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FABRIC TECHNOLOGY IN ROAD TRANSPORT

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HISTORY

The origin of the word 'tarpaulin' comes from two words "pauling" meaning a cover and "tar" is originated from coating a pauling with tar. I do not know how far back this goes but in the late 19th Century flax covers coated in a tar substance were used extensively on ships hatches.

As road transport began to emerge in the 1920's cotton came to replace flax due to its lighter weight for strength and tighter weave. Also more sophisticated methods of proofing replaced the old tar although flax remained predominant for marine use. This situation remained relatively unchanged through to the 1950's with development concentrating on producing long staple yarns and elaborate proofing processes. During this period fabrication had consisted of the basic rectangular tarpaulin, canopies (covered wagon type) roll-up rear and side drops. The metal eyelet had replaced the handworked grommet and sewing machines had taken the place of hand stitching.

With the advent of sythetic fibres in the 1950's rayon, orlon and nylon, the picture changed rapidly. The new fibres could not be proofed in the same manner as cotton and remain waterproof so they were covered with rubber compounds or plastic coatings. Cotton tried to compete by combining with synthetics and coating with plastic . The former was successful to a degree as it still exists today. The latter was a failure.

The problem was that natural fibres did not combine well with man made fibres for industrial requirements as their characteristics were often complete opposites. Fabrication witnessed changes too with high frequency welding, first combined with stitching and later without, took over from sewn seams which were a problem to waterproof with the new fabrics.

The 1960's saw polyester introduced and gain acceptance particularly for more demanding applications. High demand and low production made it expensive while being recognized as having superior characteristics to nylon. During this period road transport really started to gather momentum as a versatile medium for getting goods from point to point. That is everywhere except New Zealand where it was hamstrung by regulation and would wait another 15-20 years to catch up. Cotton and synthetic blends tried desparately to hold onto a steadily declining market share. The potential for natural fibre development had run its course whereas that of synthetics and polymers had only just begun. Throughout this decade nylon scrim based laminates dominated the market with low cost, mass produced fabrics. This decade saw considerable development but largely concentrated on production and fabrication techniques to make more faster with less regard for quality. Plastics were treated generally as the wonder fabrics without due recognition of their deficiencies. However progress was made with alternative coating systems being developed.

The end of the decade saw man land on the moon and few realized the impact this this would have on the future of industrial fabrics.

As the 1970's began road transport continued its upward spiral and fabric development expanded in many directions at once. New fibres, weaves, construction, coatings, polymers, machinery for weaving.coating and fabricating. So to the impetus for research generated by NASA was added the impetus of necessity with the first of many oil price shocks.

New fabrics with enhanced capabilities primarily P.V.C. coated polyester helped give birth to the curtainsider concept of which Tautliner was the first. While originally developed in the U.K. in 1970 it was not readily accepted - like most new ideas - due particularly to the lack of the right fabric availability and construction difficulties. Concurrently the T.I.R. tilt system was replacing box vans and tarpaulined loads in Europe. The oil crisis meant that energy was no longer a cheap commodity and fabric was far less energy consumptive than the materials it replaced. Just as the space programme had discovered in fabric the means to reduce weight to minimize launch loads so the transport industry began to realize the benefits.

By 1980 a new era of fabric orientated products had begun in road transport belatedly paralleling similar developments in other industrial sectors.

Fabrics are now used not only for all manner of side opening, top opening, concertina and sliding systems on vehicles themselves but are also being used more and more for ancilliary items such as air suspension, loading dock seals, coolstore air buffers, weather control flaps, intermediate bulk container bags (I.B.C.), liquid containment and warehousing to name a few.

FABRIC TYPES Four types of fabric are currently used in road transport today:

1) Canvas
2) Polyethelene/Polyproplene Laminates
3) P.V.C. Coated Nylon
4) P.V.C. Coated Polyester

CANVAS Today this is primarily a cotton polyester blend, plain weave or ripstop in a corespun or blended, twisted yarn configuration. Corespun uses a spun polyester with a cotton jacket whereas the other simply twists cotton and continuous filament polyester together. The basis is that the cotton swells when wet to add to the waterproofing qualities and the polyester provides the strength. Used primarily for tarpaulins. Its strengths are that it breathes and the dry weight of around 500gsm is lighter. Its disadvantages are - the waterproofing wears out with abrasion - 60% weight increase, when wet - slow drying - subject to bacterial degradation - expensive to repair.

POLYETHELENE LAMINATES Primarily used for static covers consists of a flat polyethelene or polyproplene yarn with 50 micron lamination of polyethelene on one or both sides. Generally has very limited practical life and low chafe resistance. Attempts to coat with a heavier laminate than 75 microns have all met with failure to date.

PVC COATED FABRICS Come in two basic forms, scrim laminates and spread coated wovens.

SCRIM LAMINATES These consist of an open mesh scrim of twisted threads in varying deniers with P.V.C. in hot sheet form laminated to each side in varying thickness from 75 to 250 microns. This was the first plastic type fabric used in tarpaulins in New Zealand in the late 1950's.

Scrim Laminate

First introduced in the United States of America it is very suitable for mass production and is still the major form of tarpaulin fabric used there and in Korea and Taiwan whereas it has largely been displaced elsewhere. The advantages are low cost (particularly when produced in Taiwan and Korea) tear strength and weld adhesion. When the fabric is cut and tension is applied the threads slip and bunch together to form a 'rope' which, if using 840 denier nylon or 1000 denier polyester, is very difficult to break. The gaps in the mesh when P.V.C. meets P.V.C. makes for an homogenous bond when welding with HIGH FREQUENCY.

However it has many disadvantages particularily as a multipurpose industrial fabric. Tensile strength is a function of the sum of the break load of each thread and as the closest mesh is usually no more than 14 x 14 (14 threads to the inch) this is not high. Because the laminating process relies on the open mesh substrate to obtain a good bond and the heavier the individual threads are the further apart they need to be to achieve this great tensile strength will always be an elusive quality for this construction.

While the thread slippage provides high tear strength it also causes delamination by breaking the bond between the two layers of P.V.C. Stitching has the same effect as it is impossible to arrange for the stitches to fall on thread lines consequently they form a serated line in the P.V.C. film greatly assisting delamination. When tension is applied to a welded attachment point because the bond is very good the solid welded section will pull away from the remainder of the fabric causing elongation of the P.V.C. film and permanent deformation.

As further load is applied, the P.V.C. laminate stretches beyond yield point and breaks as the nylon/polyester mesh has no dimensional stability to hold it together.

The gaps in the mesh create a hill and dale effect which cause the threads to stand proud. Although being covered with a uniform thickness of P.V.C. by their relative isolation are more subject to chafe. To help overcome this problem a heavier P.V.C. sheet is generally used increasing the total weight and stiffness of handling in cold temperatures. This is another of the disadvantages of a laminated P.V.C. even at 10°C it becomes stiff and hard to handle.

The same gaps in the scrim give this fabric a low puncture resistance. Most scrim laminates available in New Zealand are manufactured in Taiwan or Korea and in order to keep their production cost low have little Ultra Violet inhibitor in the P.V.C. and exhibit colour bleaching and plasticizor loss after 2 years or less. Usually available in 210, 420 and 840 denier nylon scrims with varying coated weight, applicable for basic or disposable applications.

SPREAD COATED WOVENS This system consists of a woven fabric, rather than a scrim, onto which molten P.V.C. paste is scraped with a knife on each side in successive layers. Unlike scrim laminates it does not rely on the P.V.C. for any of its strength, only some stability, waterproofing, chafe resistance and weldability. The molten form of P.V.C. creates a pliable material that remains flexible at colder temperatures.

Apart from the first coating run which impregnates the fabric the majority of the P.V.C. remains on the surface giving a relatively smooth finish less vulnerable to chafe. As the woven fabric has no discernable gaps in the weave it has a high puncture resistance.

As the P.V.C. is a surface coating the thread types, sizes, methods of weaving and constructions can have a whole spectrum of variations to achieve the criteria established by the end use. Also the coating can be varied in thickness; either side or both, in type; P.V.C., polyurethane, P.V.D.F., tedlar, silicone, nylon, acrylic or a combination of these also density; with foaming for temperature or audio insulation.

Irrespective of the type of threads used or quantity per cm the tensile strength is relatively high due to the density of the woven configuration.

However in most end use applications tensile strength is not the governing factor and in most cases is of minor importance compared with tear strength and adhesion. Adhesion is a function of the bond between the P.V.C. and the base fabric. Any weld irrespective of type relies on this bond for its strength. At the same time too great an adhesive strength will rigidize the mass of fabric and P.V.,C. reducing its tear strength. While a balance between these factors needs to be stuck for most general purpose applications the ability to vary the composition provides the fabric engineer with another tool,with which to design a fabric to meet its end use criteria.

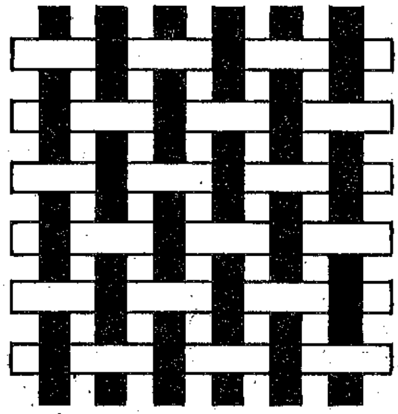
The major difference between a scrim and woven base is the mechanics of the bond that exists after the fabric is welded. Scrim laminate acts partically like a single film in that any "peel" force is the same as "sheer" between the threads of the scrim. With spread coated wovens a "peel" force is to be avoided wherever possible. To convert this to sheer will often require the use of specialized machinery, tooling and methods of fabrication that will tax the expertise of the best fabricators, if he is to utilize this fabric to its potential.

The base fabric onto which the P.V.C. is coated comes in many forms and is currently the object of considerable research. The difficulty lies in development as a specific weave configuration cannot be made in a laboratory but has to be set up on a loom with thousands of yarns and then at least a thousand metres run to be coated for testing.

The most common form of this fabric in use in the road transport industry is for tarpaulins.

Plain Weave 1 x 1

It consists of an 840 denier nylon in a 9 x 9 (9 threads per cm warp and weft) construction in a 1 x 1 (plain weave) configuration. Coated up to a total weight of 550gsm this is commonly referred to as Tufcover. When a double thickness thread is inserted warp and weft every 2 cm and coated to 650gsm it is known as Ripstop, which is the most widely used P.V.C. coated fabric for truck tarpaulins.

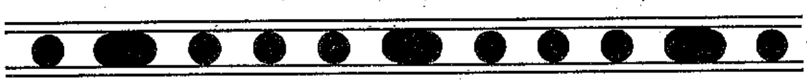


Plain Weave 1 x 1

The nylon yarn imparts good tear and tensile strength but lacks dimensional stability. It shrinks and expands depending on climatic conditions and is subject to considerable stretch under load. Weight is another disadvantage which is primarily a function of construction. All the threads are twisted yarns so that the ripstop thread is double the size of the adjacent threads.

1 x 1 with Twisted Ripstop Threads

To coat it less than 650gsm provides insufficient cover over the heavier ripstop threads. If, as has been done in Europe, the ripstop thread is a flat untwisted yarn and therefore double width only, the fabric can be coated to a total weight of 600gsm without any appreciable loss of strength.



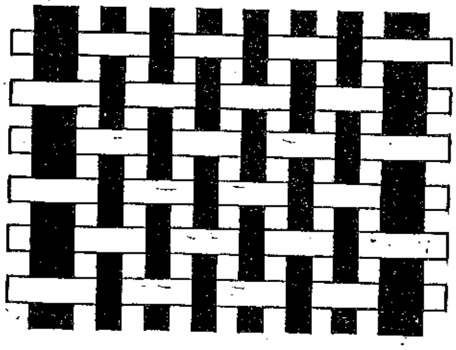
1 x 1 with Flat Untwisted Ripstop Threads

While 50gsm may not seem a lot it represents 3-4 kgs in an average tarpaulin and if that is on top of 40kgs already it can be the last straw. However New Zealand is one of the few countries still utilizing nylon base fabrics for this purpose.

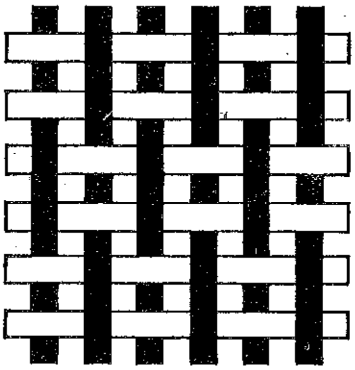
Internationally spread coated polyester is the most widespread fabric used, not only in road transport, but in many other industrial fields. In fact, one of the major uses for polyester yarns is for application of plastic coatings of one kind or another.

As its use has grown, production has increased so that it is roughly equal in cost to nylon weight for weight. With a higher specific gravity polyester is not as strong as nylon for the same weight. Consequently to equate this initial deficiency a 1000 denier polyester is normally used in place of an 840 denier nylon. Unlike nylon, polyester is dimensionally stable irrespective of climatic conditions or temperature variations, has far lower stretch under load and is less affected by ultra violet degradation. The impetus to develop new and varied constructions for polyester fabrics came from two sources - sail making and tensile membrane structures. As a result a hugh range of deniers became available from which weavers could choose, which further advanced the use of polyester fabric for other applications.

Polyester had so many qualities it became the natural choice for road transport coverings. With such a diversity of deniers and end uses available it became economic to experiment with different yarn types and construction mediums, the objectives being the best compromise between weight, strength and chafe resistance. P.V.C. is still the principal medium for coating, but it has a high specific gravity which means the majority of the total wight of the finished fabric will be in the coating. A good compromise for truck tarpaulins is 600gsm if an equivalent tear strength and adhesion to Ripstop, the industry standard, is maintained. This can be achieved with a 1 x 2 (half panama) construction using twisted threads, or 1 x 1 Ripstop using an untwisted yarn for the double threads thus maintaining a constant thickness of P.V.C. over the base fabric.



1 x 1 with Flat Untwisted Ripstop Threads



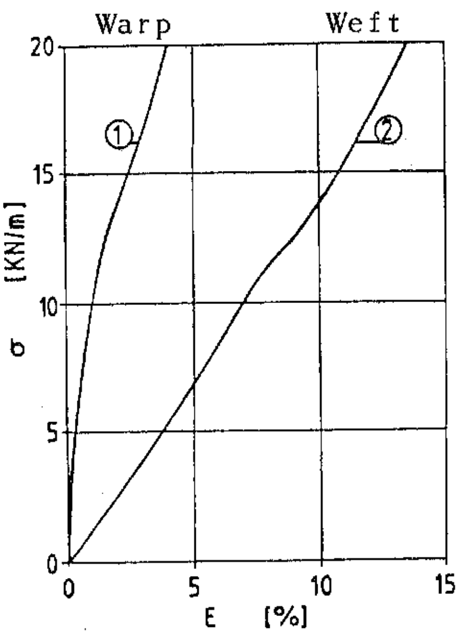
2 x 1 Half Panama Weave

Some base cloths are woven with less than 9 threads to the cm by utilizing a looser weave. If using twisted threads this is usually to save cost but with a consequent reduction in tear and tensile strength. The recent innovation of fully woven fabrics using untwisted yarns has compounded this equation as less threads are needed per cm. For example, a 7.5 x 7.5 flat thread 1 x 2 construction can provide the same strength as a 9 x 9 twisted thread 1 x 1 construction. However 1 x 2 or 2 x 2 panama construction is required to achieve sufficient tear strength for most applications. While tensile strength will never be as great it is seldom a consideration for tarpaulins. This is particulatrly so now with the recent introduction of the load restraint tarpaulin where the built in webbs carry the primary load at regular intervals which reduces the stress on the fabric between the webb. In this situation a commonality of base fabric in the webb and the tarpaulin material is particularly important.

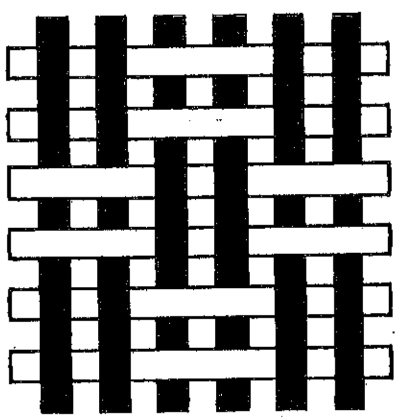
Being dimensionally stable P.V.C. coated polyester became ideal for soft sided and soft topped containers, T.I.R. tilts, airline container curtains and any application where dimensional accuracy regardless of climate is a prime consideration.

Curtainsiders require a fabric with high tensile strength, high tear resistance and low stretch to justify their load retention capabilities. The fabric developed for this purpose is a 1000 denier polyester with 12 threads per cm warp and weft in a 2 x 2 panama weave configuration. This use of the panama or basket weave increased tear strength dramatically and formed the basis for many other applications. With a lot heavier thread configuration this fabric has a total coated weight of 850 to 900 gsm. As the curtain is hung off rollers and incorporates buckles webbs and rave hooks, flexibility and chafe resistance are more important considerations than fabric weight. Acrylic lacquers are generally added to the surface of the P.V.C. for ease of handling during fabrication and resistance to grime accumulation.

The present methods of coating these fabrics secures the salvedges (edges of the cloth and thus the weft threads) and applies a high tensile load to the warp (length of the cloth). Consequently the finished fabric becomes warp, orientated, meaning the warp threads will resist stretch far more than the weft. In most construction at a ratio of 3:1.



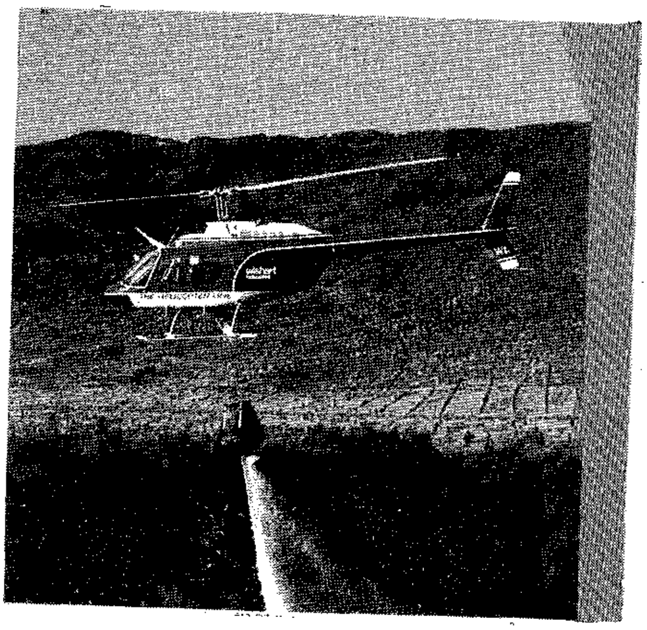
Uniaxial Test POLYMAR 6505

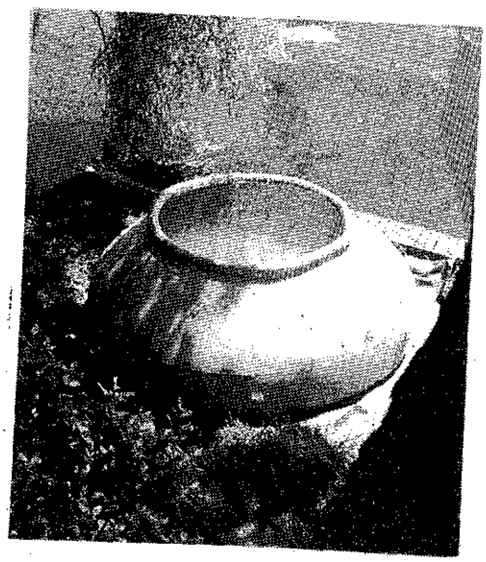


2 x 2 PANAMA WEAVE

The fabricator must take this into account when engineering the design of his product if stretch in one direction is more critical than another. In curtainsiders for example excessive stretch can result in illegal load width so it is important that the warp of the fabric is orientated to the longitutional axis, normally the length of the vehicle.

This same basic 1000 denier 12 x 12 panama weave fabric with various coating thicknesses and surface finishes is used for many purposes such as BIG BAG flexible intermediate bulk containers, FLEXIDAM open topped liquid storage, air jacks, smaller tensile structures, lightweight conveyor belting, air buffers, loading dock seals, air supported buildings, strapping, HELIBUCKET monsoon buckets.





Heavier versions in construction and coated weight are used for SOFTANK transportable liquid containers, hovercraft skirts, chipsider curtains, conveyor belts, 2-3 tonne I.B.C.'s , large tensile, frame and air supported structures.

Future developments will follow paths being led for more technical end uses. The quest for the best combinations of weight,strength, durability and economy will escalate the already rapid advances in yarn types like polyester, long staple polyethelene (spectra) aramid (kevlar) and carbon fibre;construction such as 3 x 3 panama and triaxial wovens, weft inserted warp knits, Malimo stitchbonds and shaped multiaxial 3-D integrated preforms and surface coatings like tedlar, mylar, silicone, P.V.D.F. C.P.E. and polyurethane not to mention a whole new generation of polymer alloys (a combination of various polymers).

Considerable research into existing U.V. degradation will continue to increase the lifespan of all fabrics.

As each new fabric becomes available new fabrication systems have to be developed to successfully convert these materials into finished products. There are currently a number of fabrics which have been developed for a particular end use that are still awaiting fabrication technology to be implemented.

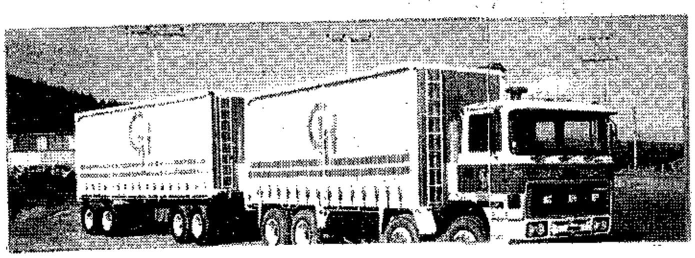
MAXIMUM ACCESS VEHICLES

FLEXISIDER

CURTAINSIDER

These come in various forms the most common being FLEXISIDER and TAUTLINER. Basically a very versatile system with rollers in a track at the top connected to rave hooks at the bottom via an over centre tensioning buckle. End poles in channels at either end of the vehicle with one or a pair of tensioners. A retractable load bearing system it has the advantage of being detachable from the coaming rail if containing maximum width loads. Variations utilizing the same system are Insulsider where a fibre or cellular material is sandwiched between the outer load bearing skin and an inner chafe skin to provide an insulating barrier for chilled goods. The addition of brush seals can improve the thermal capacity to handle a temperature of 0°C plus or minus 2° for a period of 8 hours. Tests have proven that so long as the rigid elements of the body are well insulated air movement is the major factor in heat loss.

INSULSIDER



CHIPSIDER

Where a 2 x 2 double skin or heavy duty 3 x 3 panama fabric is used together with a pole locking system for the discharge end poles.

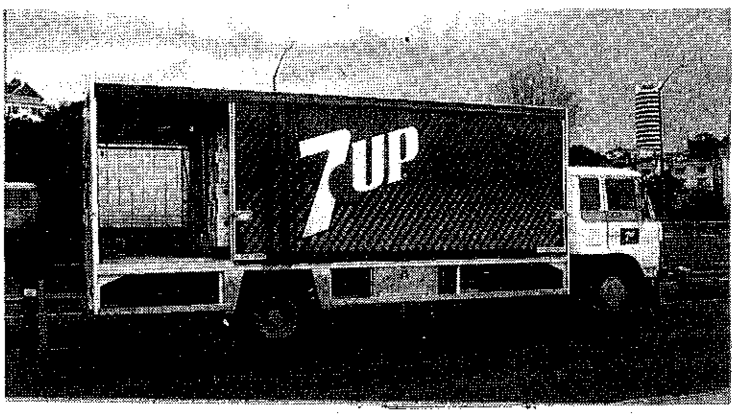
This allows the wood chip or shavings to be tipped giving free flow of material while still being easily retractable for back loading with other products. While a single thickness 2 x 2 curtain can contain the load, stretch from continual pressure is often beyond the maximum width allowance, even with reduced strap spacings. Also the horizontal stress from the end poles has an unacceptably low margin of safety.

LITESIDER

Is a FLEXISIDER built into a demountable body to gain maximum versatility from the truck or trailer. When not in use on the vehicle the LITESIDER can double for yard storage.

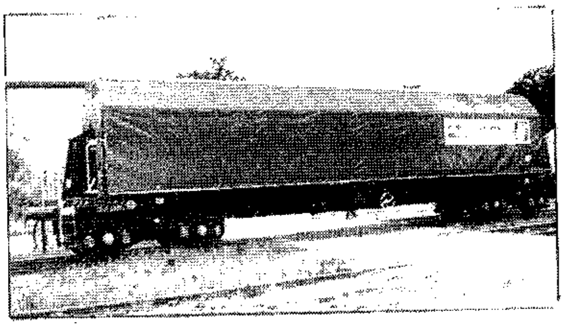
SLIDE-A-SIDE

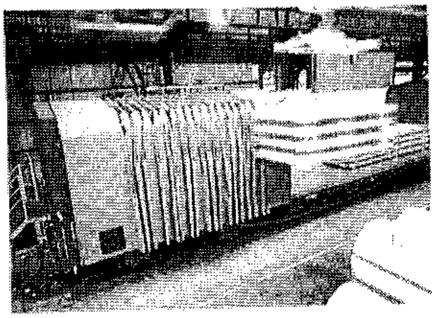
A more recent development in New Zealand is the SLIDE-A-SIDE or LOCALINER system which is captivated top and bottom with an overcentre catch at each end to supply horizontal tension on the curtain. The cantrail rollers are connected vertically to the side coaming glides or hooks with poles or battens. Bias strips built into the curtain or attached to the pole assist the curtain to fold as it is contracted. While it is considerably faster than the buckle and hook curtainsider it has the disadvantage of having to be clear of the load for the curtain to slide. For this reason cargo restraining straps are essential for this system. While for round town delivery there is nothing to match it the buckle and strap curtainsider can come close with the use of double tensioners, front and rear.



A more recent innovation is the Roll-up Curtain developed by Lawrence David in the United Kingdom. Currently rather expensive it can be electrically operated although it does occupy overhead space and is therefore some restriction on working height.

A system devised to accomodate the EUROPEAN ECONOMIC COMMUNITY requirements for a T.I.R. tilt and yet have the advantage of a retractable curtain side is the EUROCURTAIN. Currently only appropriate to Europe with multiple national borders and customs systems.





CONCERTINA RAIL WAGONS

Another development has been the concertina hood for use with overhead loading equipment. This is particularly appropriate for heavy items like coil steel where existing handling facilities are already available. While still largely confined to rail transport it is gaining prpularity with some road hauliers in the United Kingdom.

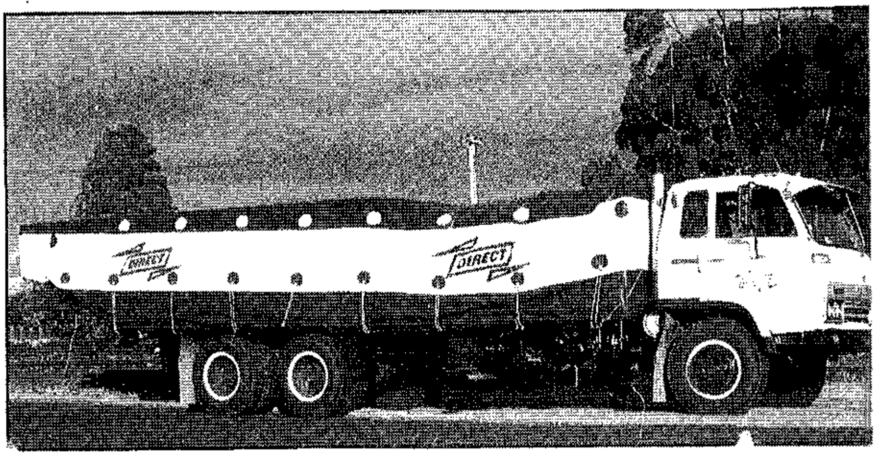
T.I.R. SLIDING CANOPY

Another version of this more commonly used in Europe for overhead loading situations is the sliding canopy. Special folding bias strips are built into the fabric to concertina the canopy while the overhead sections of the framework are dismantled and reassembled after loading. Conventional loading is from the rear.

Just as curtainsiders are being used on containers another system incorporates a sliding tokpto a container similar to a SLIDE-A-SIDE but utilizing a roller at one end for tensioning and retraction of the membrane.

TARPAULINS & CANOPIES

New fabrics have also revolutionized the lowly tarpaulin and canopy with advanced fabrication technology and new fastening and attachment systems. Intensive research saw the development of the onetonne reef lug multiplying previous attachment strength standards by a factor of 2.5.

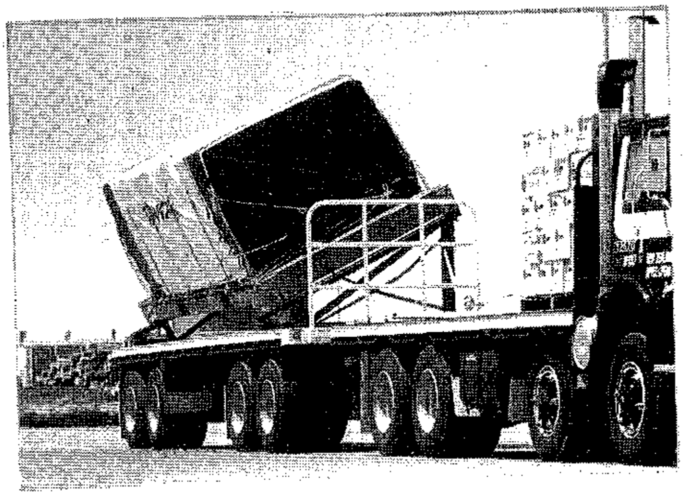


Carbon impregnated polyethlene rope and nylon reef lug bushes increased durability by a factor of 1.5. These gains were achieved by ignoring previous canvas fabrication methods and developing new systems based on coated fabrics and welding technology.

The advent of the load restraint regulations witnessed the development of the load restraint tarpaulin to meet this criteria with further innovations in attachment systems.

This system is now appropriate for all applications as the load bearing webbs have a similar effect as placing load binders over the top of a tarpaulined load. While this is suitable for soft or palletized cargo it is not appropriate for irregular rigid objects. In this case the load should be secured first and the tarpaulin used as a low stressed waterproofing medium only. Preferably with the tarp protected on hard corners with reinforcing pads.

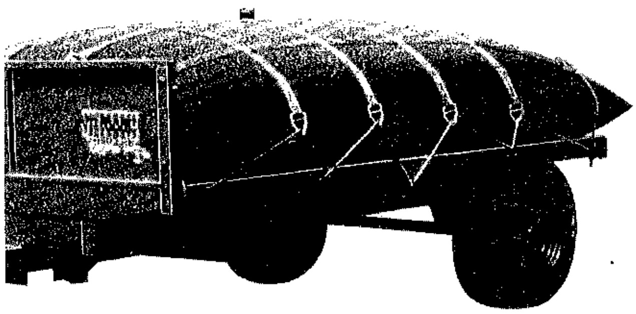
As with most ideas it is the application that counts.



FLEXIBLE REUSABLE CONTAINER SYSTEMS.

Many forms of liquids and flowable solids are transported today in flexible containers. The one trip polyproplene bag is the basic form but the reusable systems like BIG BAG have been know to do 200 round trips sometimes spanning 10 years before replacement is necessary. These containers vary in capacity from 800 kgs to 3 tonnes and occupy minimum storage or transportation space when empty. Variations in diameter, base shape, inlet and outlet chutes or fully opening bottoms allow for a great variety of materials, some like lamb skin pelts or rubber filings, rather unexpected.

Liquids containers come in different forms from wheel type for aviation fuels to tear drop for forest fires. However the predominant type in road transport and storage is the pillow tank. While in the past mainly of rubberized fabrics, P.V.C. and polyurethane coated polyester are generally less expensive, lighter when empty and more easily cleaned and dried. New polymers are being developed to handle the most volatile of liquids which in turn will often mean new fabrication techniques.



ENVIROMENT CONTROL

Often as important as transportation is condition of loading and unloading, either to keep goods dry or at a particular temperature. Inflatable air buffers and load out flaps are used at cool stores to maintain a low temperature enviroment. Inflating buffers seal the dock space adjacent to the vehicle, container or rail wagon. After use the air is extracted to release the seal and retract the buffer allowing the vehicle immediate despatch.

Another system of dock seal uses a P.V.C. coated polyester over expanded foam plastic which a truck backs against to seal the loading space on three sides. However it does not adapt for different height vehicles unless accepting the minimum vehicle height as the aperture size. If used with a multileaf flap fixed above maximum aperture for the top of the loading bay it can adapt for varying heights.

FABRICATION

N Z has always been a country where we have had to make each piece of machinery multi-functional. There are very few commodities that can have specialized machinery dedicated to one product line as our small market quickly gets saturated. This is never more applicable than in the fabrication of flexible P.V.C. products. The efficient fabricator must have available in addition to the odd sewing machine a plethora of welder types and bonding methods.

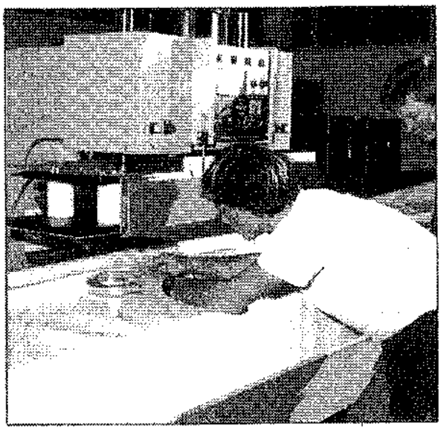
GLUEING

This creates a good bond strength with catalyst type adhesives on P.V.C. but they require 8-24 hours drying and curing times. Contact adhesives can provide a high strength bond but wide seams are required to allow for inconsistencies. Toxic fumes, inflamability and time consuming applications are reasons why adhesives are only used for specialist technical fabrications such as inflatable boats.

WELDING

High frequency radio waves commonly referred to as HF or RF is the most common but for versatility the fabricator requires 'C' press, overhead and mobile types to optimize the various functions. While extremely versatile and accurate it is also rather slow.

Hot wedge welding requires very expensive mobile machinery but it is fast and accurate but is restricted to certain types of seaming and cannot close a circle except as a tube.



Hot air welding is similar in application to hot wedge but mainly used for repair work or non critical seaming as the quality of welding is often suspect.

Ultrasonic welding has been used with varying degrees of success but primarily with light-weight coated fabrics that are difficult or impossible to weld by other means.

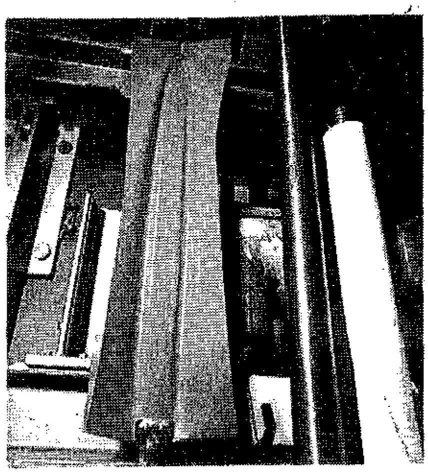
Vibration welding is a new technique common with rigid plastic components undergoing some development with flexible materials but currently restricted to specialized mass produced items.

DESIGN LIFE

So how long should a tarpaulin,curtainsider or other road transport fabric article last? There is no easy answer as it depends largely on use, abuse, care and maintenance. FLEXISIDER and TAUTLINERS are high quality products manufactured from high quality materials that given a modicum of care and maintenance should see approximately ½ million km for line haul work or approximately 6 years of general service. The use part of the lifespan is a function of time and distance between loading and unloading. However the operator who has never looked at the service manual and ignores small cuts and holes will have a shorter life from his curtain. Nevertheless at the point when investment is made in his FLEXISIDER or TAUTLINER the operator should allocate a design life so that he is prepared to replace it at a given distance travelled just as he does with other components in his rig.

If truck tarpaulins are made from good quality spread coated 840D nylon and 1000 denier polyester they should see 6 years of service life. While construction is important the key decision is the choice of the right fabric. Scrim laminates should be avoided for truck tarpaulins as they rely too much on the P.V.C. laminate.

Spread coated nylon and polyesters come in an all up coated weight of between 550 and 650 gms. As the weight is relative to chafe resistance the fabric chosen will depend on size and end use. If predominantly covering wool bales or similar 'soft' goods and in large sizes 550 gsm is fine. On the other



hand if covering timber or similar hard coarse objects 650gsm should be chosen.

As with any product in constant use attention to care and maintenance will greatly enhance the life of the tarpaulin.

TEST METHODS & STANDARDS

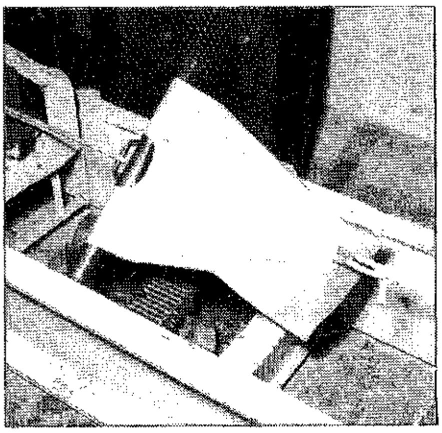
While there are no N.Z. or British standard tests for curtainsiders or tarpaulins they are available for testing the fabric itself. The P.V.C. coated fabric industry has generally adopted the following key test standards:

TENSILE STRENGTH BS 3424 METHOD 6B

This test pulls a 50mm wide piece of fabric between the jaws of the testing machine to breakpoint. The same test is used for seams with the fabric bonded midway between the jaws. Seam strength should always be at least 90% of fabric strength regardless of application, at room temperature.

TEAR STRENGTH BS 3424 TONGUE TEAR METHOD 7B

This, along with adhesion, is the critical test for many applications as it measures the tearing force once a cut has been made in the fabric.

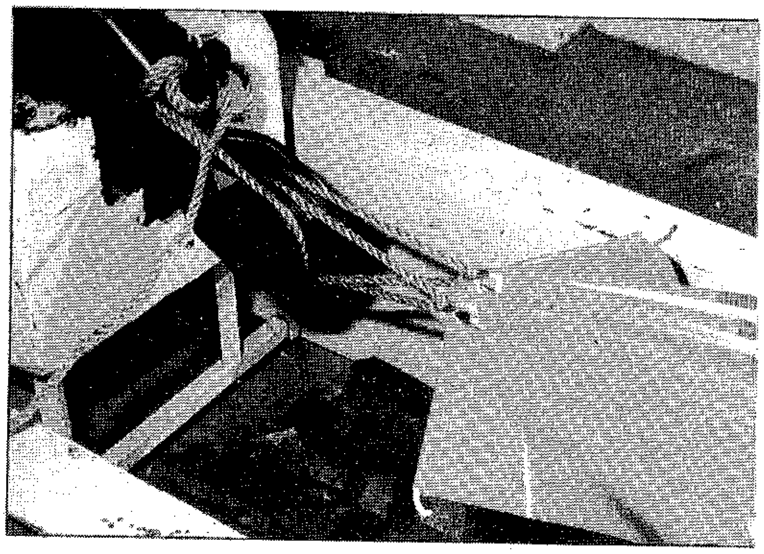


ADHESION BS 3424 METHOD 9B

This test measures the load required to peel the P.V.C. from the base fabric and should never be less than 120N. In some situations where tear strength can be compromised this value can go as high as 200N. Once again the end use criteria should determine the specifications required.

ABRASION ASTM D1044/73 1000 CYCLES AT 250GM

This test measures the resistance to chafe and makes a good comparison with other fabrics.



Tear and adhesion tests should be carried out on every roll of fabric run through the coating plant and be available to fabricators for end use evaluation. Coaters that do not have an efficient system to supply this should be suspect and the fabricator must install in house test facilities or use testing institutions to provide these test results.

Standard test specifications need to be established so that the end use customer can be guaranteed an acceptable standard of quality. These should encompass seam weld test against BS 3424 method 6B - reef lug and edge patch break loads on tarpaulins - curtainsider total assembly test from cantrail track to rave hook. These basics will at least show that the fabricator is prepared to back up his words with facts and figures.

Curtainsider's have begun a whole new era in N.Z. road transport and a great deal of damage can be done to the reputation of the system if poor fabrication practices are allowed to develop. Consequently a code of practise has been promulgated with a view to an eventual N.Z. standard for curtainsider testing.The basis for the code is two years of testing curtain segments and systems by D.S.I.R., J.E.B. Telarc Laboratory, Wakefield Laboratories, Donaghys Industries and N.Z. Railways.

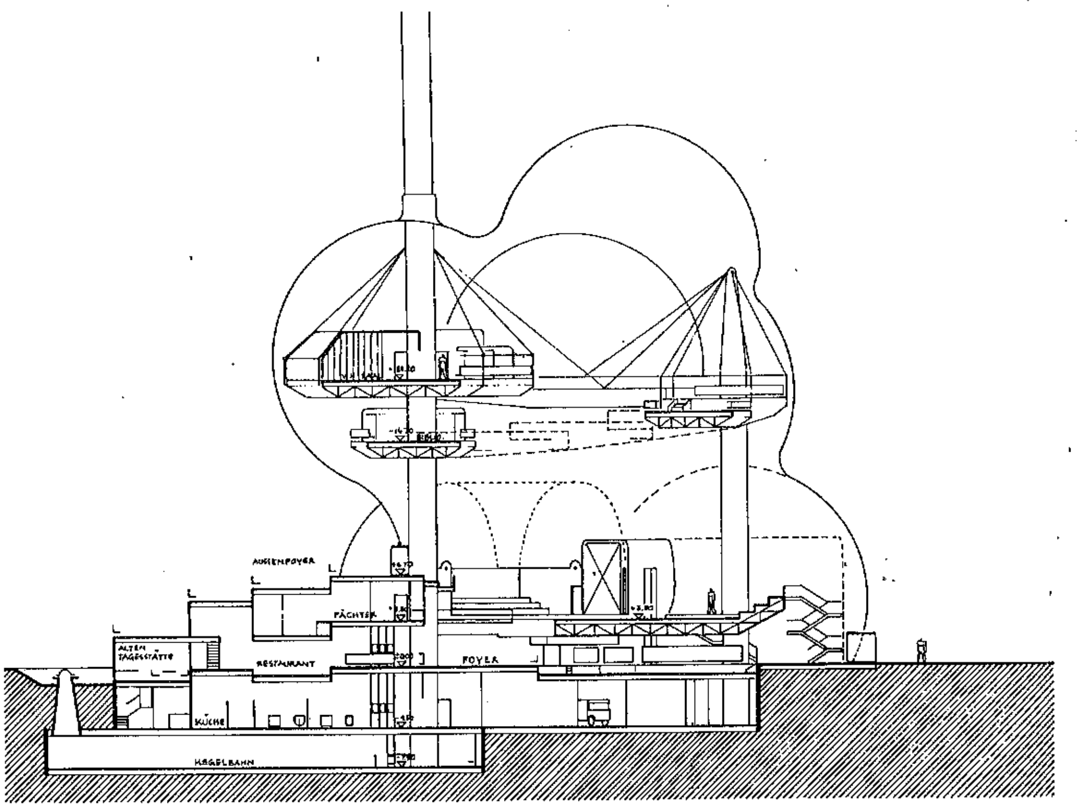
WHAT OF THE FUTURE

The 1990's will be the age of industrial fabrics not just in road transport but in most walks of life. While development in metals and other rigid materials has largely run its course that of plastic coated fabrics has only just begun. Research and development of polymers and polymer alloys is continually producing new products.

The space race alone has produced a whole new generation of fibres and coatings most of which have still yet to find their way into the industrial marketplace. While it is impossible to speculate on new fibre discoveries, new methods of weaving and coating are constantly being developed to produce wider, stronger, lighter more durable fabrics. A major breakthrough would be a method of combining a heavier polyethylene coating to a lightweight strong base fabric. Surface coatings are already in use in tensile structures which greatly enhance resistance to ultra violet light and are so grime resistant that they repel any foreign matter and remain in prime condition for years. However these finishes are not available in sufficient quantities or require such specialized machinery for application that they are too expensive for more mundane industrial applications. The discovery or invention of these materials is often not in itself sufficient as sometimes new machinery and fabrication methods must be developed to convert them into economically viable end products.

The industrial fabric industry encompasses four technologies:
polymers
yarns
fabrics
fabricators

As yet these subjects are not combined in a formal tertiary education. When this is achieved the advances in fabric orientated technology will be even more rapid than it has been in the past. A whole new era is just around the corner.



GLOSSARY OF TERMS

GSM	-	Grams per square metre
P.V.C.	-	Poly Vinyl Chloride
T.I.R.	-	Transport International Routes
I.B.C.	-	Intermediate bulk container
H.F.	-	High Frequency
R.F.	-	Radio Frequency
C.P.E.	-	Chlorinated Poly Ethelene
P.T.F.E.	-	Poly Tetra Fluora Ethelene