Innovation of Batik Textile Works Using Wax Printing Techniques: Insights from Indonesia

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Abstract

Batik is a type of decoratively patterned cloth made by applying hot wax to the surface of the cloth with a canting or stamp tool, a process that takes a long time. One batik maker in one week only produces 1 sheet of cloth (115cm x 250cm). Therefore, there is a question as to what is the right technique to speed up the batik production process. This research examines the wax printing technique including the steps for making it, the equipment used, and the preparation of the dough material.

Research was conducted at the Dewi Ratih batik business in Sragen, Central Java, Indonesia using qualitative, descriptive and participatory methods. The informants consisted of a batik entrepreneur, a motif designer, a molding wax maker, three printers, two color craftsmen, and two batik craftsmen.

It concludes that the innovation of wax printed batik is capable of producing 150 times the product compared to written batik. The stages of making batik patterned textile crafts using a new technique (cold wax print technique) are as follows: (1) make a master design of batik motif on paper then arrange the master design according to the pattern made, apply an afdruk of the motif design on the screen, make mixing print wax, printing motifs on fabric using cold wax media, drying the print wax, dyeing the fabric in the first stage, the process can also be combined with wax batik which uses writing techniques. (2) Dyeing the fabric, melting the wax, and finally washing the fabric to produce batik-patterned textile craft products.

Keywords: Batik textile craft, Printing, Cold wax.

Introduction

Batik is a traditional pattern of cloth with various decorative patterns made using a strain dyeing technique with "batik wax" as a color straining material (Doellah, 2002). It is a cloth-based work of art that uses a strain dyeing technique with hot wax as a color strainer (Sarwono, 2021). Thus, a cloth is referred to as a batik creation if (1) the strain dyeing technique employs hot wax, (2) the method of incising the wax employs a canting tool and/or a hat, and (3) it contains various decorative patterns typical of batik (Mandegani, 2018).

The cloth creations used in this study have various decorative patterns typical of batik, but the process of coloring the cloth motifs uses cold wax blocks rather than hot wax as is the common practice. Then, instead of a *canting* or stamping device, a screen is used to attach cold wax to the cloth. Therefore, whereas this work does not comprise batik, it is classified as a batik-patterned textile craft (Erwantoro, 2023).

Color screen printing or full print textiles, color removing screen printing textiles, resin removing screen printing textiles, and cold wax screen printing textiles are the various types of batik-patterned textiles. Cold wax screen printing textile production can be integrated with the written batik technique. The following is a comparison of cold wax textile screen printing and writing technique batik with written technique batik. (1) The production capacity of batik-patterned textiles is approximately 150 to 1, indicating that the wax-screen textile production process can produce 150 products in one week or six working days, whereas written batik can only produce one product. (2) Because the combined textile process also employs the writing technique, the crispness of the motifs and colors produced is nearly identical (Sholikhah and Nurrohmah, 2021; Salma and Eskak, 2020).

Reactive dyes or remazol, indigosol dyes, and napthol dyes are some of the most common dyes used to color batik (Aprilia and Adriani, 2022). Reactive dyes can react and bond directly with the fiber, becoming a part of it. Remazole is a reactive dye that is frequently used in batik coloring. Technically, remazol batik staining can be applied by dipping, dabbing, or brushing. These dyes are water soluble, have brilliant colors, are fast, and have a low affinity (Rashidi, 2012).

Indigosol dye is a type of water-soluble vessel dye. This dye solution is clear and colored. The expected color is not obtained when the cloth is dipped in the dye solution. The desired color will be obtained after being placed in an acid solution (HCl or H_2SO_4). Indigosol has molecular formula $C_{16}H_{10}N_2Na_2O_8S_2$.

Naphtol dyes are common water-insoluble dyes. Costik soda auxiliaries were required to dissolve it. Napthol dyeing is done in two stages. First dyeing with naphtol solution yielded no color. The desired color will be obtained after the second stage of immersion in a diazodium salt solution. Cold napthol dyes for batik are napthol dyes that must be generated with a color generator, specifically Diazo Salt.

A screen is a type of cloth that is used for screen printing. Thick, abbreviated as T, is the density of the woven screen threads and is used to indicate screen size. For example, T54 denotes that every centimeter of screen fabric is made up of 54 threads. Thus, the larger the T number, the more threads or the tighter the threads on the fabric. Screen sizes include T36, T40, T48 (T12), T54 (T14), T61 (T16), T77, T90, T120, T150, T165, T180, and T200.

Rakel is a broom made of synthetic rubber (Suparman, 2017). There are several types of *rakel*, which are as follows. (1) Taper *rakel*, in which both sides of the slanted *rakel* are symmetrical. The taper rack's objective is to ensure that the pressed ink produces detailed and clear images. (2) Taper *rakel* type with flat tip, its function is to make the ink pressed wider and more. The large number of this type of *rakel* is used for screen printing on parachute or ceramic cloth. (3) *Rakel* box is a box with a 90-degree angle. This rakel is commonly used in screen printing on rough-surfaced paper or textile material. (4) Slanted rakel, which has one side with a sloping surface. This rakel is more commonly found in screen printing machines. (5) Round *rakel*, a round *rakel* surface, is typically used for screen printing with contrasting or bright ink. (6) Blunt *rakel*, which has a blunt shape at both ends of the elbow, making the *rakel* comfortable to use in screen printing on surfaces such as t-shirts, blankets, and towels.

The mass textile production process in this study used screen printing, whereas the production of motif designs used digital printing technology (DfG printer). Both technologies have advantages and disadvantages, as well as different roles and market segments (Supatmo, 2015). The textile production process in this study used a more cost-effective technology, namely screen printing. The manufacturing of industrial printing plates is a very expensive process (Andri, 2022). The active use of *cetak saring* (screen printing) techniques in the industrial sector promotes the advancement of this technique, both in terms of tools and materials. Screen printing techniques are also developed more specifically by small industries in Klaten to meet their specific needs (Battenfield and Tunnikmah, 2017).

This screen-printing technique is also used on objects that come into contact with the value of local wisdom in our lives. Thus, in this work, we attempt to collaborate between graphic art representing modern art and visual objects based on local wisdom representing tradition (Adi, 2021).

Many batik artisans in Sragen Regency, Central Java Province, are currently producing cold wax screen printing textiles and/or combining them with writing techniques. Therefore, the aim of this research is to follows:

1. To investigate cloth creations using various decorative batik typical patterns, but the process of coloring the cloth motifs used cold wax blocks rather than hot wax blocks, as is common practice.
2. To explain various aspects of the textile manufacturing process that employs a color barrier with "cold wax" that is attached to a screen tool or screen-printing technique. Cloth preparation, motif design, *updruk* motifs on the screen, wax printing/screen printing process, coloring process, color locking process, and wax *melorod* processing are the first stages of production.

The study explains how to make batik-patterned textile crafts using the cold wax printing technique, as well as the equipment needed and the steps for making the dough ingredients. These aspects include the production of raw material dough, the type of equipment used, and how each stage is carried out.

Review of Literature

Several studies have been conducted regarding the same problem as this research. For example, regarding the issue of developing batik motifs design, motif patterns, stamped batik, batik coloring and so on.

Design is a pattern, shape, configuration of parts carried out through hand craftsmanship (Aldrich, 1969), which is carried out to transform existing conditions to desired conditions (Hobday, Boddington, and Grantham, 2011), and also to satisfy or stimulate needs and consumer tastes (Guo et al. 2016). Motif innovation has a significant role in a craft product, because it provides visual appeal to consumers (Guntur, 2021). Thus, it can be interpreted that a design with its visuality is always first (Gaus et al. 2013). This is because the attractive and practical aspects of the design of a product attract consumers. Motifs are the smallest decorative elements arranged to form a pattern. Pattern is the order, arrangement, or composition of one or more motifs through repetition (Guntur 2021). A regular pattern is an arrangement of motifs based on type, size, direction or certain intervals that is repeated and constant. A pattern is a design consisting of one or more motifs, multiplied and arranged regularly (Philip and Bunce 1993).

The development of batik motifs has been researched by many people, such as Mulyanto (2018) who wrote that reog art was a source of ideas for developing Ponorogo batik motif designs. Hamzuri (1981) wrote about classic batik motifs. Salma and Eskak (2012) studied the aesthetics of typical Sleman batik designs. Salma and Satria (2015) studied coffee and cocoa in creating typical Jember batik motifs. Mulyanto (2018) wrote that archaeological sites were a source of ideas in developing Sragen batik motifs. Mulyanto et al. (2022) wrote that teak trees were a source of inspiration for developing batik motifs. Nurcahyanti et al. (2021) wrote about the role of craftsmen in the development of batik design as a traditional textile in Indonesia. Masiswo and Atika (2014) studied the application of typical Maluku ornaments to develop batik motif designs. Eko Sugiarto (2023) states that batik products have two ornamental aesthetic functions, namely a negotiation function and a communicative function.

Kamtorn et al. (2015) wrote that batik motifs in Indonesia, Malaysia and Thailand can be classified into 6 types, namely: floral motifs, geometric motifs, fauna motifs, object motifs, mixed floral and geometric motifs, and alphabet and symbol motifs. Mulyanto and Lili (2020) wrote training on batik motif design development models for designers in micro businesses. Asmah et al. (2015) and Asmah (2016) studied that innovative batik motifs are very important in contemporary batik design concepts to improve the quality of batik cloth in the Ghanaian fashion industry. Patria (2016) wrote about Dutch batik motifs: The role of Dutch rulers and entrepreneurs. Masiswo et al. (2017) explained that to make batik paste wax, batik wax, resin or cat's eye, gondorukem, kote, paraffin and turpentine are used. These ingredients are mixed and heated until batik paste wax is obtained, then diluted using benzene solvent and thinner.

The problem of batik patterns has been studied, among others, by Mulyanto et al. (2021) wrote pattern 210 to design a long-sleeved shirt with a sanggit batik motif. Mulyanto et al. (2019) studied the pattern design and placement of sanggit batik motifs on short-sleeved shirts. Fung et al. (2020), reviewing the development of men's shirt patterns in the last 100 years. Liu and Chen (2015) studied computer simulations of crack-printed batik patterns using more modern equipment, and the results proved effective in realizing various vibrant and satisfying crack-printed batik patterns.

The problem of stamped batik has been researched by Suparman (2017) regarding the creative screen-printing graphic arts industry as an effort to empower the community in Sidoharjo. Sulistyati and Widiastuti (2022) stated that one alternative to strive for sustainable Surakarta batik production is to utilize the cold wax print technique. This creativity emerged in line with the batik regeneration crisis in Surakarta and adjustments to market demand. Kasikovic et al. (2016) wrote that the advantages of the printed batik process are that textile printing offers higher printing speed in the short term, flexibility, creativity and environmental benefits. Additionally, the use of digital printing techniques allows for better visual effects, as well as greater flexibility of print formats. Additionally, it offers better control over print quality uniformity throughout the production run.

The problem of batik coloring has been researched by Sarwono, et al. (2021) regarding natural batik dyes from Terminalia bellirica, Ceriop condolleana, Cudrania javanensis and Pelthopherum pterocarpum. Aprilia and Adriani (2022) wrote about synthetic batik dyes at the Pandan Mangurai Batik House, Sungai Penuh City. Belfer (2012) has explored the history of dyes in batik cloth and traditional tie-dye techniques.

Research Methods

This action research was conducted at the Dewi Ratih Batik Business in Sragen Regency, Central Java Province, Indonesia, in 2021. To create batik-patterned textiles, the batik industry employed the cold wax printing technique. Data on the batik textile craft production process includes the steps of the batik-patterned textile craft production process carried out by employees as well as the priority aspects of each process in achieving optimal product quality.

Following diagram represents the flow of the batik-patterned textile production process using the wax printing technique (Mulyanto, 2020).

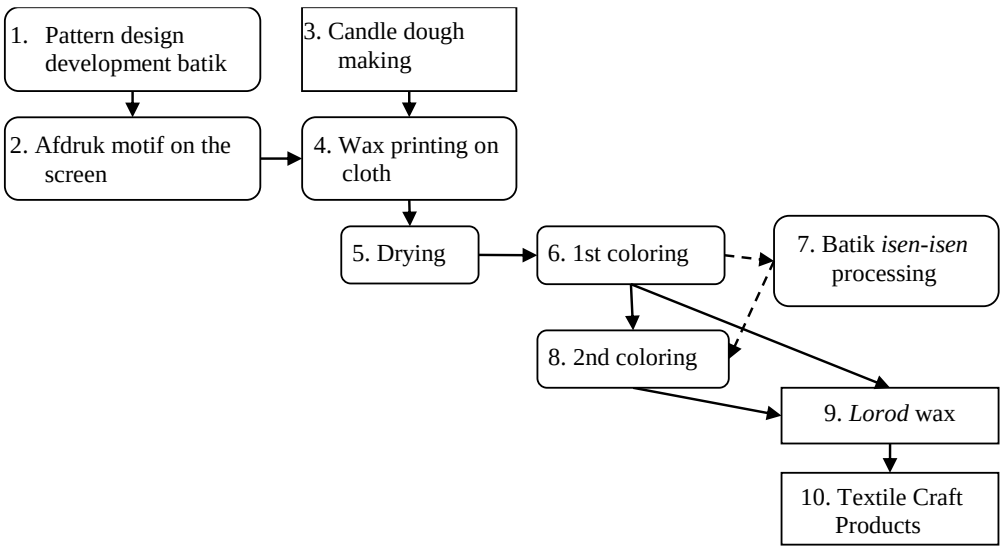


Fig 1: The flow of the Wax Printing Textile Crafts Production Process
Source: Author

Informants, the location and process of textile craft production, and documents were used to collect data. There were ten informants, including one entrepreneur, one motif designer, one printed candle maker, three printing employees, two dye employees, and two batik artisans.

Data on the production process was collected through interview techniques and observations of the events of the process of designing motifs, making printed wax dough, printing activities, coloring activities, and wax dropping activities.

Findings and the Discussion

This study on batik-patterned textile crafts using screen printing or cold wax printing examines the process as well as the tools and materials used. Making motif designs, processing with ufdruk, making printed wax raw materials, printing wax on fabrics, drying waxes, dyeing fabrics, and waxing processes are some of the production processes.

Textile Product Planning

Typically, the textile manufacturing process begins with product planning. The planning is related to several aspects such as the production technique to be used, the type of motif created, the pattern type used, the use of cloth, and so forth.

Based on field observations, textile production techniques include full color printing, color removal printing, resin removal printing, cold wax printing, and a combination of printing and writing techniques. Motifs include repetition motifs, fried rice motifs, machete motifs, symmetrical motifs, asymmetrical motifs, and abstract motifs. Patterns include long cloth patterns, shirt patterns, shirt-finger patterns, and others. Textile applications include, for example, women's and men's clothing, as well as accessories.

The Process of Boiling the Cloth

According to Wartitik entrepreneur and Waluyo craftsmen, the main purpose of boiling, *meloyor*, or mordanting cloth is to remove starch and dirt that has abided to the cloth. The alum element used to slough off will bind iron (fe) to the fabric. Therefore , the cloth can easily and strongly bind dyes, especially natural dyes. Here is how to make a loyor or mordant solution mixture. *Loyor* dough = 120 g alum + 40 g soda ash + 20 liters water. The solution is then boiled for 1 hour, or if the solution for melting cotton cloth has a boiling point of up to 100ºC, while the solution for softening silk cloth is boiled to a temperature of about 70ºC.

Following is a simple way to apply the slack method to fabric, according to Waluyo craftsmen: (1) TRO water or detergent is used to wash/clean the cloth. (2) The cloth is boiled or dissolved in boiling water for one hour before the heat is reduced. (3) After soaking for 24 hours (1 day), the cloth is washed with clean water and drained.

The more the cloth is stretched during the refining process, the more cracked the thread will be and the cloth will become more sticky, limp so that if dyed, the dye will stick more easily and be stronger/not easily faded. Additionally, the cloth's character will be more flexible and weak, making it easier to make batik and color.

Creation of Motifs and *Ufdruk* Motifs

Based on observations, the following is in designing the batik motif that will be applied to the screen and screen for printing cold wax. If the motif is geometric in nature and the pattern is as lengthy as the cloth, the master motif is made measuring 115cm x 60cm, and the motif is printed on a screen measuring 150cm x 80cm. If the pattern is made of long cloth and printed in pieces, arrange the motifs in a size of 115cm x 250cm, then apply *ufdruk* on a screen measuring 150cm x 300cm. The number 115cm represents the width of the cloth to be worked on.

If the motif is intended for shirt clothing products with motifs that are intended to be very sharp, the master motif is 70cm x 90cm in size (the size of the broken pattern on the back of an adult). The master motifs are then arranged on the selected pattern in accordance with the broken shirt pattern. Short sleeve shirt patterns measure 115cm x 200cm, long sleeve shirt patterns measure 115cm x 250cm, jumbo long sleeve shirt patterns measure 115cm x 270cm, and long sleeve shirt patterns measure 115cm x 210cm.

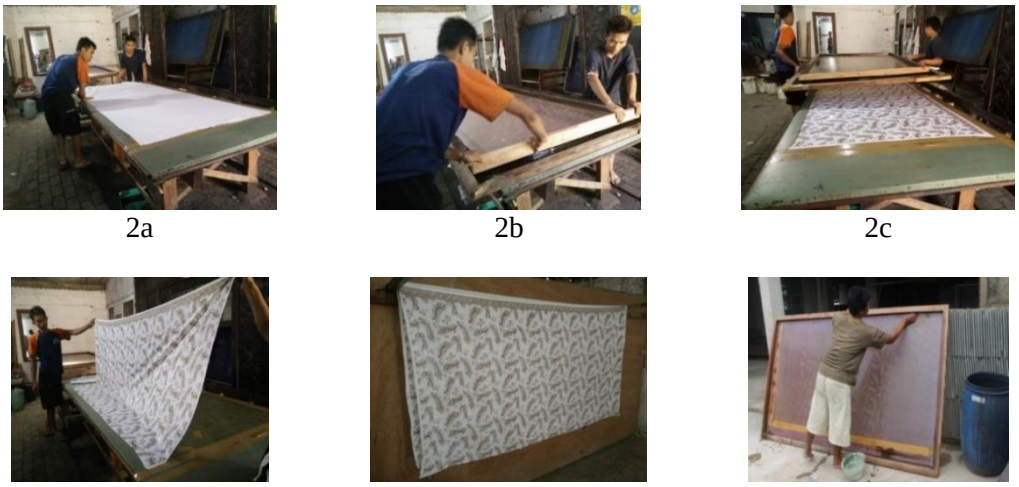
Wax Printing Process

Based on observations at the Dewi Ratih batik business and interviews with Waluyo craftsmen, the stages of printing batik patterned textile crafts using the cold wax print/screen printing technique are as follows. First, prepare the printing table by ensuring that the table surface is clean and flat so that the wax prints penetrate the fabric evenly. If the table is dirty during the printing process, the cloth may become damaged or torn, and the color may become bloated. The table's surface is then smeared with super glue using a brush or scrap to glue the cloth to the table so that the surface of the cloth is arranged flat on the table and the cloth does not shift when waxed (Fig. 2a).

Second, place the screen on a cloth, then place a cold wax mixture on top of the screen, and then the wax is wiped with a *rakel* by two people from one end of the screen to the other, and vice versa. If the cloth being worked on is a fine cotton *mori* cloth of the prima or *primisima* type, the wiping procedure is repeated 2-3 times back and forth until the wax penetrates the pores of the fabric evenly. If the cloth is dobby cotton *mori* cloth with a textured surface, the process is repeated 3-4 times back and forth until the wax has evenly penetrated the pores of the cloth. When the printing is finished, the screen is lifted and placed at the end of the table, and the cloth is cut (Fig. 2b and 2c).

Third, once the printing process is complete, the printed cloth is cut from the rolled cloth and lifted and removed from the table by two people (Fig. 2d). Furthermore, the wax is dried using a drained cloth that is hung lengthwise on a wire (Fig. 2e). The drying process for this printed wax is sufficient to drain it in the room; however, it should not be exposed to direct sunlight. When drying in direct sunlight, the wax that has been attached to the cloth could melt, allowing the motif to become damaged. The fabric is ready to be dyed once the printed wax has dried.

Fourth, after the printing process is complete, the table and screen are cleaned of the glue and wax mixture so that the screen pores are not coated with wax (Fig. 2f). The adhesiveness of the wax dough, the size of the wax grains, the condition of the table surface, the condition of the rubber *rakel* surface, the compressive power when printing, and the air temperature when printing all have an impact on the outcome of this wax print. Mesh type, screen rule, ink viscosity, and raster spacing are all factors that influence screen printing quality (Farida, 2021). The printing material is equally important as the screen printing process itself. The quality of screen printing material is determined by the composition, structure, and features of the printed matter, as well as the composition, viscosity, and other properties of the ink.



2a 2b 2c

2d 2e 2f

Fig. 2: Process Flow of Cold Wax Printing on Cloth
Source: Author, 2021

Printing Equipment and Facilities

Based on observations and interviews with craftsmens, the basic The basic equipment required to print cold wax in the production of batik-patterned textile crafts includes a printing table, screen, rack, bucket, and drain cloth. The printing table considered necessary to print is approximately 150cm wide, with the length of the table determined by the needs and length of the location in multiples of the length of the cloth to be printed (2.0m or 2.5m). For example, if only one piece of cloth is to be printed at a time, a table length of approximately 2.5m or 3m (2m or 2.5m + 0.5m) is required. If only one print is required, two pieces of cloth are required, and the table length is 4.5m to 5.5m (2.5m + 2m or 3m + 2.5m). If only one print is required, three pieces of cloth are needed, and the table length is 6.5m or 8m 2.5m + (2 x 2m) or 3m + (2 x 2.5m). If it is only needed to print once, 10 pieces of cloth are required, so the table length is 22.5m or 28m 2.5m + (10 x 2m) or 3m + (10 x 2.5m), and so on.

The table's length is determined by the requirements of production capacity, the length of each piece of cloth produced, and the length of the location. To increase the efficiency of the batik-patterned textile production process with wax screen printing, use a long printing table; the longer the table, the more efficient the production process. For example, if a printing table measuring 50m long is used to print a piece of cloth that is 2m long each time, one can get 24 pieces of cloth every time one arranges the cloth on the table (50m : 2.05m = 24). As well as if it is used to print cloth, each piece measuring 2.5m, it takes every time the cloth is organized on the printing table to produce 19 pieces of fabric (50m : 2.55m = 19).

The size of the printing table is closely related to the printing facilities. A location approximately 3m wide and a minimum length of 7m is required to print 1 piece of cloth once. The location's 3m width is reduced by the 1.5m table width, leaving 1.5m of space. The table is then placed in the center, leaving 0.75m of space on the right and left sides of the table. The printer uses the 75cm wide space on the right and left sides of the table for cloth arranging and printing forward and backward.

The length of the printing space is 7m minus the table length of 3m, leaving 4m, which is used for the roll cloth to be printed at one end of the table, and the remaining 3.5m is used to put the screen after use to print. If the table is 5.5 m long, the location is approximately 9.5 m long; if the table is 8 m long, the location is 12 m long, and so forth. Table 1 shows the approximate length of the table and the length of the required printing location, as well as the number of printed cloth pieces.

Table 1: Relationship between printed cloth cut, table length, and required location length
Source: Author

No.	The number of cloth pieces in a single print	Cloth length 250cm	
		Table length (cm)	Location length (cm)
1	1	300	700
2	2	550	950
3	3	800	1200
4	4	1050	1450
5	5	1300	1700
6	10	2550	2950
7	15	3800	4200
8	20	5050	5450
9	N	M= 50+(Nx250)	L= 450+(Nx250) L= M+400

Information:
N = Number of cloth pieces printed in a single printing process
M= Printing table length
L = Length of the table's location

A rough screen measuring T54 (T14) or T61 is used to screen cold wax (T16). Because the T61 screen produces less wax than the T54 screen, it is appropriate for printing candles

during the rainy season, printing rather complex motifs, and printing wax on fine textured cloths.

T54/T14 screen sizes, on the other hand, emit more wax, making this screen excellent for printing candles during the dry season because the printed wax dries faster. Screen T54 can also be used to print wax on slightly rough or large motifs, as well as on coarse-textured garments like dobby cloths.

Rakel is a tool that is used to push and press the ink on the screen cloth so that it adheres to the screen printed media such as cloth, paper, plastic, wood, and glass. Rakel is made up of two parts: a rubber rakel and a wood or aluminum handle.

Wax Print Textile Material

Based on observations and interviews with craftsmen, cloth, printed wax dough, and fabric dyes are the raw materials required to make batik-patterned textile crafts using wax screen printing techniques. Cotton fabrics with an even texture and textured dobby cotton cloth are used to create wax print textile crafts. (See Fig. 3) In this study, a fine cloth of the Prima or Primissima type was used.

Fig. 3: Cotton cloth
Source: Author, 2021

Fig. 4: Dobby cloth
Source: Author, 2021

The raw materials for molded wax dough are wax, *gondorukem* (resina colophonium), resin, and turpentine (Fig.5). Comparison of these materials: 30 kg of wax + 2 kg of *gondorukem* + 2 kg of resin. To make molded wax dough, boil the three ingredients until they melt, then filter the dough while it is still hot through a T61/T16 size screen (Fig. 6). The filter dregs or dirt are removed. After the dough has cooled slightly and the stove flame has been extinguished, it is mixed with 5-6 liters of gasoline and stirred until smooth, ready for printing.

The function of the wax in the printed wax mixture is to block the color in the cloth dyeing process. The *gondorukem* (resina colophonium) and resin serve to abide the wax to the cloth. Turpentine's function is to thin the dough and speed up the wax drying process.

Fig. 5: The G*ondorukem*, and Resin Waxes
Source: Tokopedia

Fig. 6: The Process of Boiling and Filtering the Wax Material.
Source: Author, 2021

If the dough will be used for printing, another 3 liters of turpentine was added. The thickness of the printed wax dough is determined by the type of cloth to be printed, the size of the motif (such as dots, stripes, and areas of the motif to be printed), and the printing room temperature. Runny wax dough is better suited for printing on cloths with tight pores and a rough texture (dobby cloth), printing complex motifs and small sizes, and printing in the dry season when the room temperature is high. A slightly thick wax mixture, on the other hand, is

appropriate for printing cloths with large or sparse pores and a fine texture, for printing large motifs, and for printing in the rainy season with low room temperature so that the wax dries quickly.

Cloth Dyeing Process

Based on observations and interviews with craftsmen, the dyeing of wax-printed cloth can be accomplished in two ways: *colet* and dyeing. The *colet* technique involves dyeing the cloth horizontally on *spanram* before coloring it with a brush, sponge, or other tool. This *colet* technique is suitable for dyeing wax printed cloths, in which wax is generally difficult to penetrate through the pores of the cloth; additionally, this *colet* technique is appropriate for coloring small areas of motif.

The dyeing technique is the process of dying the cloth by immersing it in a color solution, dipping it in but not allowing the batik wax to break. This dyeing technique is appropriate for dyeing wax-printed cloths with good wax penetrating power in the pores of the cloth, as well as hand-drawn batik cloths (Kurniati, 2023).

Remazol dye with waterglass (sodium silicate) as the locking agent is used to color wax-printed batik cloths. Because remazol dyes have bright colors that are difficult to absorb in the cloth, they are best suited for cotton fabrics and not silk fabrics, and the drying process of cloths must be drained and should not be exposed to direct sunlight. Remazol is a reactive *procion* batik dye. The use of remazol dye is relatively simple because we do not need to give a mixture of substances to produce the color as we do with napthol dyes.

There are three primary colors: blue, yellow, and red. These three primary colors are used in remasol color mixing. Remasol blue colors include KNR, RSP, and others. Remazol red colors include 3B, 5B, 6B, 8B, and others. Remazol yellow colorants include 7G, FG, and others. Green is made up of two primary colors: blue and yellow. Yellow 7G, FG, and others can be used to make these two procion colors, as can blue KNR, Black B, Turquoise, RSP, and others.

To make a dark green color, combine blue and yellow with a higher blue dose ratio (e.g., 60% blue and 40% yellow). To make a light green, mix less blue than yellow (for e.g., 20% blue and 80% yellow). After measuring each dye, the two colors are mixed in a bucket with 1 liter of water. The dye is now ready to be used for the fabric coloring process, both dab and dye.

Fig. 7: Cold Wax Printed Cloth
Source: Author, 2021

8a 8b 8c 8d

Fig. 8: Textile Products Dyed Using the Dyeing Technique
Source: Author, 2021

The Process of Boiling Wax (*melorod*)

After the final coloring process is completed, the wax boiling process *melorod* begins, which involves cleaning the wax from the fabric with a lorod solution. How to make a wax *melorod* solution with 50 liters of boiled water and 1/2 kg of soda ash. The *melorod* wax method, in which one piece of cloth is inserted and dipped into a boiling *lorod* solution with a stick. After the wax is removed from the cloth, it is removed, inserted, and washed in a regular water bath, removed again, and washed in the next water bath, and finally drained.

Fig. 9: The Wax Boiling Process Through *Melorod* by Dipping a Cloth in Boiling Water
Source: Author, 2021

Conclusions

Following are the steps for making batik patterned textiles using the cold wax print technique. First step is to create a master batik motif design on paper, which is then assembled according to the pattern created, the motif design that has been printed is screen printed, the process of printing the motif on fabric using wax media, and drying process. The wax printing process includes drying the fabric so that the wax does not melt, the first stage is the process of dyeing the fabric using the dabbing technique, the batik process which can also be combined with writing techniques, the wax melting process, and finally the wax melting process. washing cloth to produce batik patterned textile craft products.

When compared with the writing technique process, the process of crafting batik patterned textiles using the cold wax print technique can save batik production costs by 15,000 (fifteen thousand) percent or 1:150. For written batik, two people work in one week to produce two/2 pieces of cloth measuring 115cm x 250cm, while for cold wax print technique batik, two people work in one week to produce 350 pieces of cloth measuring 115cm x 250cm.

The advantage of hand-written batik is that it can be made one sheet of cloth, while the disadvantage of wax-printed batik is that the product must be mass-made from at least 50 pieces of cloth. The more products that are made the more efficient the process becomes

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References

Adi, Sukerta, Marianto. & Hadi (2021) Penciptaan Karya-Karya Seni Cetak Saring dengan Objek Visual yang Berbasis Kearifan Lokal, *Acintya Jurnal Penelitian Seni Budaya*, Vol.13, No.1, pp.84-89, doi: 10.33153/acy.v13i1.3824.

Aldrich, Virgil C. (1969) Design, Composition, and Symbol. *The Journal of Aesthetics and Art Criticism* Vol.27, No.4, pp.379–88. https://doi.org/https://doi.org/10.2307/429424.

Andri Petrushevski (2022) Use of Three Dimensional Printing in the Production of Textile Print Forms, *Vlakna a Textile* (*Fibres Textile*), Vol.29, No.2, pp.3-9, doi: 10.15240/tul/008/2022-2-001. http://vat.ft.tul.cz/2022/2/VaT_2022_2_1.pdf.

Aprilia & Adriani (2022) Pewarnaan Batik Zat Sintetis di Rumah Batik Pandan Mangurai Kota Sungai Penuh: *Gorga Jurnal Seni Rupa*, Vol.11, No.1, pp.174-177, doi: 10.24114/gr.v11i1.29839. https://jurnal.unimed.ac.id/2012/index.php/gorga/article/view/29839

Asmah, Okpattah, & Frimpong (2015) Kanto: An innovative approach to batik production, *International Journal Innovative Research Advance Studies*, Vol.2, No.1.

Asmah, Okpattah, & Daitey (2016) The Innovative Wet-Dyeing Batik T-shirt Technique, *Internationaal Journal Academic Reserch Reflection*, Vol.4, No.1, pp.19.

Battenfield, J. & N. Tunnikmah (2017) Panduan Kewirausahaan Bagi Perupa. BP ISI Yogyakarta, 2017. [Online]. Available: http://digilib.isi.ac.id/2372/

Belfer. (2012) *Batik and tie dye techniques*. Courier Corporation.

Ciptandi, Fajar, Agus Sachari, Achmad Haldani, & Yan Yan Sunarya. (2018) *Identity Shift On Traditional Clothes For Women Tuban, East Java, Indonesia.* https://doi.org/10.2991/bcm-17.2018.48.

Doellah S. (2002) *Batik: Influence of Times and the Environment*, Surakarta: PT Batik Danarhadi.

Erwantoro, Heru; Kunto Sofianto; Ani Rostiyati; Lasmiyati; Adeng & Suwardi Alamsyah. (2023) Gender Bias in "Batik Larangan" Clothing at the Yogyakarta Royal Palace: A Semiotic Perspective. *ISVS e-journal*, Vol.10, No.1, pp.249-263. https://isvshome.com/pdf/ISVS_10-1/ISVSej10.1.18_%20Heru.pdf

Farida, Paras Trapsiladi, Zohanto Widyantoko, Isnaini, Joni Setiawan, Dana Kurnia Syabana, Irfa'ina Rohana Salma, Dwi Wiji Lestari & Tin Kusuma Arta. (2021) Batik Analyzer sebagai Pengidentifikasi Produk Batik dan Tiruannya, in *Prosiding Seminar Nasional Industri Kerajinan dan Batik*, Vol.3, No.1, pp.1-12. https://proceeding.batik.go.id/index.php/SNBK/article/view/136

Fung F.T., Hes L. & Bajzik V. (2020) Review of men's shirt pattern development for the last 100 years, *Vlákna a textile (Fibres and Textiles*), Vol.27, No.3, pp.49-58. http://vat.ft.tul.cz/2020/3/VaT_2020_3_9.pdf

Gaus, Olaf, Bernd Neutschel, Matthias G. Raith, & Sándor Vajna. (2013) How Designed Communication Supports New Product & Service Development. *IBusiness* Vol.5, No.3, pp.10–17. https://doi.org/10.4236/ib.2013.53b003.

Guntur. (2021) Inovasi Desain Motif Parang: Studi Kasus Koleksi Museum Batik Danar Hadi. *Dinamika Kerajinan dan Batik*, Vol.38, No.1, pp.29–44. https://doi.org/10.22322/dkb.V36i1.4149.

Guo, Jing, Runhua Tan, Jianguang Sun, Jianliang Ren, Shengxuan Wu, & Yang Qiu. (2016) A Needs Analysis Approach to Product Innovation Driven by Design. *Procedia CIRP* 39: pp.39–44. https://doi.org/10.1016/j.procir.2016.01.163.

Hamzuri (1981). *Batik Klasik*. Jakarta: Djambatan.

Hobday, Mike, Boddington, Anne & Grantham, Andrew (2011) An Innovation Perspective on Design, *Design Issues* Vol.28, No.1, pp.18-29. https://doi.org/10.1162/DESI_a_00137Kasikovic, Nemanja, Gojko Vladic, and Dragoljub Novakovic. (2016) Textile Printing-Past, Present, Future. *Glasnic Hemicara, Tehnologa, Ekologa*, pp.35–46.

Indraswara, Mohammad Sahid, Hardimana, Gagoek., Rukayaha, Siti., Supraptia, Atiek & Hermawanb (2022) Sense of Place of the Batik Trade Center in the Arab Village Sugihwaras Pekalongan, Indonesia, *ISVS e-journal*, Vol.9, No.5, pp.98-109. https://isvshome.com/pdf/ISVS_9-5/ISVS_9.5.7_Sahid_Final.pdf

Kerdthip, Kamtorn, Laisatruklai, Namfon & Vongphantuset, Jirawat (2015) Modular Batik Stamp Block: Development of Southern Thai Printing Batik Stamp Block. *International, Humanities, Social Sciences, and Arts*, Vol.8, No.4, pp.127–42.

Kurniati, R.., Wakhidah K., Novia S.R. & Endah K.S. (2023) Strategies for Sustainable Urban Tourism in Kampoeng Batik Semarang Indonesia. *ISVS e-journal*, Vol.10, No.1, pp.1-23. https://isvshome.com/pdf/ISVS_10-1/ISVSej10.1.1_Rina_Kurniati.pdf

Liu & Chen (2015) Computer simulation of batik printing patterns with cracks, *Textile*

Research Journal, Vol.85, No.18, pp.1972-1984, doi: 10.1177/0040517514561919. https://journals.sagepub.com/doi/abs/10.1177/0040517514561919?journalCode=trjc

Mandegani, Setiawan, Haerudin, & Atika (2018). Persepsi Kualitas Batik Tulis, *Jurnal Dinamika Kerajinan dan Batik*, Vol.35, No.2, pp.75-84, doi: 10.22322/dkb.v35i2.4108. http://ejournal.kemenperin.go.id/dkb/article/view/4108

Masiswo & Atika, V. (2014). Aplikasi Ornamen Khas Maluku untuk Pengembangan Desain Motif Batik. *Dinamika Kerajinan Dan Batik*, Vol.31, No.1, pp.21-30.

Masiswo, Masiswo, Joni Setiawan, Vivin Atika, & Mandegani, Guring Briegel (2017) Karakteristik Fisik Produk Batik Dan Tiruan Batik. *Dinamika Kerajinan Dan Batik: Majalah Ilmiah*, Vol.34, No.2, pp.103–112.

Mulyanto, Figur, R.F., Endri S.M., Desy N., & Dyah Y.K. (2021) Pattern 210 for Designing long-sleeved shirts with sanggit batik motif. *Vlákna a textile (Fibres and Textiles*), Vol.28, No.4, pp.65-74. http://vat.ft.tul.cz/2021/4/VaT_2021_4_9.pdf

Mulyanto, Lili Hartono, Endri Sintiana Murni, Endang Sri Handayani, & Desy Nurcahyanti (2022) Teak Trees as Source of Inspiration for Developing Batik Motifs, *Harmonia: Journal of Arts Research and Education*, Vol.22, No.2, pp.241-253. file:///C:/Users/windows/Downloads/37874-106342-2-PB%20(1).pdf

Mulyanto, Nadia, Lili, Figur & Sari (2020) Training models of batik motif design development for designers in micro enterprises, Vlakna a Textile (Fibres and Textiles) Vol.27, No.2, pp.74-88, http://vat.ft.tul.cz/2020/2/VaT_2020_2_13.pdfCoaffee, Jon. (2009) Terrorism, Risk and the Global City: towards Urban Resilience. Farnham: Ashgate.

Mulyanto, Prameswari N.S., Afatara N. & Hartono L. (2019) Pattern design and motif placement of batik sanggit in short-sleeved shirt style, *Vlákna a textile (Fibres and Textiles*), Vol.26, No.2, pp. 37-42, http://vat.ft.tul.cz/2019/2/VaT_2019_2_7.pdf

Nurcahyanti D., Mulyanto & Agus, S. (2021). The role artisans in the batik designs development as a traditional textile in Indonesia. *Valkna a Textil. (Fibres and Textiles*). 28(2), p.45-53.

Patria, A.S. (2016). "Dutch Batik Motifs: The Role of The Ruler and The Dutch Bussinesman", *Harmonia: Journal of Arts Research and Education*, 16(2), p.125-132, https://doi.org/10.15294/harmonia.v16i2.73577

Philip, Peter, and Gilian Bunce. (1993) *Repeat Patterns: A Manual for Designers, Artists and Architects.* London: Thames and Hudson Ltd.

Rashidi, Sulaiman & Hashim (2012) Batik Industry Synthetic Wastewater Treatment Using Nanofiltration Membrane, *Procedia Engineering*, Vol.44, pp.2010–2012, doi: 10.1016/j.proeng.2012.09.025. https://www.sciencedirect.com/science/article/pii/S187770581204057X

Rohmaya, R. & Yulistiana. (2016) Batik Sendang Lamongan. *Jurnal Mahasiswa Unesa*, Vol.5, No.2, pp.1-9.

Salma, I. R. & Eskak, E. (2012) Kajian Estetika Desain Batik Khas Sleman "Semarak Salak." *Dinamika Kerajinan Dan Batik*, Vol.32, No.2, pp.1–8.

Salma, I.R., Wibowo, A.A. & Satria, Y. (2015) Kopi dan Kakao dalam Kreasi Motif Batik Khas Jember. *Dinamika Kerajinan dan Batik*, Vol.32, No.2, pp.63–72. http://ejournal.kemenperin.go.id/dkb/article/view/1362

Salma & Eskak (2020) Keeping the Genuine of Batik in the Age of Artificial Intelligence, *SSRN Electron. J.*, doi: 10.2139/ssrn.3807704.

Sarwono, Darwoto & Mataram (2021) Natural batik dyes from Terminalia bellirica, Ceriop condolleana, Cudrania javanensis and Pelthopherum pterocarpum, *IO P Conf. Ser. Earth Environ. Sci.*, Vol.905, No.1, pp.012019, doi: 10.1088/1755-1315/905/1/012019. https://iopscience.iop.org/article/10.1088/1755-1315/905/1/012019

Sholikhah & Nurrohmah (2021) The Effect of the Composition of Alginate Flour on the Making of Batik Simbut, in *IOP Conference Series: Earth and Environmental Science*, Vol.810, No.1, pp.12058. [Online]. Available: https://iopscience.iop.org/article/10.1088/1755-1315/810/1/012058/meta

Sugiarto Eko, Abdul Halim bin Husain, Muh Ibnan Syarif, Putri Khoirin Nashiroh, & Meina

Febriani. (2023) Between Aesthetics and Function: Transformations and Use of Batik Motifs in Urban Interiors in Indonesia, *ISVS e-Journal*, Vol.10, No.7, pp.122-136

Sulistyati, Apika Nurani, & Theresia Widyastuti. (2022) Efforts on Developing Sustainable Production of Surakarta's Tiga Negeri Batik from Handmade Technique to Cold Wax Technique. *Jurnal Javanologi*, Vol.5, No.2, pp.68-78. https://doi.org/10.20961/javanologi.v5i2.67955.

Suparman (2017) Industri Kreatif Seni Grafis Sablon Cetak Saring Upaya Pemberdayaan Masyarakat Desa Krembung Kecamatan Krembung Kabupaten Sidoarjo, *Jurnal Penamas Adi Buana*, Vol.2, No.2, pp.19-26, https://www.jurnal.unipasby.ac.id/index.php/penamas/article/view/967

Supatmo (2015) Screen Printing dalam Industri Grafika Pada Era Digital, *Imajin Jurnal Seni*, Vol.9, No.2, pp.105-116, doi:10.15294/imajinasi.v9i2.8827. https://journal.unnes.ac.id/nju/index.php/imajinasi/article/view/8827