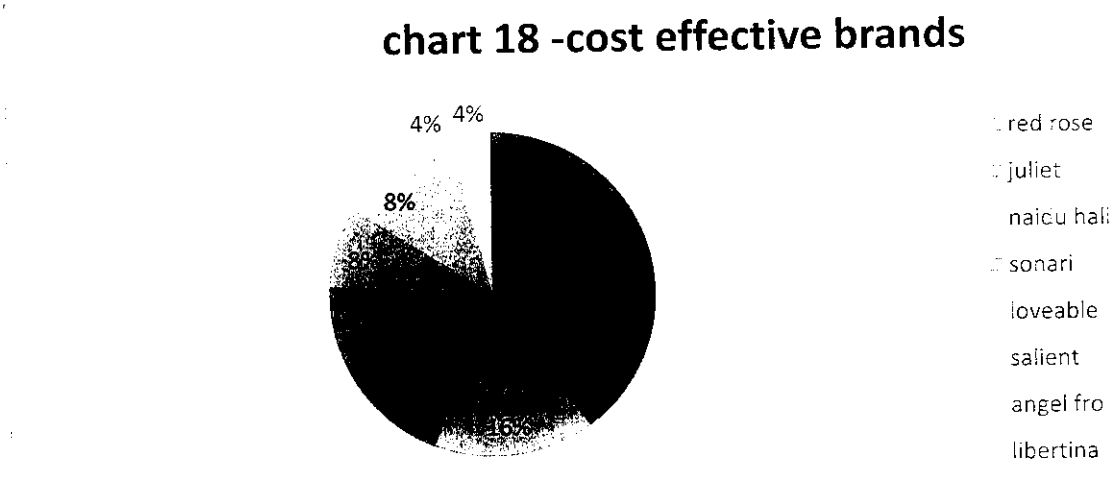
Enamor, Juliet, Trylo, Salient, Sonari, My bra, Timber land, Vanessa, Loveable, Jockey, Daisy Dee, VIP feelings, Kurvz, Naidu hall, Angel fro, Lady lacy, Triumph, Libertina, Floret, Red rose, Body care, Image, Dreams, Blossom.

Fast moving brands :



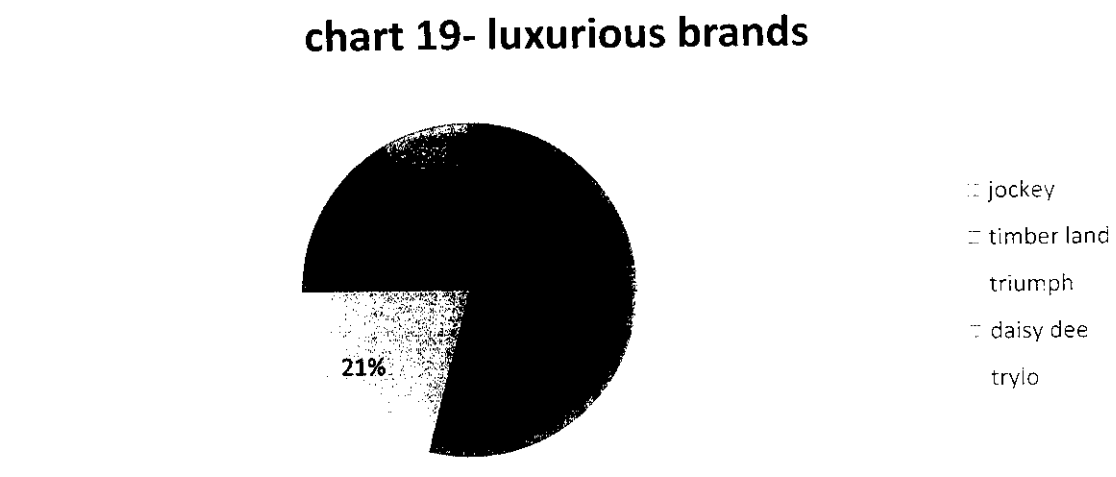
From the survey it has been found that sonari is the top fast moving brand with 24% followed by Juliet with 20% and naidu hall with 16%.

Cost effective brands :



From the consolidated results it has been found that red rose stands first with 20% followed by Juliet with 20% and naidu hall with 16%.

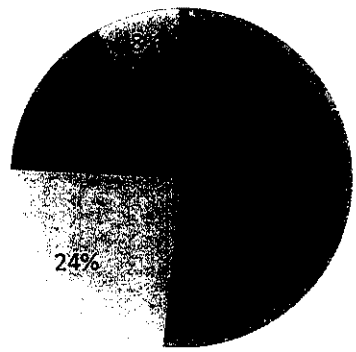
Luxurious brands :



In the luxurious brands category jockey stands first with 29% , timer land stands second with 25%, followed by triumph with 21%.

Brands used for store display :

chart 20 -brands used for store display

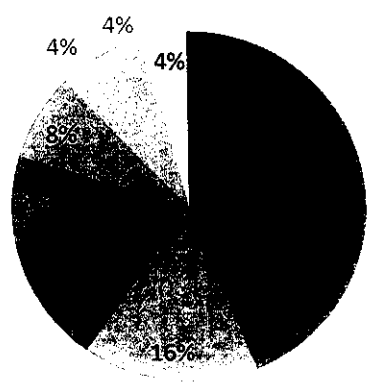


Available styles across brands :

Full support, Demi , Sports , Front closure, Padded, Under wire, Push up, Strap less, Convertible, Nursing, T.Shirt , Vintage, Lace, Trainer, Minimiser, Racer back, Seam less.

Fast moving styles :

chart 21- fast moving styles

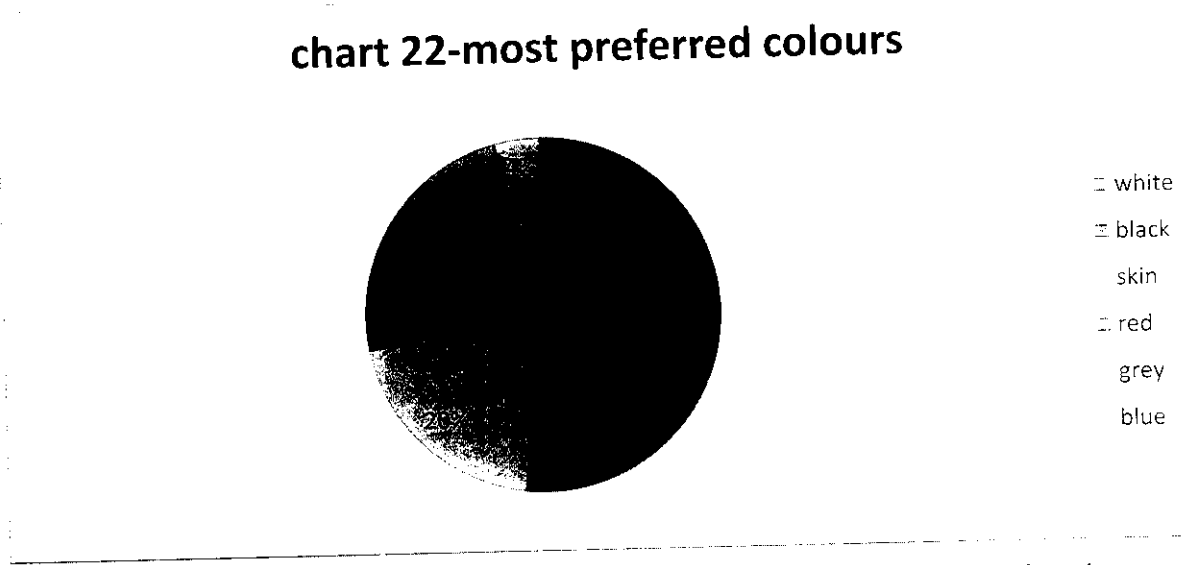


From the consolidated results it has been found that demi is the fast moving style with the rate of 24% followed by padded with 20% and sports with 16%.

Available colours :

Black, White, Skin, Red, Pink , Blue, Grey, Violet, Yellow.

Most preferred colours:



From the consolidated result it has been found that white is the most preferred colour with 32% rating followed by black with 20% and skin with 20%.

Fabrics available :

100% cotton, p/c, p/v, elastaine + cotton, Satin knitted, Combed cotton, polyamide, modal, Micro denier polyester, nylon, lace, silk.

Fast moving fabrics :

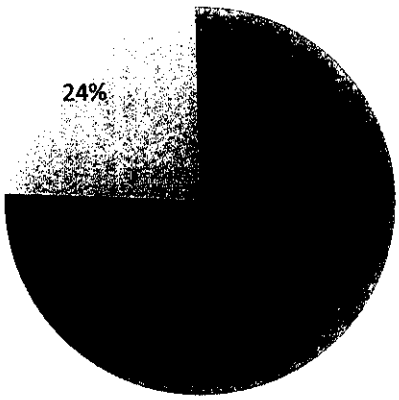
The above chart shows that in the fabrics available 100% cotton stands first with 35%, p/c stands second with 30% and polyamide stands third with 22%.

Sizes available :

28, 30, 32, 34, 36, 38 & 40 are the sizes in which Brazziers are available across brands & styles.

Fast moving sizes :

chart 23 -fast moving sizes



34
32
30

From the results consolidated from the survey it has been found that the top fast moving size is 34 with 40%, followed by size 32 with 36%, and size 30 with 24%.

BRAND SURVEY:

TABLE : 1

S.No	Name of the brand	Target market	Fast moving style	Preferred colour	Fast moving fabric	Fastest moving sizes	Cost range
1	Lovable	Upper middle class women	Demi, vintage, Sports.	White, Black, skin.	Cotton, Micro mattique	32 34	Rs.250 to 400
2	Angel fro	Middle class teens.	Thin strap, demi, lace	White, Black, skin.	Cotton, Elastane + cotton.	34 32	Rs. 15 and above
3	Naidu hall	All classes of women	Demi , Full support,	Black, White, Skin.	Cotton, Polyester cotton,	32 34	Rs. 15 and above

			front closure		Polyester viscose		
4	Daisy dee	Upper middle class women	Demi, Padded, Thin strap	Black, Skin, white	100% cotton, P/c, p/v	32 34	Rs.250 onwards
5	Timber land	Upper middle class teens	Sports, Demi, t-shirt	Skin, White, black	Cotton, p/v, micro fibre.	32 34	Rs.450 onwards
6	Sonari	Middle class women	Demi, Full support, padded	Black, Skin, white	100% cotton, P/c.	30 32 34	Rs.200 onwards
7	Jockey	Upper middle class teens and women	Sports, Trainer, Padded.	Black, White, grey	Cotton, p/v, p/c	32 34	Rs. 300 onwards
8	Enamor	Upper middle class women	Demi, double strap	White, Black, pink	Cotton	32 34 36	Rs.300 to 450
9	New petals	middle class women	Demi, Lace, t-shirt	Black, White, skin	Cotton, p/v, lace	30 32 34	Rs. 200 onwards
10	Lady lacy	Middle class teens	Demi, Padded, seamless	White, Black.	Cotton, Micro fibre	30 32	Rs.250 onwards.

4.2 TEST RESULTS OF UNFINISHED FABRIC AND FINISHED FABRIC:

DIMENSIONAL PARAMETERS:

MODAL/LYCRA :

UNFINISHED FABRIC :

GSM : 170

WPI : 36

CPI : 40

FINISHED FABRIC:

GSM : 190

WPI : 32

CPI : 36

COTTON / LYCRA :

UNFINISHED FABRIC :

GSM : 140

WPI : 62

CPI : 56

FINISHED FABRIC:

GSM : 155

WPI: 58

CPI : 53

CREASE RECOVERY :

TABLE 2: crease recovery test for Modal /lycra :

s.no	Angle of unfinished fabric		Angle of finished fabric	
	Course in degree	Wales in degree	Course in degree	Wales in degree
1	92	93	91	92
2	90	91	94	95
3	90	90	94	92
4	89	91	93	91
5	87	92	93	94
Avg	89	91	93	93

TABLE 3: crease recovery test for cotton /lycra:

s.no	Angle of unfinished fabric		Angle of finished fabric	
	Course in degree	Wales in degree	Course in degree	Wales in degree
1	140	160	107	110
2	135	155	107	102
3	139	160	102	107
4	142	162	101	102
5	137	158	100	107
Avg	139	159	103	106

From the results it is clearly evident that the angle of inclination for modal/lycra has improved after finish, showing the increase in crease recovery. The angle of inclination in cotton/lycra has decreased but the presence of lycra and single jersey knitted fabric construction will help to compensate on this problem and will help not to distort the comfort property.

ABRASION RESISTANCE :

TABLE 4: abrasion resistance for modal / lycra :

s.no	Weight of untreated sample		Weight of treated sample		Abrasion resistance %	
	Before abrasion	After abrasion	Before abrasion	After abrasion	Unfinished fabric	Finished fabric
1	.30	.29	.32	.31	96.67	96.88
2	.30	.28	.32	.32	93.34	100
3	.30	.29	.32	.31	96.67	96.88
4	.30	.29	.32	.31	96.67	96.88
Avg					96%	98%

TABLE 5: abrasion resistance for cotton/ lycra :

s.no	Weight of untreated sample		Weight of treated sample		Abrasion resistance %	
	Before abrasion	After abrasion	Before abrasion	After abrasion	Unfinished fabric	Finished fabric
1	.31	.29	.33	.31	93.55	93.94
2	.31	.28	.33	.31	90.33	93.94
3	.31	.29	.33	.32	93.55	96.97
4	.31	.29	.33	.32	93.55	96.97
avg					93%	95%

The result shows that there is an increase in the resistance to abrasion after the fabric is treated with chemicals. There is 2% increase in abrasion resistance of modal/ lycra and cotton/ lycra.

WETTABILITY :

TABLE 6: wettability test results for unfinished and finished modal / lycra and cotton / lycra fabrics :

s.no	Modal / lycra (sec)		Cotton/ lycra (sec)	
	Before finish	After finish	Before finish	After finish
1	1.58	1.23	1.90	1.56
2	1.76	1.36	1.96	1.46
3	1.62	1.11	2.04	1.60
4	1.77	1.24	2.02	1.55
Avg	1.68	1.23	1.98	1.54

The results inferred from the wettability test proved that the absorbency property of modal/lycra and cotton/lycra has improved by hydrophilic finish which is applied on the fabric.

WICKABILITY :

TABLE 7: wickability test results for unfinished and finished modal / lycra and cotton / lycra fabrics :

s.no	Modal / lycra (aft 1 min) cm		Cotton/ lycra (aft 1 min) cm	
	Before finish	After finish	Before finish	After finish
1	2.7	4.7	2.25	4
2	2.8	4.3	2.5	3.8
3	2.5	4.5	2.7	4.2
4	2.5	4.4	2.6	4
Avg	2.9	4.5	2.5	4

From the above results it is inferred that the wicking capacity of modal/lycra and cotton/lycra has improved after applying the finishes.

PILLING TEST :

TABLE 8 : pilling test results for unfinished and finished modal / lycra and cotton / lycra fabrics

s.no	Modal / lycra		Cotton / lycra	
	Before finish	After finish	Before finish	After finish
1	4	4	4	4
2	3	4	5	4
3	4	5	4	5
4	4	4	5	5
Avg	4	4	4	4

After subjecting to abrasion for five hours in the ICI pill box tester, it is found that there is no change in the pilling grade, before and after the application of finishes.

PERSPIROMETER TEST : (ACIDIC SOLUTION):

TABLE 9 : perspiration test results for unfinished and finished modal / lycra and cotton / lycra fabrics :

s.no	Modal / lycra		Cotton / lycra	
	Before finish	After finish	Before finish	After finish
1	4	5	4	5
2	4	5	5	4
3	4	5	5	5
4	4	4	5	5
Avg	4	5	5	5

From the above result it is clear that there is an increase in the grade of modal/lycra after finishing. There is no staining of colour on the cotton/lycra, before and after the application of finishes.

AIR PERMEABILITY :

TABLE 10 : air permeability test results for unfinished and finished modal / lycra and cotton / lycra fabrics :

s.no	Modal / lycra ($gm/m^2/day$)		Cotton / lycra ($gm/m^2/day$)	
	Before finish	After finish	Before finish	After finish
1	57	78.8	43.5	53.6
2	58	73.8	45.6	52.3
3	62.1	74.6	47.2	53.6
4	64.9	75.2	48.8	51.8
5	67.4	74.4	45.7	52.5
Avg	61.9	74.56	46.18	52.33

From the results obtained it is clear that the breathability of modal/lycra and cotton/lycra has improved after applying the speciality finishes. This is evident to prove that the hydrophobic finish on the face side does not affect the comfort property.

WATER VAPOUR PERMEABILIY :

TABLE 11 : water vapour permeabiliy test results for unfinished and finished modal / lycra and cotton / lycra fabrics :

s.no	Modal / lycra ($gm/m^2/day$)		Cotton / lycra ($gm/m^2/day$)	
	Before finish	After finish	Before finish	After finish
1	2734.51	3140.10	2825.83	3412.12
2	2710.04	3140.10	2787.82	3122.36
3	2661.10	3222.89	2667.43	3169.66
4	2893.56	3193.32	2635.75	3216.97
Avg	2749.80	3174.10	2729.21	3230.28

The above table shows that there is an increase in water vapor permeability of modal/ lycra and cotton/lycra after the application of finishes. The hydrophilic finish on the back side has enhanced the water vapor permeability of the fabric.

SPRAY RATING TEST:

TABLE 12 : Spray rating test result for modal/lycra and cotton/lycra

s.no	Modal / lycra (ratings)		Cotton / lycra (ratings)	
	Before finish	After finish	Before finish	After finish
1	0	80	0	90
2	0	90	0	80
3	50	90	0	90
4	0	90	50	80
avg	0	90	0	90

From the above table it is clear that the face side of modal/lycra and cotton/lycra has shown good repellency to water after the application of hydrophobic finish on it.

ANTI MICROBIAL TEST RESULTS :

TABLE 13 : antimicrobial test result for modal/lycra and cotton/lycra

S.NO	SAMPLE	ZONE OF INHIBITION (ESCHERICHIA COLI) (in mm)
1	Modal/lycra 1	15
2	Modal/lycra 2	12
3	Modal/lycra 3	14
4	Cotton/ lycra 1	8
5	Cotton/ lycra 2	10
6	Cotton/ lycra 3	11

4.3 COSTING

TABLE 14 : costing table for modal / lycra :

S.NO	MATERIAL	COST/UNIT	COST OF THE MATERIAL UTILIZED. (IN Rs.)		
			DESIGN 1	DESIGN 2	DESIGN 3
1	Modal/lycra	180/kg	38	36	36
2	Anti microbial finish	55/kg	4.00	10.50	10.50
3	Hydrophilic finish	33/kg	2.00	6.00	6.00
4	Hydrophobic finish	52/kg	3.75	10.00	10.00
5	Processing and curing	35/kg	3.00	6.50	6.50
6	elastic	15/meter	15	15	15
7	Stitching charge	45/garment	45	40	45
8	Total		: Rs. 11O	Rs.124	Rs.129

TABLE 15 : costing table for cotton / lycra :

S.NO	MATERIAL	COST/UNIT	COST OF THE MATERIAL UTILIZED. (IN Rs.)		
			DESIGN 1	DESIGN 2	DESIGN 3
1	Cotton /lycra	150/kg	30	30	30
2	Anti microbial finish	55/kg	4.00	10.50	10.50
3	Hydrophilic finish	33/kg	2.00	6.00	6.00
4	Hydrophobic finish	52/kg	3.75	10.00	10.00
5	Processing and curing	35/kg	3.00	6.50	6.50
6	elastic	15/meter	15	15	15
7	Stitching charge	45/garment	45	40	45
8	Total		: Rs. 104	Rs. 118	Rs.123

4.4 WEAR STUDY :

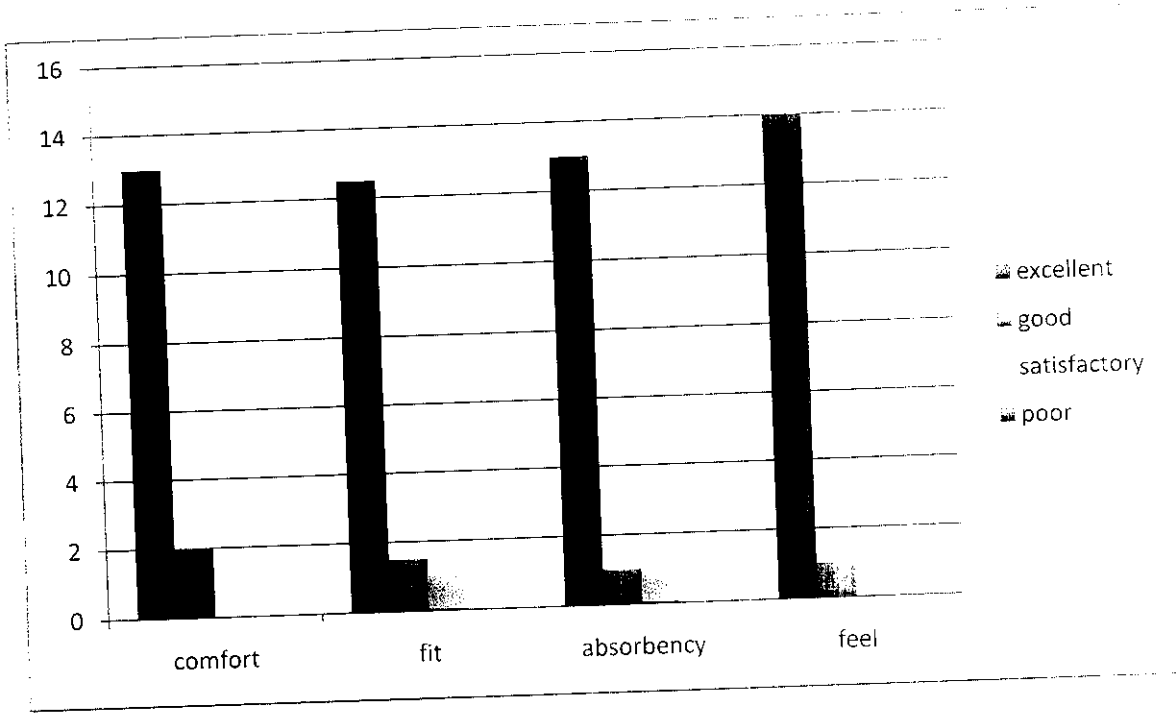
The lingerie developed is checked for its performance by doing the wear study among 15 people. The feed back form has been enclosed as **APPENDIX 5.** According to the feed back received the camisole with in built brassier is more comfortable than a separate camisole and is found to be free from irritations.

It is found to be more effective when compared to the other sweat management products in the market. It is also found to be cost effective and can be used along with any type of garment.

From the cost analysis of the existing products and camisoles it is found that the camisoles with inbuilt brassiers are more cost effective than the washable and disposable under arm pads.

CHART 24 : WEAR STUDY CHART

MODAL/LYCRA



COTTON/LYCRA

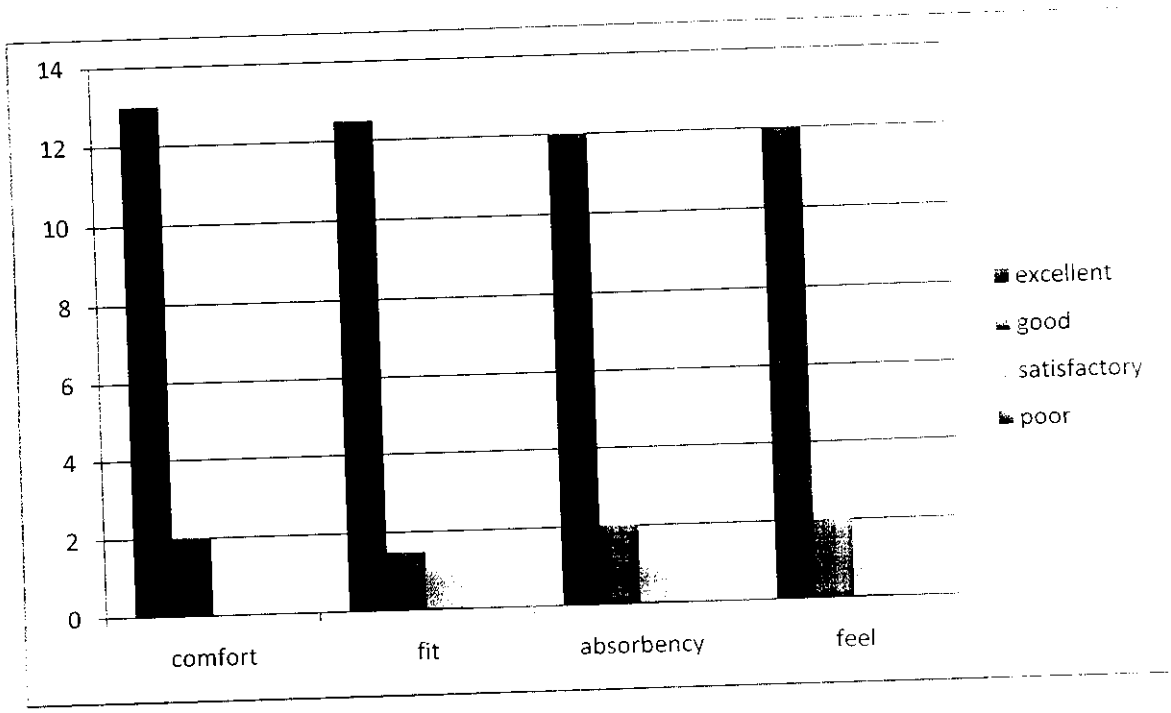


TABLE 16: COST COMPARISON BETWEEN THE EXISTING PRODUCT AND THE DEVELOPED CAMISOLE

s.no	Product	Durability	Cost/ piece	Cost/usage
1	Developed camisole Modal/lycra:	20 washes		
	DESIGN 1		Rs.110	Rs.5.50
	DESIGN 2		Rs.124	Rs.6.20
	DESIGN 3		Rs.129	Rs.6.45
2	Developed camisole Cotton/lycra :	20 washes		
	DESIGN 1		Rs.104	Rs.5.20
	DESIGN 2		Rs.118	Rs.5.90
	DESIGN 3		Rs.123	Rs.6.15
3	Washable under arm pads	5 washes	Rs. 25 * 2 pcs = Rs.50	Rs. 10
4	Disposable under arm pads	1 time	Rs. 20 *2 = Rs.40	Rs. 40

CONCLUSION

CONCLUSION :

From the project work that has been carried out we have arrived at the following conclusion.

Analysis of the different styles available in the existing brands, fabrics used for the production of lingerie, most peferred style, colour, fast moving size and the special features incorporated in the construction of a brassier has been done.

The problems faced by the consumers with the existing products such as low life of elastics, cup size mismatch, pilling and less durability, have proved a source of innovative designs with modal/lycra and cotton/lycra.

Properties of the camisole fabric have been enhanced by applying finishes like anti microbial, hydrophilic and hydrophobic finished on to it.

The comfort properties like water vapour permeability, wickability, wettability, air permeability, resistance to perspiration, resistance to abrssion, pilling and crease recovery has improved in the finished fabric. Anti microbial test results shows that the fabric posses good efficacy against microbes which prevents the wearer from skin diseases, and allergies.

The camisoles developed to meet out the problems caused due to sweat, is made using the highly absorbent and stretchable cotton / lycra and modal / lycra. The developed lingerie has comfort properties like fit, breathability, feel , absorbency, and anti microbial effect.

The produced camisole is very cost effective when compared to the disposable under arm pads and the washable under arm pads. More over the under arm pads give protection only to the arm pits where as the developed product gives protection to the whole outer wear. The product is expected to yield more attraction.

FURURE SCOPE:

- The fibres used can be changed to improve the comfort properties of the garment.
- Camisoles which cover the body till the waist line can be developed to give maximum sweat protection.
- Additional finishes can be given to enhance the performance of the fabric.
- Further study could be done to analyse the impact of various knitted fabric constructions on the performace of the developed garment with the same finishes.

APPENDIX

APPENDIX 1:

SURVEY ON LINGERIE BRANDS FROM RETAILERS

Name of the Shop:

Location:

Type of Shop:

- MBO
- Lingerie retailers

Kindly furnish the details of Lingeries in your Store.

1. What are the Brands available?

2.List of Top three Fast moving brands:

1. 2. 3.

3.List of Cost effective Brands:

1. 2. 3.

4.List of luxurious Brands:

1. 2. 3.

5.What are the Brands generally used for store Display?

6.What are the available styles across Brands?

7.List of Top three fast moving Styles:

1. 2. 3.

8.What are the commonly available Colours?

9.What are the most preferred colours?

1. 2. 3.

10.What are the Fabrics available?

11.What is the fastest moving Fabrics?

1. 2. 3.

12.What are the sizes available?

13.What are the fastest moving size?

1. 2. 3.

14.How many pieces are preferred by customers in a single purchase?

15.What are the common customer complaints?

16.Suggestions for Manufacturers?

APPENDIX II:

BRAND SURVEY

Kindly furnish the details on Individual Brazier Brands in your store:

Name of the Brand:

Target market:

1.What styles are available?

2.List of top three fast moving styles?
1. 2. 3.

3.What are the colours available?

4.What are the most preferred Colours?
1. 2. 3.

5.What are the Fabrics available?

6.What is the fastest Moving fabric?
1. 2. 3.

7.What are the size available?

8.What are the fastest moving sizes?

9.What are the Cost Ranges available?

10.What are the features available for
1. Fit:

2. Comfort:

3. Special Features:

11.What are the common customer complaints about the Brand?

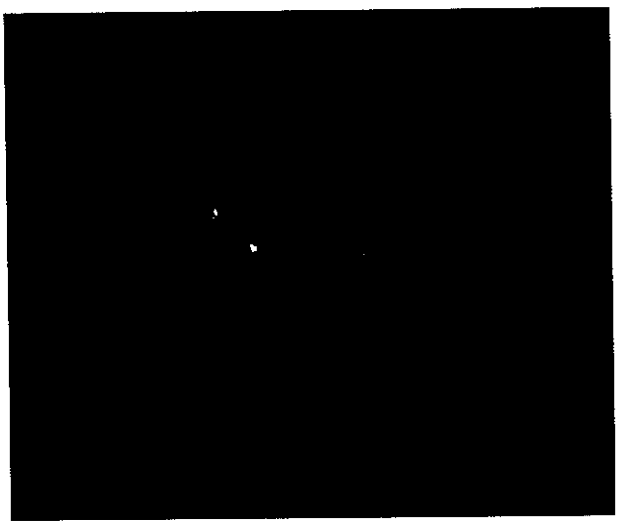
12.Suggestion for the manufacturer:

13.Brand logo:

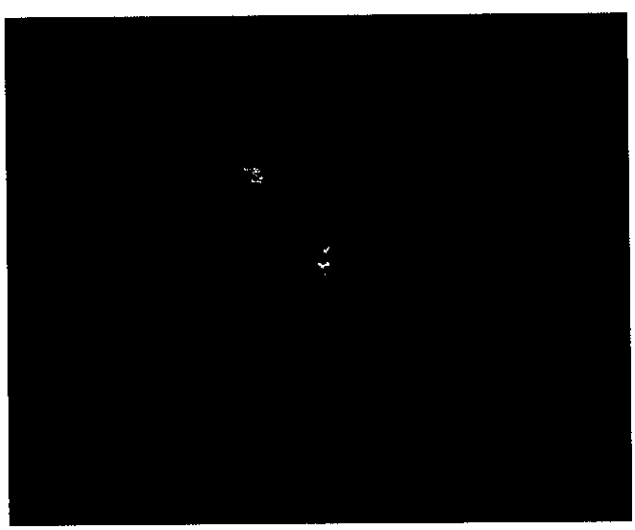
14.What are the colours used in the package?

APPENDIX III :

MODAL /LYCRA (FACE SIDE):

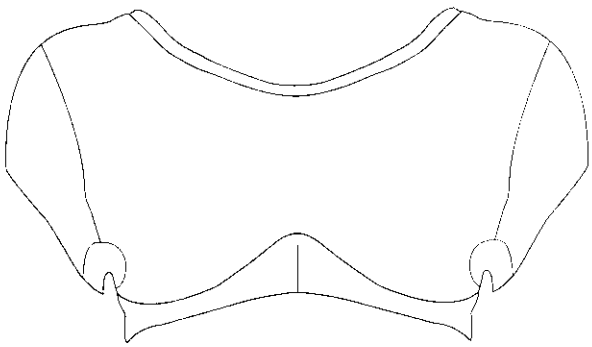


COTTON /LYCRA (FACE SIDE):

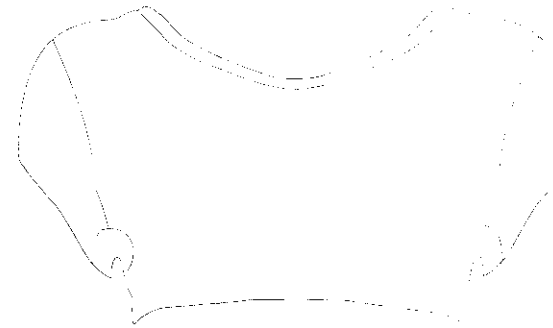


APPENDIX IV: WORKING DIAGRAMS OF THE SELECTED STYLES:

DESIGN 1:

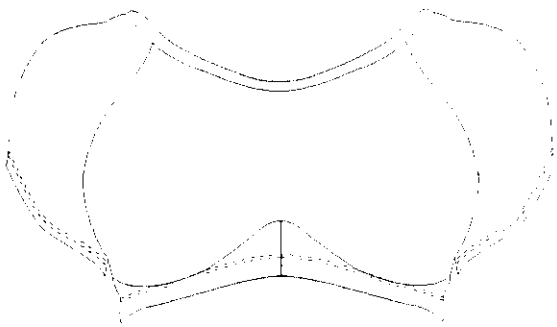


front



back

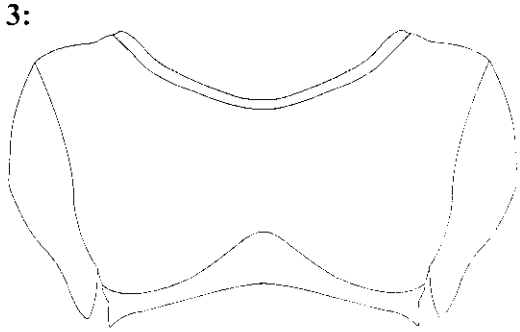
DESIGN 2:



Front

Back

DESIGN 3:



Front

FIG 12

Back

APPENDIX V:

FINAL LOOK OF THE PRODUCT

DESIGN 1:

DESIGN 2 :

DESIGN 3:

APPENDIX V:

FEED BACK FORM FOR WEAR STUDY :

NAME : AGE :

ADDRESS : OCCUPATION:

ABOUT THE PRODUCT

1. COMFORT ☐ EXCELLENT ☐GOOD ☐SATISFACTORY ☐FAIR
2. FIT ☐EXCELLENT ☐GOOD ☐SATISFACTORY ☐FAIR
3. ABSORBENCY ☐ EXCELLENT ☐GOOD ☐SATISFACTORY ☐FAIR OF SWEAT
4. FEEL ☐ EXCELLENT ☐GOOD ☐SATISFACTORY ☐FAIR
5. IS THEREANY IRRITATION CAUSED?

   A) YES B) NO
6. ANY ALLERGIC REACTIONS ?

   A) YES B)NO
7. IS IT EFFECTIVE WHEN COMPARED TO UNDER ARM PADS?

   A) YES B)NO
8. ANY OTHER COMMENTS ?

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