Textile Industry

The following guidelines are intended to provide examples of “experimental development” projects which would qualify for Canadian SR&ED (Scientific Research & Experimental Development) tax credits.

Content Summary:

1 - Sample Textile Industry SR&ED - General Guidelines:

Scientific or Technological Objectives:

[THESE GUIDELINES ARE REPRODUCED FROM EXCERPTS FROM "TEXTILE INDUSTRY GUIDANCE DOCUMENT FOR SCIENTIFIC RESEARCH & EXPERIMENTAL DEVELOPMENT", AVAILABLE ON THE CRA WEBSITE AT HTTP://WWW.CRA-ARC.GC.CA/TAXCREDIT/SRED/PUBLICATIONS/TEXTILE-E.HTML, JANUARY 2002]

The Textile Industry Company, like that in many other sectors, does conduct SR&ED for the sole purpose of advancing its knowledge-base. Such development work is generally conducted in the early tiers of a new technology such as new fibre or yarn technologies, a switch from acid to water base dyes, new hybrid fibres and/or textiles. However, once this early tier development has been conducted it may form the foundation for further experimentation and technological advances.

The next tier, which takes on a very different focus, is the development of a technology with a distinct need to bring a product to the market. This can be a totally new product or an improvement in the performance of an existing product. In its early stages, the technological development paths can readily be followed. Consequently, each new development can readily be followed as a "trial" on the path to advancing the technology.

However as market demand increases, the original obvious paths become blurred through an overlap and variation of technologies. Each of the projects now begins to appear as a product development project that within its own development can now incorporate its own experimentation or trials.

For example, in the early stages of the Lycra© and Tencel© fibre related developments, the technology path was usually clear. But as the foundations were set, manufacturers could pursue product developments that blurred the path through blends and combinations from other technologies such as "wicking" technologies.

In many cases, distinguishing between product development and technology development becomes difficult as the manufacturer undertakes the project. With respect to the Income Tax Act, this distinction is irrelevant because regardless of whether the development work is technology-driven or product-driven, a development project is assessed to determine if it meets the criteria of SR&ED. It is important to distinguish between product development that requires advancement in technology and product development that does not (i.e. product development based on routine engineering).

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:
In the Textile Industry, like all other market driven industries, time-to-market is critical. Consequently, a number of industry characteristics are typical and these must be taken into consideration since they represent the business context of the claimant. It is important that each claimant describe as clearly as possible the business context and the technology of the company.

- Large number of trials: Even the smallest of manufacturers undertake a significant number of development projects, of which several hundred of these trials may meet the criteria of SR&ED. Where it is possible, projects having technological commonalities can be grouped into larger, more coherent projects. This grouping, however, is not always feasible for all trials. Therefore, in these cases, the company should designate each unique trial as a separate project.

- Shop level development: The most qualified resources available to conduct a SR&ED project are management, staff, and operating personnel who are most experienced in the particular technologies. Generally many of these persons have several responsibilities and it is important to clearly identify the SR&ED responsibilities from any other responsibilities such as management, marketing, routine development and production.
Furthermore, the prototyping or proof-of-concept is often conducted using equipment which is also used for regular commercial production. Records must be maintained as to when this equipment is utilized for experimental purposes in order for the claimant to successfully support the claim.

- Experimental quantities: Laboratory scale or small-scale quantities are mostly used in order to assess the technology to be developed as well as providing a prototype that can serve as a determinant as to when the objectives have been attained. As noted later in this document, resolution of certain technological uncertainties may require experimental trials using full-scale production equipment resulting in large-scale batch quantities. It is important that these pre-production trials are clearly distinguished from normal commercial production and that records be maintained which substantiate that these trials were experimental and were focused upon the resolution of technological uncertainties.

- Product and process developments: The nature of textile development makes it difficult to separate product development from process development. A product development may require a simultaneous development of the textile process. This co-development arises from the inter-dependence of each of the development tiers. As stated earlier, a modification to one tier's parameters may affect the results of the subsequent tiers, thereby requiring development of each successive tier until the final objective is achieved.

- End of Projects: Due to the nature of the textile industry, a particular developer may be unable to ascertain whether the project has reached the technological objectives until the product is adapted and tested in its final form.

For example, a developer of fire-retardant fabrics may have to target performance characteristics of the final fire-retardant garment as the project objectives. If the fabric developer does not also produce the garment, then the fabric developer cannot test the final performance characteristics to determine if the project objectives have been met. In this case, the fabric developer becomes dependent on the garment maker's time-frame and testing. The fabric developer must keep the project open until the time that the fabric satisfies the technological objectives of the garment within the garment maker's environment. This type of field-testing is usually at negligible cost to the actual fabric developer, but it is an integral aspect of judging the success of the project and therefore the end of the project.

For this type of field-testing to be SR&ED, it must be demonstrated that the testing directly addresses technical issues related to the overall technological objectives of the SR&ED project. To this end, it is the claimant's responsibility to ensure that the technological objectives presented for each SR&ED project reflect the potential off-site field-testing objectives as well. Field-testing of a non-technical nature such as market demonstrations is not eligible.
A development project may remain open until the time that the technological objectives in the field (i.e. in the hands of the subsequent tier) have been achieved. It should be noted that if the fabric satisfies the technological demands of the subsequent tier, but this subsequent tier refuses the fabric due to commercial criteria, then the project must still be considered as complete due to the satisfaction of the technological objectives.

- Short Time Frame: Time to market is a critical factor. In many cases, the primary determinant to whether the project has met its technological objectives is if the product meets the technical performance specifications established by the subsequent tier, who will ultimately develop the textile into its final form. Consequently, a particular stage, trial, or even project can be conducted in a matter of days or weeks rather than months or years.

Field of Science/Technology:

Composites (including laminates, reinforced plastics, cermets, combined natural and synthetic fibre fabrics) (2.05.04)

Intended Results:

- Develop new processes
- Develop new materials, devices, or products
- Improve existing processes
- Improve existing materials, devices, or products

Scientific or Technological Advancement:

Uncertainty #1: Segregating Routine Development from SR&ED

It is important to note that the application of a known development methodology does not necessarily imply routine work. At the outset of an SR&ED project, the issues that do not permit the predictable resolution of the technological uncertainties should be identified. In routine development projects, the technical challenges can usually be resolved within the existing knowledge base of the claimant. The distinction should be made at the outset of the project.

The textile industry is generally product or process driven. The stimulus for initiating or continuing a project is the demand from the marketplace. In practical terms a development project is initiated at the moment the marketplace requests a product for which the claimant does not possess the specific know-how and therefore must conduct SR&ED to develop it. It is appropriate to present a product or process development project as SR&ED as long as the focus remains on technological development issues and the scope of the project embodies the three criteria of SR&ED.

Furthermore, it is recognized that within the business context of a company, it may be uncertain that standard practice will lead to the desired objective. Under most circumstances, it is clear at the outset of a project, that the existing technological knowledge-base is insufficient to develop the product or process. In certain cases, a project that starts as a routine work can result in an SR&ED project when the results deviate from expectations.

In the textile industry, the development of this technological knowledge-base is closely linked with a new or improved product or process. Generally, it is the initiation of a systematic investigation through analysis or experimentation to advance the technology and to resolve a technological uncertainty that identifies a SR&ED project and distinguishes it from routine projects.

Examples of Potential SR&ED Development Projects:
- New situation with special properties, i.e. width, thickness, tensile strength

- New fibre
- New spinning process
- New dye type
- New printing process
- New chemical or mechanical finish

[NOTE: ALL OF THESE EXAMPLES INVOLVE THE COMPANY DOING SOMETHING COMPLETELY NEW. IMPROVEMENTS TO A CURRENT PROCESS CAN ALSO QUALIFY AS A SR&ED PROJECT IF THERE IS SOME TECHNOLOGICAL UNCERTAINTY AS TO HOW TO ACHIEVE THE DESIRED IMPROVEMENTS.]

Examples of non-SR&ED Development Projects:
- Changing the blending ratio of an established 2-fibre composite yarn.
- Change of yarn source
- Developing a new shade within an established dye colour family.
- Change of weaving tension
- Development of print designs and after woven processes

[NOTE: IN THE AUTHOR'S OPINION, THESE EXAMPLES OF NON-SR&ED ACTIVITIES COULD BE ELIGIBLE DEPENDING ON THE UNCERTAINTIES INVOLVED IN HOW THEY MIGHT IMPACT THE DOWNSTREAM PROCESS OR OTHER INTERACTING VARIABLES.]

General Indicators that a Development Project may be SR&ED:
- A great deal of input and supervision by company experts is required
- Does not resemble regular production cycle
- Developmental stages are rarely skipped
- Minimal quantities at each stage are used.
- Testing performed at each stage is done solely to ensure that the objectives are met and is clearly beyond quality control requirements.
- Production runs are slower than normal solely as a result of above normal, intensive monitoring.
- Some stages require several experimental iterations
- Often a distinct "development number" is assigned to the project

General Indicators that a Development Project is not SR&ED:
- Little input/supervision from company experts
- Closely resembles regular production cycle
- Developmental steps are often skipped
- Larger than minimal quantities are used at a given stage
- Testing is done mainly for quality control of the finished product
- Low degree of monitoring and standard rate of production
- Few steps need repeating
- Regular production numbers are assigned to routine projects

The most significant underlying key variables are:
tensile strength (unresolved), new fibre (unresolved), spinning process (unresolved), dye type (unresolved), chemical finish (unresolved)

There are no Activities associated with this uncertainty.

Uncertainty #2: Five Stages of a Textile SR&ED Project

A five-stage model of a typical textile project includes Development of the Concept, Detail Development, Laboratory Scale Analysis and Experimentation Proof of Concept and Pre-production Scale-up. Details of these stages are provided below. While these five stages are not always described by companies in the format given here, they are, nevertheless, involved in some manner in most technological developments. Variations to the model do exist and are to be expected. Also, it should be noted that it is not possible to establish time frames and expense parameters for any of these stages.

The most significant underlying key variables are:
width, thickness, tensile strength, new printing process, mechanical finish

Activity #2-1: Stage 1 - Development of the Concept

Work performed in Fiscal Year 2009:

This stage incorporates translation of the marketplace functional requirements into technical specifications as developed internally, or as provided by the customer or both and, depending on the knowledge-base available to the company, determining the general technical parameters which should be followed by the company.

At this stage, the project may not constitute SR&ED if it has been determined that the objective to develop the product or process can be achieved with little or no uncertainty, or it has been determined that the project is not feasible and is abandoned.

At this stage, when the issues are sufficiently clear, it is possible to determine whether the existing technological knowledge base of the company is adequate to meet the objectives. Consequently, this is the ideal stage for determining whether the project will be SR&ED or not. Where a "routine" project changes its nature in the course of its development, the "return to the drawing board" will demand that the developers return to this stage to review the initial concepts and reformulate the concepts for the project.

Results:

[NOTE: IF THERE WERE ANY TEST RESULTS FROM THIS ACTIVITY THAN THESE SHOULD BE STATED HERE]

Conclusion:

[NOTE: THE CONCLUSION WOULD BRIEFLY DETAIL HOW THESE RESULTS COMPARED WITH INITIAL EXPECTATIONS AND OUTLINE ANY FURTHER CONCLUSIONS WHICH COULD AFFECT FUTURE DEVELOPMENTS OF THIS NATURE.]

Key variables resolved: mechanical finish

Activity #2-2: Stage 2 - Detail Development

Work performed in Fiscal Year 2009:

Methods of experimentation:

Based on the Stage 1 concepts, the details for the development of the first samples are initiated. Each of the parameters for the fabrication is established. Depending on the company, parameters such as the following are defined:
- Basic chemicals, filaments, yarn to be incorporated;
- Chemical formulations;
- Process conditions and sequences;
- Equipment conditions, accessories and set-up.

Results:

[NOTE: SIMILARLY, IF THERE WERE ANY TEST RESULTS FROM THIS ACTIVITY THAN THESE SHOULD BE STATED HERE]

Conclusion:

[NOTE: THE CONCLUSION WOULD BRIEFLY DETAIL HOW THESE RESULTS COMPARED WITH INITIAL EXPECTATIONS AND OUTLINE ANY FURTHER CONCLUSIONS WHICH COULD AFFECT FUTURE DEVELOPMENTS OF THIS NATURE.]

Key variables resolved: new printing process

Activity #2-3: Stage 3 - Lab Scale Analysis and Experimentation

Work performed in Fiscal Year 2009:

Methods of experimentation:

Based on the detailed development, one or more laboratory trials may be conducted. It should be noted that not all companies conduct laboratory trials.

Failure at this stage would normally demand a return to Stage 1 or Stage 2.

Stage 3 usually represents the initial technical assessment.

Results: Conclusion:

[NOTE: THE CONCLUSION WOULD BRIEFLY DETAIL HOW THESE RESULTS COMPARED WITH INITIAL EXPECTATIONS AND OUTLINE ANY FURTHER CONCLUSIONS WHICH COULD AFFECT FUTURE DEVELOPMENTS OF THIS NATURE.]

Key variables resolved: tensile strength

Activity #2-4: Stage 4 - Proof of Concept (Pilot Scale)

Work performed in Fiscal Year 2009:

Methods of experimentation:

Initial sample products or processes are developed under limited volume conditions. Although such a small-scale trial does not completely determine the final operating parameters, it does permit the company to reduce the risks and costs of larger scale testing.

This stage usually incorporates the use of reduced scale equipment or smaller production lots than that would be considered normal for the claimant.

Where conditions do not permit pilot scale experimentation, the company may decide to skip this stage and experiment in a production-scale environment.

A failure at this stage would normally demand a return to Stage 1.

This stage usually represents an initial proof of concept.

Conclusion:

[NOTE: THE CONCLUSION WOULD BRIEFLY DETAIL HOW THESE RESULTS COMPARED WITH INITIAL EXPECTATIONS AND OUTLINE ANY FURTHER CONCLUSIONS WHICH COULD AFFECT FUTURE DEVELOPMENTS OF THIS NATURE.]

Key variables resolved: thickness

Activity #2-5: Stage 5 - Pre-Production Scale-Up

Work performed in Fiscal Year 2009:

Methods of experimentation:

In general, the routine "scaling-up" from pilot scale is not eligible. However, specific SR&ED work may occur during this phase that is eligible. The key issue is whether there is a technological uncertainty still to be overcome that will result in technological advance, or whether this stage can be carried out through standard practice.

Most industrial textile processes cannot be accurately replicated by pilot scale development. Stage 5 is critical in determining the product or process parameters that will result in meeting the technological objectives set in Stage 1. It is at this pre-production scale-up stage the technological uncertainties surrounding the project are to be resolved. In other words, the final conclusion of whether the technological uncertainties are resolved may not be determined until Stage 5.

Any uncertainties that were unknown in the previous stages would normally come to light in the full-scale volume experimentation. Any problems at this stage of SR&ED would normally manifest themselves in product that does not meet project objectives. Further experimentation may be conducted in smaller scales or at this full-scale volume.

Indicators of full-scale experimentation are usually found in the resulting off-specification product, non-standard scrap levels or non-standard labour efficiencies.
This stage represents the resolution of the full scale operating parameters and technological uncertainties.

This stage of experimentation ends when the repeatability of the technology has been determined and steady state has been achieved. Once this occurs, the technology can be considered stable and commercial production in place.

Routine "scaling-up" is not SR&ED. If the "scaling-up" of a particular project can be accomplished using known practices with a predictable result, then no technological uncertainties exist making this stage ineligible for this given project.

Conclusion:

[NOTE: THE CONCLUSION WOULD BRIEFLY DETAIL HOW THESE RESULTS COMPARED WITH INITIAL EXPECTATIONS AND OUTLINE ANY FURTHER CONCLUSIONS WHICH COULD AFFECT FUTURE DEVELOPMENTS OF THIS NATURE.]

Key variables resolved: width

1 - Sample Textile Industry SR&ED - General Guidelines

Benchmarks: (none) **Objectives:** (none)

Uncertainty: 1 - Segregating Routine Development from SR&ED **Key Variables:** chemical finish, dye type, new fibre, spinning process, tensile strength

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
	(none)	(none)	(none)	0.00	0.00	0.00	

Uncertainty: 2 - Five Stages of a Textile SR&ED Project **Key Variables:** mechanical finish, new printing process, tensile strength, thickness, width

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Stage 1 - Development of the Concept	(none)	(none)	mechanical finish	0.00	0.00	0.00	2009
2 - Stage 2 - Detail Development	(none)	(none)	new printing process	0.00	0.00	0.00	2009
3 - Stage 3 - Lab Scale Analysis and Experimentation	(none)	(none)	tensile strength	0.00	0.00	0.00	2009
4 - Stage 4 - Proof of Concept (Pilot Scale)	(none)	(none)	thickness	0.00	0.00	0.00	2009
5 - Stage 5 - Pre-Production Scale-Up	(none)	(none)	width	0.00	0.00	0.00	2009

901 - Railroaded Corduroy for Upholstery Market:

Scientific or Technological Objectives:

Measurement	Current Performance	Objective
Abrasion Resistance (rubs)	40000	80000
Cost per yard ($)	29	18
Improve manufacturing speed (Feet per Yard)	12	14
Minimize maintenance required (hours per week)	12	5

[THIS EXAMPLE IS REPRODUCED FROM "TEXTILE INDUSTRY GUIDANCE DOCUMENT - EXAMPLES FOR SCIENTIFIC RESEARCH & EXPERIMENTAL DEVELOPMENT", JUNE 2006.]

[AUTHOR'S NOTE: IDEALLY THE TAXPAYER WOULD ATTEMPT TO QUANTIFY THE OBJECTIVES THEY ARE TRYING TO ACHIEVE. A QUANTIFIABLE OBJECTIVE HAS BEEN ADDED ABOVE, TO ILLUSTRATE.]

The objective of the project was to develop a weaving process that leaves gaps in the weft direction in corduroy velvet fabrics. The result will be a new weave pattern that can be manufactured on the current equipment.

The resultant product is constrained by the need to have a soft and drapeable railroaded corduroy look and yet must meet the heavy-duty mechanical performance requirements for upholstery.

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

- Internet searches: 7 sites / articles -- To insure a clear rib formation, pile tufts are preferably arranged only at every second of the long
- Patent searches: 2 patents -- Apparatus for steam treating a textile web, said apparatus comprising a generally horizontal tunnel
- Competitive products or processes: 1 product -- Traditional flat woven weft loop corduroy - does not meet performance requirements.
- Similar prior in-house technologies: 1 products / processes -- Current slitters need to be redesigned to perform slitting while material is moving.

TechStyle Fabrics produces woven piece dyed fabrics targeted at the apparel and upholstery markets. The company has been in velvet production for over 30 years in Canada.

In September 2003, the sales and development team decided that the market needed a corduroy-like velvet fabric, which would be railroaded. The only similar products currently on the market were traditional flat woven weft loop corduroys targeted at the apparel market; these did not meet the performance requirements for upholstery. Part of the challenge was to find a way to produce the corduroy with piles at right angles to the usual direction; the simple solution of cutting the fabric at right angles to the current direction would not have worked, since this does not provide the width needed for upholstery applications.

Traditional corduroy products are manufactured by weaving the fabric with loops that are aligned in the direction that the fabric is moving, so that they can be slit with stationary knives. This "slitting" method will not work for a product in which the loops are aligned across the machine; it is thus necessary to modify the slitters to perform the slitting while the material is moving. This change will impact the construction of the product.

Field of Science/Technology:

Composites (including laminates, reinforced plastics, cermets, combined natural and synthetic fibre fabrics) (2.05.04)

Intended Results:

- Develop new materials, devices, or products
- Improve existing processes

Work locations: Commercial Facility

Scientific or Technological Advancement:

Uncertainty #1: Effect of new "slitting" method on performance

Changing the direction of the gap in corduroy has a very significant impact on the textile production process and on the properties and processing characteristics of the textile. A new weaving process had to be developed and tested in order to meet the target properties.

The most significant change in the process, needed to achieve technological advancement, was the development of a new "slitting" method, which was perpendicular to existing methods. This new slitting method had uncertain effects on the properties and performance of the textile as well as on the subsequent manufacturing processes.

A number of factors (the type of yarn used, its construction, its count, its density and how it is woven) all interact to determine the appearance and properties of the fabric. The changes in the manufacturing process that are required will result in a product that is very different in structure from other products produced by standard weaving. These modifications to the equipment and construction will change the product properties in ways that cannot be predicted without experiments.

[NOTE: THE TECHNOLOGICAL UNCERTAINTY IS CLEARLY EXPLAINED. THE PRODUCT REQUIREMENTS SHOULD BE A BIT MORE SPECIFIC AND QUANTIFIED IF POSSIBLE - IE, DRAPEABILITY, APPEARANCE, ABRASION RESISTANCE, ETC.]

The most significant underlying key variables are:
type of yarn, construction, count, density, how it is woven

Activity #1-1: Textile construction and slitters modified

Work performed in Fiscal Year 2009:

Methods of experimentation:

- Process trials: 2 runs / samples - 1 weaving trial, 1 dyeing and finishing trial (10 meters/trial).

  The company started with a polyester yarn that is currently used in other applications. This yarn was used primarily with an existing velvet weave construct. They modified the loom set up to leave gaps in the weft direction, changing the construction of the fabric, and then modified the slitters on their existing equipment to accommodate this change. Trials conducted: 1 weaving trial, 1 dyeing and finishing trial (10 meters/trial).

Results:

- Abrasion Resistance: 80000 rubs (100% of objective)

  It is still a further object of the present invention to provide a continuous textile treating apparatus having the advantageous characteristics mentioned in the preceding paragraph which is extremely simple in construction and operation, durable and reliable throughout a long useful life, and which is otherwise well adapted to meet practical conditions of manufacture and use.

Conclusion:

Meet abrasion requirements. Fabric appearance (bulk) and hand (softness) are reasonable, but the specifications are not met. Also the product is too expensive. Need to reduce pile by increasing spacing and remove slub filling to reduce cost.

[NOTE: IDEALLY, ALL OF THESE VARIBLES SHOULD BE QUANTIFIED.]

Key variables resolved: construction, density

Technical Documents:

- Slitters modified

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Activity #1-2: Reduce pile and remove slub filling.

Work performed in Fiscal Year 2009:

Methods of experimentation:

- Process trials: 4 runs / samples - 1 weaving and 1 dyeing with 2 finishing trials (10 meters/trial.)

  Using the polyester yarn currently used in other applications, and the modifications to the loom set-up from Activity 1-1, the pile was then reduced by increasing spacing and the slub filling was removed. Trials conducted: 1 weaving and 1 dyeing with 2 finishing trials (10 meters/trial.)

[NOTE: WHY WERE 2 FINISHING TRIALS CONDUCTED? HOW DID THEY DIFFER? MORE DETAIL COULD BE PROVIDED HERE.]

Results:

- Abrasion Resistance: 80000 rubs (100% of objective)

Conclusion:

Cost constraints are met. Product meets abrasion requirements. Fabric has poor appearance - it is too open, not enough pile. Need to be redesigned to add more coverage.

Key variables resolved: type of yarn

Technical Documents:

- Process which comprises driving a pile having a hollow stem and an enlarged preformed lower tip

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Activity #1-3: Construction modified to add more coverage

Work performed in Fiscal Year 2009:

Methods of experimentation:

- Process trials: 2 runs / samples - 1 weaving, 1 dyeing and finishing (10 meters/trial.)

Pile same as original sample from Activity 1-1 but without slub in filling, and with an increased rib. Trials conducted: 1 weaving, 1 dyeing and finishing (10 meters/trial.)

Results:

[NOTE: IF THERE WERE ANY TEST RESULTS FROM THIS ACTIVITY THAN THESE SHOULD BE STATED HERE]

Conclusion:

Fabric looks too flat, not enough bulk and softness. Decision is made to try both cotton pile and poly cotton pile yarn.

Key variables resolved: construction, count, density, type of yarn

Technical Documents:

- Construction Techniques

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towelimage.php.jpeg -- 7358 bytes

Activity #1-4: Change in yarn and pile height

Work performed in Fiscal Year 2009:

Methods of experimentation:

- Process trials: 3 runs / samples - 2 weaving and 1 finishing (10 meters/trial.)
- Physical prototypes: 1 samples - a plurality of binding warp threads arranged in pairs, each pair of binding warp threads being crossed to each other to form a plurality of openings; at least two weft threads passing through selected ones of said openings; and
-
- A plurality of tension warp threads, each pair of binding warp threads being disposed between at least two of said tension warp threads, the number of said tension warp threads relative to the number of pairs of said binding warp threads being maintained at a ratio of at least two to one.
-
- ... prototype revisions: 5 revisions

Cotton pile yarn and two different pile heights are tried to increase bulkiness. [NOTE: WHICH PILE HEIGHTS WERE TRIED? THIS SHOULD BE MORE SPECIFIC.] Trials conducted: 2 weaving and 1 finishing (10 meters/trial.)

Results:

- Abrasion Resistance: 60000 rubs (50% of objective)

Conclusion:

Cost requirement is met, abrasion requirements not met. The fabric still lacks the softness and bulkiness that are the targets for this fabric.

Key variables resolved: construction, how it is woven, type of yarn

Technical Documents:

- Pile threads which are bound off or bound in between the first and the second tension warp threads.

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Activity #1-5: Change in yarn, pile height and finishing

Work performed in Fiscal Year 2009:

Methods of experimentation:

- Process trials: 4 runs / samples - 2 weaving and 2 finishing trials (10 meters/trial.)

  Poly cotton pile yarn is tried to increase softness. Two different pile heights and regular and tumbled finishes are tried to increase fullness. Trials conducted: 2 weaving and 2 finishing trials (10 meters/trial.)

Results:

- Abrasion Resistance: 70000 rubs (75% of objective)

Conclusion:

Fabric now has the desired fullness, and meets the targeted selling price. Abrasion resistance still not met.

Key variables resolved: construction, type of yarn

Activity #1-6: Application of latex backing

Work performed in Fiscal Year 2009:

Methods of experimentation:

- Process trials: 1 runs / samples

  Poly cotton pile is adopted and the first run is woven with thin latex backing to provide the required abrasion resistance. 200 meters of material are produced in a pre-production run.

Results:

- Abrasion Resistance: 80000 rubs (100% of objective)

Conclusion:

Abrasion resistance and cost O.K.; hand O.K. but appearance is poor - the ribs are too clearly defined. With the new weaving process too much of back of the fabric shows between the wales. The 'hand' could be fuller. It was decided to increase the burl (pile height) to 6mm for future production.

Key variables resolved: construction, how it is woven

Technical Documents:

- adhesive layer

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Activity #1-7: Woven test yardage with increased pile height

Work performed in Fiscal Year 2009:

Methods of experimentation:

- Process trials: 1 runs / samples

  A second pre-production run is woven with poly cotton pile and thin latex backing. The pile height is increased to 6mm. 600 meters of material is produced.

Results:

- Cost per yard: 18 $ (100% of objective)
- Improve manufacturing speed: 14 Feet per Yard (100% of objective)
- Minimize maintenance required: 6 hours per week (85% of objective)

Conclusion:

Production went OK. All specifications are met and the technological advancement has been made. Development proceeds to colour line production.

As a result of this work, TechStyle Fabrics added a new capability to their existing equipment to produce a product with new features, namely railroaded corduroy. This advancement in the weaving process enabled them to produce the first of a range of such three-dimensional fabrics, allowing the creation of a new product line.

[CRA COMMENTS: COMMERCIAL QUANTITIES OF MATERIAL WERE PRODUCED IN THE FINAL TRIAL. HOWEVER, THIS TRIAL WAS NECESSARY TO DEMONSTRATE THAT THE PROCESS WAS STABLE UNDER NORMAL PRODUCTION CONDITIONS. IF THE MATERIAL PRODUCED IN THIS (AND THE PREVIOUS) TRIALS IS SOLD, THEN THE RECAPTURE RULES APPLY (RECAPTURE OF INVESTMENT TAX CREDIT).]

[NOTE: EVEN IF THE MATERIAL PRODUCED IN THIS TRIAL IS SOLD AT FULL MARKET VALUE, BECAUSE THIS TRIAL IS PART OF THE SR&ED PROJECT ANY LABOUR COSTS INCURRED DURING THIS TRIAL CAN BE APPLIED TOWARDS THE SR&ED CREDIT.]

Key variables resolved: count, how it is woven

Technical Documents:

- shearing forces

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901 - Railroaded Corduroy for Upholstery Market

Benchmarks:
Internet searches: 7 sites / articles
Patent searches: 2 patents
Competitive products or processes: 1 products
Similar prior in-house technologies: 1 products /

Objectives:
Abrasion Resistance: 80000 rubs
Cost per yard: 18 $
Improve manufacturing speed: 14 Feet per Yard
Minimize maintenance required: 5 hours per week

Uncertainty: 1 - Effect of new "slitting" method on performance

Key Variables: construction, count, density, how it is woven, type of yarn

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Textile construction and slitters modified	Process trials: 2 runs / samples	Abrasion Resistance: 80000 rubs (100 %)	construction density	58.00	0.00	3,299.79	2009
2 - Reduce pile and remove slub filling.	Process trials: 4 runs / samples	Abrasion Resistance: 80000 rubs (100 %)	type of yarn	83.00	1,237.00	0.00	2009
3 - Construction modified to add more coverage	Process trials: 2 runs / samples	(none)	construction count density type of yarn	91.00	815.00	9,832.36	2009
4 - Change in yarn and pile height	Process trials: 3 runs / samples Physical prototypes: 1 samples ... prototype revisions: 5 revisions	Abrasion Resistance: 60000 rubs (50 %)	type of yarn construction how it is woven	56.00	543.99	777.49	2009
5 - Change in yarn, pile height and finishing	Process trials: 4 runs / samples	Abrasion Resistance: 70000 rubs (75 %)	type of yarn construction	47.00	323.22	0.00	2009
6 - Application of latex backing	Process trials: 1 runs / samples	Abrasion Resistance: 80000 rubs (100 %)	construction how it is woven	54.00	776.77	120.00	2009
7 - Woven test yardage with increased pile height	Process trials: 1 runs / samples	Minimize maintenance required: 6 hours per week (85 %) Improve manufacturing speed: 14 Feet per Yard (100 %) Cost per yard: 18 $ (100 %)	count how it is woven	19.00	222.00	255.00	2009

902 - Uniform 2D Stretch Swimsuit:

Scientific or Technological Objectives:

Measurement	Current Performance	Objective
Warp Stretch (%)	31	25
Weft Stretch (%)	18	25
Reduce cost of production ($ per yard)	12	6
Increase production speed (Yards per hour)	250	400

[THIS EXAMPLE IS REPRODUCED FROM "TEXTILE INDUSTRY GUIDANCE DOCUMENT - EXAMPLES FOR SCIENTIFIC RESEARCH & EXPERIMENTAL DEVELOPMENT", JUNE 2006.]

Develop knitting and finishing process for a new textured polyamide blend yarn in order to produce swimwear fabric with uniform two-dimensional stretch of 25%.

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

- Internet searches: 3 sites / articles -- no similar results were specified
- Patent searches: 1 patent -- no found patents utilizing polyamide yarn blended with a spandex filament yarn.
- Similar prior in-house technologies: 1 products / processes -- Experience producing nylon/spandex fabric; limitations with polyamide fabrics outlined below.
- Queries to experts: 4 responses

Full Speed Fabrics Inc. is a fabric manufacturer specializing in the knitting and finishing of high-tech fabrics for the sportswear industry. The company had 3 years of experience in the development and production of swimsuit fabrics made of nylon/spandex.

At a meeting in February 2000, their R&D department took on the challenge of developing a new swimwear fabric line using a new type of polyamide yarn blended with a conventional spandex filament yarn.

The performance of a textile depends on the yarn (and other materials), the construction, the equipment used to produce it, and the manufacturing process, including any post-treatment. The stretch target might be met through changing the yarn, by changing the textile construction, or with the help of modifications in the post-treatment.

Before starting the project, the following knowledge was available:

1) The company could manufacture a product with plenty of stretch in the warp direction but limited stretch in the weft direction. Currently available knitting constructions result in a product with plenty of stretch in the machine direction (length) but insufficient in the width, as demonstrated in Activity 1-1 below.

2) The available polyamide based yarns provide limited stretch that needs compensation from a higher level of spandex. Changing the yarn will impact on the amount of feed on the knitting machine, dye colour absorption, reaction to finish treatments, and the reaction of the finished textile when exposed to chemicals such as chlorine and algaecide.

3) Changing the structure or the amount of spandex could improve the stretch in the width direction, but this was expected to compromise the stretch in the warp direction. The appearance would suffer from this compromise; the spandex could also cause a surface defect known as "smile up".

4) Modifications to the finishing conditions might give a small amount of stretch in the weft direction (1-2%), but previous experience had shown that this would not be sufficient to achieve their goals.

Field of Science/Technology:

Composites (including laminates, reinforced plastics, cermets, combined natural and synthetic fibre fabrics) (2.05.04)

Intended Results:

- Improve existing processes
- Improve existing materials, devices, or products

Work locations:

Lab, Commercial Facility

Scientific or Technological Advancement:

Uncertainty #1: New process to produce fabric with required stretch

The technological advancement sought was to develop a new process in order to produce fabric with uniform two-dimensional stretch of 25%. In order to achieve this advancement, the company had to address and overcome existing limitations with the weaving equipment, processing parameters, and yarn materials, integrating into the new process the know-how developed in a series of experimental runs. It was necessary to resolve the uncertainties associated with finding ways to increase the stretch in the width without either losing too much strength in the machine direction, creating new problems with the surface, or by requiring prohibitively expensive raw materials.

The most significant underlying key variables are:
processing parameters, yarn materials, weaving equipment modifications, material formulation, material density

Activity #1-1: Base-line data and limits of current technology

Work performed in Fiscal Year 2009:

Methods of experimentation:

- Analysis / simulation: 1 alternatives - Analysis of run data.

  Initial runs were conducted with the known construction and material (with conventional polyamide) to determine base-line data and limits of current technology.

Results:

- Warp Stretch: 31 % (no improvement)
- Weft Stretch: 18 % (no improvement)

Conclusion:

Material stretched 31% lengthwise and 18% widthwise - does not meet the specified 25% stretch in each direction.

[CRA COMMENT: THE INITIAL RUNS USING THE COMPANY'S EXISTING TECHNOLOGY WERE USED TO ESTABLISH BASE-LINE DATA AND THE LIMITS OF THE CURRENT TECHNOLOGY. THESE WERE COMMERCIAL RUNS PRODUCING A VIABLE PRODUCT TO MEET EXISTING CUSTOMER ORDERS AND THEREFORE WERE NOT PART OF THE ELIGIBLE PROJECT. HOWEVER, THE WORK REQUIRED TO ANALYSE THE DATA FROM THESE INITIAL RUNS WAS CONSIDERED TO BE PART OF THE SR&ED PROJECT.]

Key variables resolved: material density, material formulation, yarn materials

Technical Documents:

- Current technology trial

Activity #1-2: Trials with a new textured polyamide

Work performed in Fiscal Year 2009:

Methods of experimentation:

- Process trials: 21 runs / samples - 15 knitting trials and 6 finishing trials.
- Physical prototypes: 6 samples - 4 revisions to new textured polyimide
- ... prototype revisions: 4 revisions

  15 knitting trials and 6 finishing trials were conducted with the new textured polyamide. The resulting test fabrics were analyzed to determine degree of stretch.
  [NOTE: HOW DID THE TRIALS DIFFER? MORE DETAIL SHOULD BE PROVIDED.]

Results:

- Warp Stretch: 27 % (66% of objective)
- Weft Stretch: 19 % (14% of objective)

Conclusion:

Of the resulting fabrics, the material that came closest to the specified uniform 25% stretch had a 27% stretch lengthwise and a 19% stretch widthwise.
[NOTE: STRENGTH OF FABRIC IN THE MACHINE DIRECTION AND SURFACE QUALITY ARE MENTIONED IN THE DESCRIPTION OF UNCERTAINTY 1, BUT ARE NOT MENTIONED IN THIS OR ANY OTHER TRIAL. THOSE CRITERIA SHOULD BE ADDRESSED AS WELL.]

Key variables resolved: material density, material formulation, yarn materials

Activity #1-3: Modifications of spandex feeding

Work performed in Fiscal Year 2009:

Methods of experimentation:

- Process trials: 37 runs / samples - 21 knitting trials and 16 finishing trials.
- Physical prototypes: 2 samples - 4 different feeding methods using spandex

Using the best result from the previous tests, modifications were then made to the spandex feeding on the knitting machine. 21 knitting trials and 16 finishing trials were conducted. The resulting test fabrics were again analyzed to determine degree of stretch.

Results:

- Warp Stretch: 24 % (116% of objective)
- Weft Stretch: 21 % (42% of objective)

Conclusion:

The material that came closest to meeting specifications stretched 24% lengthwise and 21% widthwise - an improvement, but still does not meet specified 25% in each direction.

Key variables resolved: processing parameters, weaving equipment modifications

Activity #1-4: Establish heat setting temperature range

Work performed in Fiscal Year 2009:

Methods of experimentation:

- Process trials: 10 runs / samples

Heat setting temperature in the finishing process was varied to determine a temperature range that would produce the desired stretch results. Ten finishing trials were conducted.
[NOTE: WHAT TEMPERATURE RANGES WERE CONSIDERED? MORE DETAIL SHOULD BE PROVIDED.]

Results:

- Warp Stretch: 25.5 % (91% of objective)
- Weft Stretch: 25 % (100% of objective)
- Reduce cost of production: 7.5 $ per yard (75% of objective)
- Increase production speed: 339 Yards per hour (59% of objective)

Conclusion:

A heat setting temperature range was found that produced material with a 25.5% stretch lengthwise and a 25% stretch widthwise - this meets the specified goal.

[CRA COMMENTS: THE MODIFIED PROCESS WAS CONSIDERED PROVEN AFTER THE COMPLETION OF THE FINISHING (HEAT SETTING) TRIALS BECAUSE THE STRETCH CRITERION HAD BEEN MET. THE TECHNOLOGICAL OBJECTIVES OF THE PROJECT WERE ACHIEVED.]

[CRA COMMENTS: IN AN ACTUAL PROJECT DESCRIPTION, THE CLAIMANT MUST INDICATE THE LENGTH OF EACH OF THESE TRIALS AND THE TYPE OF EQUIPMENT USED, TOGETHER WITH A BRIEF DESCRIPTION OF THE RELATIONSHIP OF THE TRIALS TO THE TECHNOLOGICAL ADVANCEMENT THAT IS BEING ATTEMPTED. THE CLAIMANT SHOULD PROVIDE A BRIEF EXPLANATION OF WHY ALL THE TRIALS WERE REQUIRED AND WHAT WAS ACHIEVED DURING EACH OF THEM.]

Key variables resolved: material formulation, processing parameters, weaving equipment modifications

902 - Uniform 2D Stretch Swimsuit

Benchmarks:
Internet searches: 3 sites / articles
Patent searches: 1 patents
Similar prior in-house technologies: 1 products /
Queries to experts: 4 responses

Objectives:
Warp Stretch: 25 %
Weft Stretch: 25 %
Reduce cost of production: 6 $ per yard
Increase production speed: 400 Yards per hour

Uncertainty: 1 - New process to produce fabric with required stretch

Key Variables: material density, material formulation, processing parameters, weaving equipment modifications, yarn materials

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Base-line data and limits of current technology	Analysis / simulation: 1 alternatives	Warp Stretch: 31 % (0 %) Weft Stretch: 18 % (0 %)	material density material formulation yarn materials	93.00	346.95	1,250.00	2009
2 - Trials with a new textured polyamide	Process trials: 21 runs / samples Physical prototypes: 6 samples ... prototype revisions: 4 revisions	Warp Stretch: 27 % (66 %) Weft Stretch: 19 % (14 %)	material density material formulation yarn materials	119.00	345.25	395.65	2009
3 - Modifications of spandex feeding	Process trials: 37 runs / samples Physical prototypes: 2 samples	Warp Stretch: 24 % (116 %) Weft Stretch: 21 % (42 %)	processing parameters weaving equipment modifications	59.00	845.00	0.00	2009
4 - Establish heat setting temperature range	Process trials: 10 runs / samples	Warp Stretch: 25.5 % (91 %) Weft Stretch: 25 % (100 %) Reduce cost of production: 7.5 $ per yard (75 %) Increase production speed: 339 Yards per hour (59 %)	material formulation processing parameters weaving equipment modifications	84.00	0.00	1,200.00	2009

903 - Chlorine Stability of 2D Stretch Swimsuit:

Scientific or Technological Objectives:

Measurement	Current Performance	Objective
Improve Chlorine Stability (rating)	2	5
reduce cost of material ($ per yard)	25	13
Improve color availability (%)	50	100
improve production speeds (Yards per hour)	145	175

Identify the cause of poor chlorine stability in a polyamide/spandex swimsuit fabric, and develop a process to ensure a chlorine stability rating of 4-5.

[THIS EXAMPLE IS REPRODUCED FROM "TEXTILE INDUSTRY GUIDANCE DOCUMENT - EXAMPLES FOR SCIENTIFIC RESEARCH & EXPERIMENTAL DEVELOPMENT", JUNE 2006.]

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

- Internet searches: 4 sites / articles -- Insufficient info on cause of poor chlorine stability in a polyamide/spandex swimsuit fabric
- Patent searches: 2 patents -- no technology on causes of poor chlorine stability in a polyamide/spandex swimsuit fabric
- Competitive products or processes: 7 products -- swimsuits in the market
- Similar prior in-house technologies: 1 products / processes -- Product was developed previously, but is showing poor chlorine stability.
- Queries to experts: 3 responses -- No new info on chlorine stability was discovered

In 2000 the company had claimed work to develop a swimwear fabric (Project #2: Uniform 2D Stretch Swimsuit) made with a new type of polyamide combined with a conventional spandex filament yarn. It had succeeded in developing and commercializing Polyspam, a polyamide/spandex swimwear fabric that could stretch 25% in all directions.

Market response to this product was good but the colour selection was too narrow and, as a result, sales were not great enough to achieve the desired profitability. In addition the material was too expensive. In January 2001, the R&D team also took on the challenge of sourcing new yarn supply in order to develop the new shades.

CRA Comment: Finding a cheaper source of spandex does not require SR&ED. This is routine work to evaluate a new raw material. The new shade developments also did not require SR&ED. These activities do not meet the requirements of SR&ED because the problem was solved using generally available techniques and knowledge.

At the same time, the company needed to investigate the cause of the return of almost 50 rolls of material by two customers. Some of the material was being returned because of poor chlorine stability. The company needed to identify the cause of the problem and ensure that the product met the required chlorine stability rating of 4-5.

CRA Comment: The returned material from two customers cannot be considered part of material consumed for the project since it was made to fill commercial orders after the end of the previous year's project. When the material was returned, the company had completed the process development. The material was returned because of colour fading, not as a result of an SR&ED project.

CRA Comment: In 2000, the claimant had met the objectives set at the time. The company started commercial production and filled orders. The SR&ED project was considered completed when the claim was filed. Although in 2001 the claimant is working on the same product, the company was addressing new problems, one of which required them to start a new SR&ED project.

Field of Science/Technology:

Composites (including laminates, reinforced plastics, cermets, combined natural and synthetic fibre fabrics) (2.05.04)

Intended Results:

- Improve existing processes

- Improve existing materials, devices, or products

Work locations:

Lab, Commercial Facility

Scientific or Technological Advancement:

Uncertainty #1: Effect of different chemicals in swimming pools

Why does the material fade despite passing the accelerated chlorine tests? What types of interactions occur between colour pigments and various swimming pool chemicals, including algaecides?

The most significant underlying key variables are:
colour pigments, swimming pool chemicals, material formulation

Activity #1-1: Effect of several chemicals used in swimming pools

Work performed in Fiscal Year 2009:

Methods of experimentation:

- Process trials: 147 runs / samples

  A systematic investigation using testing and analysis of 147 laboratory trials was conducted. [NOTE: WHICH CHEMICALS WERE CONSIDERED? WHY 147 TRIALS? MORE DETAIL SHOULD BE PROVIDED.]

Results:

- Improve Chlorine Stability: 3 rating (33% of objective)

  Algaecide X caused some fading of the red component.

Conclusion:

The analysis required to determine which algaecides because the fading of red pigments provided the company with a new understanding of relationships between algaecides and colour stability.

Key variables resolved: colour pigments, material formulation, swimming pool chemicals

Technical Documents:

- Chemicals

Uncertainty #2: Dye combination not affected by algaecide X

Can the company develop a dye combination that is stable to the fading effects of algaecide X within the constraints of the application?

The most significant underlying key variables are:
Formulation of dye, amount of algaecide X, Type of formulation materials

Activity #2-1: Dye Combination Trials in Lab

Work performed in Fiscal Year 2009:

Methods of experimentation:

- Process trials: 14 runs / samples - 7 different combinations, each replicated twice.

  [AUTHOR'S NOTE: THE DESCRIPTIONS BELOW WERE PROVIDED IN THE CRA'S EXAMPLE. THE DATA ABOVE (# TRIALS/ALTERNATIVES) IS PROVIDED TO ILLUSTRATE SOME OF THE ADDITIONAL DETAILS THAT WOULD IDEALLY BE INCLUDED.]

  Several dye combinations were tried in laboratory trials. [NOTE: "SEVERAL" IS VAGUE - HOW MANY DYE COMBINATIONS WERE TRIED?]

Results:

- Improve Chlorine Stability: 4 rating (66% of objective)

Conclusion:

The dye combination that performed best in the presence of algaecide X was chosen for the commercial production trial.

Key variables resolved: amount of algaecide X, Formulation of dye, Type of formulation materials

Technical Documents:

- Dye Combo

Activity #2-2: Test best Dye Combination in Commercial Production

Project Name:	Chlorine Stability of 2D Stretch Swimsuit	**Start Date:**	2009-01-01
Project Number:	903	**Completion Date:**	2009-06-30

Work performed in Fiscal Year 2009:

Methods of experimentation:

- Process trials: 2 runs / samples - Two rolls were dyed and finished with the new dye combination chosen from laboratory trials.

Results:

- Improve Chlorine Stability: 5 rating (100% of objective)
- reduce cost of material: 12 $ per yard (108% of objective)
- improve color availability: 95 % (90% of objective)
- improve production speeds: 180 Yards per hour (116% of objective)

Conclusion:

Both rolls met the specifications.

CRA Comments: Although the company had identified the probable cause of the fading and potential solutions, they still needed to apply this new knowledge to develop a modified product and process.

CRA Comments: Application of the new know-how to produce a commercial product may or may not require SR&ED, depending on the facts in the specific circumstances. If SR&ED is required, then the trial (or trials) required to develop the modified product (and a process for its manufacture) may result in the presence of "Experimental Production" or "Commercial Production with Experimental Development".

CRA Comments: In this case the claimant was able to support the need for SR&ED carried out in the context of Commercial Production during Activity 2-2. They were thus able to claim the additional work required to advance their technology during the trials. If the material produced in these trials is sold, then the recapture rules apply (SR&ED 2000-04R2).[NOTE: ALTHOUGH THE CRA COMMENT INDICATES THAT THE CLAIMANT WAS ABLE TO SUPPORT THE NEED FOR SR&ED CARRIED OUT IN THE CONTEXT OF COMMERCIAL PRODUCTION, THIS EVIDENCE DOESN'T SEEM TO APPEAR IN THE ABOVE EXAMPLE. A STATEMENT SHOULD BE INCLUDED EXPLAINING POSSIBLE UNCERTAINTIES IN THE SCALE-UP FROM LABORATORY RESULTS TO COMMERCIAL PRODUCTION.]

Key variables resolved: amount of algaecide X, Formulation of dye, Type of formulation materials

Technical Documents:

- various combinations of dye samples

Water lilies.jpg -- 83794 bytes
Winter.jpg -- 105542 bytes

903 - Chlorine Stability of 2D Stretch Swimsuit

Benchmarks: Internet searches: 4 sites / articles
Patent searches: 2 patents
Competitive products or processes: 7 products
Similar prior in-house technologies: 1 products /
Queries to experts: 3 responses

Objectives: Improve Chlorine Stability: 5 rating
reduce cost of material: 13 $ per yard
improve color availability: 100 %
improve production speeds: 175 Yards per hour

Uncertainty: 1 - Effect of different chemicals in swimming pools

Key Variables: colour pigments, material formulation, swimming pool chemicals

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Effect of several chemicals used in swimming pools	Process trials: 147 runs / samples	Improve Chlorine Stability: 3 rating (33 %)	colour pigments material formulation swimming pool chemicals	308.00	1,090.88	43,996.45	2009

Uncertainty: 2 - Dye combination not affected by algaecide X

Key Variables: amount of algaecide X, Formulation of dye, Type of formulation materials

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Dye Combination Trials in Lab	Process trials: 14 runs / samples	Improve Chlorine Stability: 4 rating (66 %)	amount of algaecide X Formulation of dye Type of formulation materials	131.00	955.00	3,409.00	2009
2 - Test best Dye Combination in Commercial Production	Process trials: 2 runs / samples	Improve Chlorine Stability: 5 rating (100 %) reduce cost of material: 12 $ per yard (108 %) improve color availability: 95 % (90 %) improve production speeds: 180 Yards per hour (116 %)	amount of algaecide X Formulation of dye Type of formulation materials	61.00	611.00	450.00	2009