1998 TAPPI Proceedings Nonwovens Conference & Trade Fair

NONWOVENS CONFERENCE & TRADE FAIR

March 9-11, 1998
Bay Front Hilton Hotel
St. Petersburg, FL

TAPPI
Technology Park/Atlanta
P.O. Box 105113
Atlanta, GA 30348-5113, USA
www.tappi.org

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TAPPI PRESS

Technology Park/Atlanta
P.O. Box 105113
Atlanta, GA 30348-5113 U.S.A.
www.tappi.org

(ISSN 1046-6289/98) $1.00 + $.50 pp.

ISBN 0-89852-711-2
TP 01051398
Printed in the United States of America

TAPPI'S Antitrust Policy and Compliance Procedures

"Accomplishment of these objectives is everyone's responsibility. We also urge you to advise your colleagues and corporate officers of TAPPI's . . . compliance program"

This article sets forth TAPPI's antitrust policy and the rules of conduct and compliance procedures which govern all TAPPI activities. These formal guidelines are intended to do two things: (1) to prevent the occurrence of an actual antitrust violation in the course of TAPPI activities, and (2) to prevent inadvertent conduct which might give the appearance of an antitrust violation to someone unfamiliar with TAPPI's nature and purposes. They are designed to protect you, your employer and TAPPI from any accusation of wrongdoing arising out of your participation in TAPPI activities.

Accomplishment of these objectives is everyone's responsibility. We urge you to keep this article handy, and to refer to it whenever you have any question about the antitrust implications of any activity you might undertake under the auspices of TAPPI. We also urge you to advise your colleagues and corporate officers of TAPPI's comprehensive antitrust compliance program, so that you can count on their continued support in your TAPPI activities.

Any questions you or your company's legal counsel may have concerning TAPPI's antitrust compliance program should be directed to the Executive Director, TAPPI, Technology Park/Atlanta, P.O. Box 105113, Atlanta, Georgia 30348-5113 or to TAPPI's antitrust counsel, Peter Kontio, Alston & Bird, One Atlantic Center, 1201 West Peachtree Street, Atlanta, GA 30309; Phone (404) 881-7000, TELE FAX (404) 881-7777.

STATEMENT OF ANTITRUST POLICY

TAPPI is a professional and scientific association organized to further the application of the sciences in the paper and related industries. Its aim is to promote research and education in the areas of interest of its members. TAPPI is not intended to, and may not, play any role in the competitive decisions of its members or their employers, or in any way restrict competition in the paper and related industries.

Through its short courses, technical conferences and other activities, TAPPI brings together representatives of competitors in the paper and allied industries. Although the subject matter of TAPPI activities is normally technical in nature, and although the purpose of these activities is principally educational and there is no intent to restrain competition in any manner, nevertheless the Board of Directors recognizes the possibility that the Association and its activities could be seen by some as an opportunity for anticompetitive conduct. For this reason, the Board has taken the opportunity, through this statement of policy, to make clear its unequivocal support for the policy of competition served by the antitrust laws and its uncompromising intent to comply strictly in all respects with those laws.

In addition to the Association's firm commitment to the principle of competition served by the antitrust laws, the penalties which may be imposed upon both the Association and its individual and corporate members involved in any violation of the antitrust laws are so severe that good business judgment demands that every effort be made to avoid any such violation. Certain violations of the Sherman Act, such as price-fixing, are felony crimes for which individuals may be imprisoned for up to three (3) years or fined up to $350,000, or both, and corporations can be fined up to $10 million for each offense. In addition, treble damage claims by private parties (including class actions) for antitrust violations are extremely expensive to litigate and can result in judgments of a magnitude which could destroy the Association and seriously affect the financial interests of its members.

It shall be the responsibility of every member of TAPPI to be guided by TAPPI's policy of strict compliance with the antitrust laws in all TAPPI activities. It shall be the special responsibility of committee chairmen, Association officers, and officers of Local Sections to ensure that this policy is known and adhered to in the course of activities pursued under their leadership.

To assist the TAPPI staff and all its officers, directors, committee chairmen, and Local Section officers in recognizing situations which may raise the appearance of an antitrust problem, the Board will as a matter of policy furnish to each of such persons the Association's General Rules of Antitrust Compliance. The Association will also make available general legal advice when questions arise as to the manner in which the antitrust laws may apply to the activities of TAPPI or any committee or Section thereof.

Antitrust compliance is the responsibility of every TAPPI member. Any violation of the TAPPI General Rules of Antitrust Compliance or this general policy will result in immediate suspension from membership in the Association and immediate removal from any Association office held by a member violating this policy.

TAPPI GUIDELINES FOR SUBMITTING COPIES OF CORRESPONDENCE TO TAPPI HEADQUARTERS

TAPPI headquarters needs to remain aware of what particular committees and Sections of TAPPI are doing or are planning to do in order to better assist those groups in achieving their objectives and to continue to supervise actively the antitrust compliance of TAPPI. The Board of Directors of TAPPI therefore has adopted this formal statement of TAPPI's policy which requires that persons corresponding or receiving correspondence on behalf of TAPPI provide copies of the type of correspondence outlined below to the appropriate liaison person at TAPPI headquarters.

For this policy TAPPI does not require copies of routine, written communications regarding arrangements for speakers, meetings, travel, dinner reservations and the like.

TAPPI headquarters does require that copies of correspondence of an important nature and of non-routine matters be supplied in a timely fashion to TAPPI headquarters personnel connected with the committee or Section involved as shown below:

1. Plans regarding the activities of TAPPI committees or Sections.
2. Communications with other TAPPI committees or Sections.
3. Communications with persons or organizations outside TAPPI.
4. All written or recurring verbal complaints or criticisms of TAPPI activities.

All correspondence falling under the above-stated policy must be forwarded promptly to the appropriate TAPPI headquarters liaison person, preferably at the time of transmittal or receipt.

TAPPI GUIDELINES FOR MANUFACTURING PLANT TOURS

Manufacturing plant tours in connection with TAPPI technical program activities provide an opportunity for observation of applied science and technology. On-site inspection of equipment and processes by program attendees serves to promote knowledge of advances in manufacturing processes. Sponsored plant tours are conducted for the purpose of promoting understanding of production techniques and alternative approaches to technical problems in areas such as safety, pollution control, noise abatement and energy conservation. They may also promote the practical education of new TAPPI members and student members.

TAPPI's General Rules of Antitrust Compliance forbid the use of any TAPPI activity, including plant tours, for the purpose of exchanging competitive information.

In order to assure compliance with TAPPI's antitrust policy and general rules in connection with plant tours, the TAPPI Board of Directors has adopted the following supplemental guidelines to cover the plant tour portion of TAPPI programs:

1. Participation in plant tours should be limited to meeting registrants.
2. Plant tours should not include any discussion or exchange of competitive information.
3. Participants in plant tours should not under any circumstances discuss or otherwise disclose proprietary information.
4. Plant tour participants should not divulge to each other any operating data which could be used to reveal competitive information.
5. Plant tour participants may discuss the productive capacity of particular processes or items of equipment, but may not discuss the planned utilization of such productive capacity by the host plant or any other producer.
6. Plant tour participants may discuss production cost savings which may be effected through the use of a particular process or piece of equipment, but may not discuss the overall production costs of the host plant or any other producer.
7. The plant tour is to be conducted in compliance with TAPPI's Antitrust and Plant Tour Guidelines outlined in these pages, as well as the rules and directives of the host plant. While TAPPI encourages participation by all registrants for the plant tour, a host plant may decide to restrict or limit tour participation. It is the responsibility of those arranging plant tours to inform affected registrants of the restrictions as far in advance of the tour date as possible.

GUIDELINES FOR ANTITRUST COMPLIANCE BY DIVISION AND COMMITTEE OFFICERS

DO's and DON'Ts for Meetings and Operations

DO send the agenda for all meetings to TAPPI headquarters c/o Technical Division Administrator 15 days prior to the meeting.

DO send all minutes to TAPPI headquarters 30 days after the meeting.

DO review TAPPI Antitrust Policy and General Rules of Antitrust Compliance prior to the meeting.

DO stop any discussion which appears to be leading to:

(a) discussion of prices or pricing policy,

(b) any restraint on competition of any kind.

DO advise all meeting attendees to observe the General Rules of Antitrust Compliance in informal conversations as well as formal TAPPI activities.

DO NOT place constraints on committee membership, other than the member's technical capability in the area covered by the committee and the willingness of the committee member to participate actively in committee work.

DO NOT undertake any committee activity involving collection or dissemination of prices or pricing methods.

DO NOT undertake any committee activity involving collection of individual firm cost data or dissemination of any compilation of such data without prior approval of TAPPI legal counsel.

DO NOT undertake any activity to establish a product standard or specification. All test methods must be cleared by TAPPI headquarters prior to publication.

DO NOT set a numerical limit on committee size unless membership on the committee is rotated on a regular and reasonable basis. You may set a numerical limit on the maximum number of representatives per company.

RECOMMENDATIONS FOR THE SELECTION OF SPEAKERS

TAPPI technical sessions at conferences and short courses are not designed to be sales forums; they are designed to provide a forum for the exchange of technical information. Nevertheless, employees of suppliers are sometimes asked to participate as speakers or panelists because of their knowledge and experience. Participation on the program of a conference or short course may be viewed by suppliers as a significant competitive opportunity, and the favoring of some suppliers over others can give rise to antitrust problems. The exclusion of a supplier from a panel or program will not be considered an antitrust violation unless it constitutes an unreasonable restraint on competition. The key to "reasonableness" in this area is fair-minded decision making based upon objective criteria. In order to be fair to all suppliers and to avoid a charge of acting unreasonably to deprive any supplier of a significant competitive opportunity, TAPPI session developers should in all cases observe the following guidelines:

1. No speaker should be chosen with the intent to afford his company a competitive advantage, and no speaker should be excluded with the intent to deny any company a competitive opportunity.
2. Speakers should be chosen individually on the basis of objective criteria reasonably related to the educational purpose of the session, such as technical knowledge, experience, professional reputation, and effectiveness as a speaker.
3. The criteria to be used in selecting speakers should be established prior to the actual selection of speakers.
4. Supplier participation should be planned so as to minimize any competitive advantage which might arise from participation in a TAPPI activity.
5. Consideration should be given by session developers to all available methods for equalizing the competitive opportunity among suppliers.

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Session 1. Introduction to Nonwovens Products Tutorial

Session Moderator

Roy M. Broughton
Auburn University

Speakers

Subhash Batra
North Carolina State University

Other speakers to be announced

ABSTRACT

The Nonwovens Division has offered a variety of short courses in nonwovens technology in the past. We have decided to institute introductions to some of these areas of technology as tutorials to be presented at our annual TAPPI Nonwovens Conference. The tutorials will provide an introduction to particular areas of nonwovens technology for people who are new to the industry, or for those who want an overview of the particular subject area. Our previous two offerings have been in the areas of fibrous raw materials and nonwovens manufacturing technology. This year the tutorial will be an introduction to nonwovens products. The introduction will concentrate on nonwoven products (and uses of these products) with brief comments about the materials and manufacturing processes used for particular products. Some of the product areas included in the discussion are products for: roofing, wipes, filtration, thermal insulation, clothing construction, composites, furniture/bedding, interior construction/decoration, coating substrates/backings, and geotextiles.

Session 2. Binders and Additives I: Environmental Issues (Panel Discussion)

Panel Moderator

Tom Hamilton
Sequa Chemicals Inc.

Panelists

Peter Mayberry
INDA

Joseph R. Gosney
Owens-Corning

Angela L. Jankousky
Johns Manville

Michael Drews
Clemson University

Eric Schweitzer
Ogletree, Denkins, Nash, Smoak, and Stewart Law Firm

Kay Prince
EPA

Jerry Kissel
Forida Dept. of EPA for Southwest District

U. S. Congressman to be announced

ABSTRACT
Pressure to control formaldehyde and reduce VOC emissions in to the environment has been steadily increasing as newer Clean Air Act restrictions are implemented. New criteria governing chemical selection with increase emphasis on toxicology related attributes and environmental impact are emerging domestically and internationally. What impact will these changes have on the chemical industry and manufacturing facilities in the U.S.? What options are vailable to the chemical manufacturers?

THE USE OF PLASTIC FABRICS IN THE NONWOVENS INDUSTRY

by Dr. Hansjörg PAETOW
COFPA, France

Abstract

Although monofilament plastic fabrics have been using in the nonwovens industry since more than 25 years the general knowledge about such fabrics is relatively poor. This paper shall bring some light in this matter so that the user of plastic fabrics will get more understanding about them. Beside the comparison of glass and metal to plastics some properties of chosen materials are mentioned. Special subjects as air permeability, cleaning, and shrinking are also discussed.

Introduction

Fabrics made of plastic monofilament yarns have been used in the dryer section of paper machines for more than 35 years. Prior to that, only fabrics made of plastic multifilament yarns and metal wires were available. For more than 25 years plastic fabrics have been supplied to the nonwovens industry worldwide. In the following table you can find the main groups of products used in the nonwovens industry. Today, most of these fabrics are made of monofilament yarns and used in all known processes producing nonwovens.

TABLE No. 1

FABRICS AND SEAMS FOR THE NONWOVENS INDUSTRY

FORMING FABRICS	ANTISTATIC
TRANSFER FABRICS	OR
POLYMERIZATION BELTS	NON-ANTISTATIC
THERMAL BONDING CONVEYORS	AND
SPRAY CABINET CONVEYORS	UTILIZABLE UP TO 250°C
HYDROENTANGLEMENT CARRIERS	(DEPENDING OF PLASTIC MATERIAL)
PATTERNING FABRICS	
HIGH TEMPERATURE DRYER BELTS	
SPIRAL CONVEYORS	
ENDLESS	
SINGLE PIN LOOP SEAMS	MAY BE SUPPLIED
DOUBLE PIN-DOUBLE LOOP SEAMS	WITH AN
SPIRAL SEAMS	ASSEMBLY HELP DEVICE

HP/127

In the nonwovens industry three different processes to form a web can be distinguished.

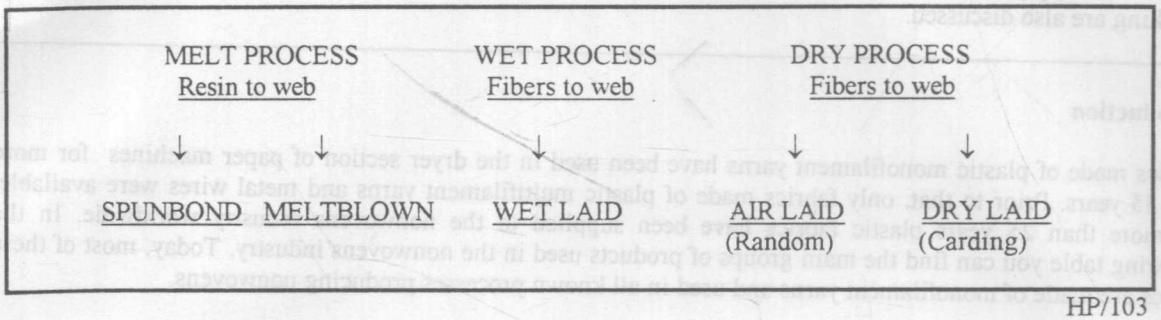
Processes to form a web :

WET
DRY
MELT

Nearly all machines used for these processes need at least one fabric. The Wet Process is dominant in the forming of glass nonwovens and paper like products. The Dry Process can be distinguished in two parts : "Carded Dry Laid" materials and "Air Laid" products, so-called dry paper. The Melt Process is the youngest one, and there are also two parts : Spunbonding and Meltblown.

TABLE No.2

NONWOVENS PRODUCTION



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The highest number of different positions can be found normally in Air Laid Machines : there are up to eleven positions. Most of the Spunbonding and Meltblown machines have only one fabric : the Forming Fabric. But there can be further fabrics in line resp. off line, e.g. for Thermal Bonding, Hydroentangling, etc.

The Forming Fabric

The Forming Fabrics for the three processes are quite different :

- for the Wet Laid Process a Forming Fabric similar to the paper industry is required ;
- for the Dry Laid Process "Carding" a "non-pinching of fibers" fabric has to be used ;
- for the Air Laid Process fine antistatic Forming Fabrics are necessary, and
- for Spunbonding and Meltblown nearly all Forming Fabrics are antistatic, and there exists also a high variation in air permeability.

In all machines the web forming is the most important part. Therefore the Forming Fabric plays a key role in the process. A normal fabric is woven with warp yarns (normally machine direction "MD") and weft yarns (normally cross machine direction "CD"). There are single, double, and triple layer fabrics in use, depending on the process, the machine, the fiber lay-down etc.

Regarding the Forming Fabric, it is clear that the formation of the web should be made easily and without marking or release problems. The best Forming Fabric would be endless, without any seam. It is very important that the Forming Fabric does not create an extra marking in the seam area (if the Forming Fabric has not been supplied endless). But not all machines have a cantilever system where you can open a part of the machine and install the complete finished Forming Fabric on the machine.

If the machine does not have a cantilever system, then the fabric has to be made endless in the machine. Open end fine metal wire fabrics are made endless by welding which requires a specialist and needs plenty of time. One of the major advantages of plastic fabrics is that they can be supplied with a non-marking seam which allows that the fabric can be installed on the machine without requiring any specialists. Often the installation of the fabric can be done by the machine operator.

In 1972 COFPA patented the ISOFIL seam, a non-marking double loop, double-pin seam, and in 1991 single layer Forming Fabrics were developed with the same diagonal air flow as double layer Forming Fabrics. Single layer fabrics with long floats in machine direction are predestinated for the ISOFIL seam.

In "dense" single layer fabrics you cannot speak longer in terms of mesh and open area. Only the air permeability, the construction, the weaving pattern, and the material can be taken for the right choice of the Forming Fabric as well the knowledge of the process as the particularities of the machine. Therefore, to improve your own processes, a discussion "on-the-spot" makes finding a combination of effective solutions quicker.

Dissipation of electrostatic charges

It is well known that the friction of the polymer during the extrusion, the spinning, and the lay-down produces static electricity. If the Forming Fabric is not equipped with conductive yarns, the electrostatic charges will remain on the surface of the Forming Fabric and can hinder a uniform lay-down and produce "bubbles" in the web. The occurence of "bubbles" will create folds in the web when going through the calender while the appearance of non-uniform distribution of fibers gives a "cloudy" web, sometimes holes.
Therefore, a very good antistatic behavior of the Forming Fabric is necessary for the dissipation of electrostatic charges : the conductive monofilaments are in contact with the metal rolls which are connected to the frame of the machine. Sometimes you hear that an "antistatic" fabric does not function as it should. In that case you have to verify if the connection to earth is made in a correct manner.

On the other hand, if the Forming Fabric does not contain conductive filaments some other precautions have to be taken : the use of ionization bars and/or moistening of the air. In some cases such machines are encapsulated to create a defined micro-climate. If the dissipation of the electrostatical charges is hindered due to a bad connection of the machine to earth then some sparks can appear and may disturb the forming of the web. The measured voltage is up to 75000 V. It has been found that with antistatic fabrics and a proper connection to earth the former high voltage can be lowered to 500 V.

We have developed also antistatic, high temperature resistant Forming Fabrics. In this case the fabric is made of PEEK and the conductive filaments in the weft are made of metal. As you are aware, PEEK fabrics can be used continuously up to 250°C, in a short period even up to 300°C. At this temperature the "normal" plastic conductive monofilament will be melted.

Air permeability

In Forming Fabrics the air flow is as well important for the retention of the fibers as for the lay-down. The air flow can be vertical, diagonal or a mixture of both. The choice of the right fabric is depending on the machine and on the process.The air permeability of Forming Fabrics for the Spunbond Process lies between 6500 m3/m2/h and 26000 m3/m2/h, for the Meltblown Process between 8100 m3/m2/h and 13000 m3/m2/h. These air permeabilities are measured under a vacuum of 100 Pa resp. about 10 mm water column. If the air permeability is given in CFM which means Cubic Feet / Minute -but the right formula should be ft3/ft2/min- the applied vacuum is 127 Pa, which is equal to about 1/2 inch water column. The corresponding conversion factor to calculate from CFM (under a vacuum of 127 Pa) into m3/m2/h (under a vacuum of 100 Pa) is about 16.2.

Conversion : 1 ft3/min/ft2 (under a vacuum of 127 Pa) → m3/m2/h (under a vacuum of 100 Pa)

1ft3/min = 30.48 cm x 30.48 cm x 30.48 cm/min = 28316.8 cm3/min = 0.028 m3/min
1ft2 = 30.48 cm x 30.48 cm = 929.03 cm2 = 0.0929 m2
0.028 m3/min : 0.0929 m2 = 0.3048 m3/m2/min = 18.2885 m3/m2/h (under a vacuum of 127 Pa)

$$A1 = A2 \times \sqrt{(p1/p2)}$$

with A1 = air permeability1, A2 = air permeability2, p1 = vacuum1, p2 = vacuum2.

A1 = 18.2885 m3/m2/h; p1 = 127 Pa
A2 = ? (under a vacuum of 100 Pa); p2 = 100 Pa
$\sqrt{(p1/p2)}$ = $\sqrt{(127\ Pa/100\ Pa)}$ = 1.1269

A2 = A1/ $\sqrt{(p1/p2)}$ = 18.2885 m3/m2/h : 1.1269 = 16.23 m3/m2/h (under a vacuum of 100 Pa)

→ 1 CFM (under a vacuum of 127 Pa) ≈ 16.2 m3/m2/h (under a vacuum of 100 Pa)

There exist sometimes also measurements of air permeabilities under a vacuum of 200 Pa.
If p1 = 200 Pa and p2 = 100 Pa then $\sqrt{(p1/p2)} = 1.41$.
Therefore, the air permeability has to be mentioned everytime with the applied vacuum !

As you can see, the air permeability will give you finally a speed under which the air is passing through the holes of the fabric. The above mentioned 6500 m3/m2/h under a vacuum of 100 Pa (about 400 CFM under a vacuum of 127 Pa) give a speed of 1.8 m/sec (6500 m3/m2/h = 6500 m/3600 sec) and the 26000 m3/m2/h (about 1600 CFM) give 7.2 m/sec (under a vacuum of 100 Pa). A fabric of 400 CFM is a relative closed construction, 1600 CFM is a very open fabric.

It is important that the air permeability of the fabric is not the limiting point of the suction capacity of the machine. If the air permeability of the Forming Fabric is too low, the web will not be hold on the surface, it can flutter, and the possibility of producing wrinkles -when passing through the compaction roll or the calender- is given. If the air permeability is too high, the "endless" fibers can go through the holes of the Forming Fabric and will give later some release problems because the fibers are caught between the end roll and the fabric.

The surface of the Forming Fabric has a considerable influence on the web. Long floats in machine direction (MD) -that means that the warp yarns are going at least over two weft picks- and a dense warp will give a relatively smooth surface in MD, and the web will be hindered to glide in the cross machine direction (CD). A gliding in MD could be possible if the suction force is not strong enough. Long floats in CD will result in a very good transportation of the web, but a gliding in CD cannot be excluded if the suction force is not strong enough. So, you could say that "knuckles" in MD and "knuckles" in CD would be the best. May be in some cases but the surface of such a fabric is relatively rough and at very high speeds such a fabric will not be stable on the machine.

Success of plastic fabrics

Due to the diversity in weaving pattern, finishing, polymer types etc. plastic fabrics have replaced many metal and glass fabrics. Let's compare plastic fabrics with metal and glass fabrics and discuss their properties.

TABLE No.3

DIFFERENT MATERIALS FOR FABRICS

METAL	GLASS	PLASTIC
STEEL	C - GLASS	PE
BRONZE	E - GLASS	PA
COPPER	R - GLASS	PET
	S - GLASS	PPS
		PEEK
		F - containing polymers (PVDF, ...)
		Aramides (multifils only)
ROUND MONOFILS	MULTIFILS	ROUND MONOFILS
STRIPES		FLAT MONOFILS
" CHICKEN WIRE "		ELLIPTIC SHAPED
KNITTED		(oval shape)
TWISTED		SPIRALS
SPIRALS		
SINGLE LAYER	SINGLE LAYER	SINGLE LAYER
DOUBLE LAYER		DOUBLE LAYER
		TRIPLE LAYER

On the metal side, most of the fabrics are made of steel, copper or bronze. These metals can be supplied as round wires or stripes. In a metal fabric the warp is mostly twisted by thin wires to give a better resistance against breaking. In new machines there is also a guiding roll. On this roll the sense of running is changing : the former top side becomes the back side. At the same time a movement -that means a flexure- in machine direction (MD) will occur which will result in a breaking of the warp if it is a stiff metal. Plastic fabrics are much more flexible in such positions and conditions and also "stiff" plastic monofilaments will not break when these movements will happen.

TABLE No.4

COMPARISON OF SOME PROPERTIES OF FABRICS

A) ADVANTAGES		
METAL	GLASS	PLASTIC
. HIGH TEMPERATURE RESISTANT . STIFFNESS . ANTISTATIC . LOW ELONGATION	. HIGH TEMPERATURE RESISTANT . LOW ELONGATION . LOW TENSION NEEDED . NO THERMAL MARKING	. FLEXIBLE AT NORMAL TEMPERATURE . LOWER TENSION THAN METAL NEEDED . LOW WEIGHT . NO MARKING SEAMS . NO THERMAL MARKING . LOW HEAT CONDUCTIVITY . NO BREAKING EDGES . CAN BE MADE ANTI-STATIC
B) DISADVANTAGES		
METAL	GLASS	PLASTIC
. THERMAL MARKING . BRITTLE EDGES . HIGH HEAT CONDUCTIVITY . EDGES BREAKING AFTER FLEXION . HIGH WEIGHT . MARKING PIN SEAM . HIGH TENSION NEEDED . STIFFNESS	. ONLY MULTIFILS . PINCHING OF FIBERS . EASY BREAKING . MARKING PIN SEAM . LOW RESISTANCE OF COATINGS . NON-ANTISTATIC	. MELTING AT HIGH TEMPERATURES . HIGH ELONGATION

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The edges of metal fabrics are especially endangered because the coating which is keeping the wires together hinders the wires from moving. But the coating is needed to fortify the edges for guiding. In contrary, the edges of plastic fabrics can be welded. Often a coating is not necessary. This shows once more that plastic fabrics are much more flexible than metal fabrics.

On the glass side there are different compositions : C-, E-, R- and S-glass. R- and S-glass have a 30% higher tensile strength than E-glass. Glass can be woven only as multifilaments because glass monofilaments break easily. Often the entire glass fabric is coated e.g. with Teflon but this coating does not last very long due to the low affinity

On the plastic side there are much more possibilities for making fabrics as well of different materials as of different mixtures. Only some chosen polymers are mentioned here :

PE	polyethylene
PA	polyamide
PET	polyethyleneterephthalate (polyester)
PPS	polyphenylenesulfide
PEEK	poly(phenylene)etheretherketone
PTFE	polytetrafluorethylene (only multifilaments)
PAA	polyaramide (aromatic amide)[only multifilaments].

TABLE No. 5

PROPERTIES OF SOME MATERIALS FOR FABRICS [4,5,6]

		METAL		GLASS	PLASTIC	
Specific resistivity (20°C)	Ohm cm	Steel	10,4x10 Exp-6	Glass 5x10Exp13	PA	6,6x10Exp15
					PE	>10Exp15
		Copper	1,7x10Exp-6		PET	10Exp15
					PP	>10Exp15
		Bronze	7x10Exp-6		PTFE	10Exp18
					PVDF	10Exp16
					PA/C	10Exp2
Heat extension coeff. alpha	1/°C	Steel	1,23x10 Exp-5	Glass 8,1x10Exp-6	PA	8,0x10Exp-5
					PE	15x10Exp-5
		Copper	1,65x10 Exp-5		PET	7x10Exp-5
					PP	9x10Exp-5
		Bronze	1,62x10 Exp-5	Quartz 5x10Exp-7	PTFE	10x10Exp-5
					PVDF	7x10Exp-5
Specific gravity	g/cm3	Steel	7,7	Glass ~2,2	PA	1,14
					PET	1,38
		Copper	8,9		PPS	1,37
					PEEK	1,30
		Bronze	8,6		PVDF	1,84
					PTFE	2,10

HP/101

As mentioned above, on a machine there can be different positions equipped with a fabric.

Let's take an "Air Laid Kroyer" Machine. The following positions could exist :

Forming
Web Transfer
Spray Cabin #1
Dryer #1
Spray Cabin #2
Dryer #2
Curing
Cooling
Conditioning
Dryer Thermal Bonding
Dryer Cleaning System.

The requirements for fabrics on these positions are quite different and can vary very much in :

- temperature
- conductivity
- air permeability
- structure, and
- polymer.

TABLE No. 6

PROPERTIES OF POLYESTER AND POLYAMIDE 6.6 MONOFILAMENTS

	Unit	Polyethylene-terephthalate PET	Polyamide 6.6 PA 6.6
dtex	g/10km	1780	1480
diameter	mm	0.4	0.4
specific gravity	g/cm3	1.38	1.14
melting point	°C	260	250
1st transition temperature	°C	85	60
heat capacity	kJ/kg/°C	1.3	2.2
thermal conductivity	W/m/°C	0.3	0.3
cont. service temperature	°C	150-180	140-170
oper. temperature (surges)	°C	200	190
moisture uptake (20°C/65% r.h.)	%	0.4	4
volume resistivity	Ohm cm	10Exp15	10Exp15
dielectric constant		3.2	4.3
limiting oxygen index	%	21	22
tenacity	cN/tex	38	37
extension at break	%	37	31
modulus - 2%	cN/tex	450	270
modulus - 5%	cN/tex	220	260
modulus - 10%	cN/tex	140	170
elastic recovery ex 2%	%	80	70
work recovery ex 2%	%	85	70
knot tenacity	cN/tex	27	25
loop tenacity	cN/tex	24	20

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Further in the field of Hydroentanglement/Spunlacing and Patterning other types of fabrics are used. For hydroentangling a very fine fabric has to be taken. The structure of the fabric should not have any effect on marking of the web, only "traces of the water needles" should be visible. In contrary to this process is the patterning. Here it is important that the fabric gives an effect on the web. In some cases only metal wire fabrics or metallic cylinders will give satisfactory results but many special effects can be made only by different types of woven monofilament plastic fabrics.