FLAAR Reports

November 2014

ARIA brand

Eco-Friendly Material of the Future

PE (Polyethylene)

or Billboards, Banners Signs & Display

By Dr. Nicholas Hellmuth

Introduction

PVC was a great material in the past, but its day is gone. PVC includes chemicals which are not people-friendly. Vinyl for billboards, building wrap, truckside advertising and a hundred other applications is gradually fading away (except that the awful material itself is littering our Earth for too many years into the future).

So each year there are more requests by advertisers, asking their print suppliers to please find a more eco-friendly material. PE as a technical textile is one appropriate material for the year 2012 onward through the future.

PE (depending on how it is engineered and manufactured) can be printable by UV-cured inks and HP latex ink printers.

What is PE?

PE, Polyethylene

In today's world, as we enter 2014, many Fortune 500 brand owners prefer that no PVC be used any more for their advertising. More and more corporations in Europe and North America ask printshops for signage on "non-PVC" substrates.

The same is true for ink: people ask for prints using inks that are not solvent (or at least not full-solvent). Today most printers are no longer buying any printer which uses full-solvent ink. Even printers which use at least mild-solvent (Seiko ColorPainter) or HAPs free inks (again Seiko) are no longer as popular as eco-solvent. So for over a decade eco-solvent ink has been preferred over full-solvent and increasingly favored over mild- or lite-solvent.

At DRUPA 2008 the first popular latex ink was introduced, by HP. By autumn 2011 the HP latex ink was in its second generation for 42" and 60" HP Designjet L26500 and in thirdgeneration printers (and second generation ink) for widths up to 3.2 meters (HP Scitex LX850 and related models).

By DRUPA 2012 there were several more latex-like and resin-based inks by many other manufacturers. Although their solvent contents percents vary, all are less eco-awful than full-solvent. And today in 2014, latex ink is now in its third generation. However latex ink does not print well on all materials.

Now printable substrates are needed to match the less-vile inks

With HP latex inks leading the way in popularity, and with diverse new inks scheduled to be launched every two years, there is an increasing need for eco-friendly substrates to work together with the nicer inks. PE is one of the more user-friendly materials of the recent years.

Aria branded PE technical textile material is now available for Europe, Asia, Australia,Middle East, and Africa. Let's look at the factory, and at the people who stand behind this factory, to learn about Aria brand PE substrate.

Why PE and not PVC?

PVC is an ideal material for billboards, banners, truckside advertising, building wrap and a hundred other uses. PVC works perfectly with most solvent inks. So it is no surprise that PVC is the most commonly used signage material in the world today.

But PE is more ecologically friendly and is accepted around the world as a printable material that has potential to be labeled as green. So for the last several years there has been a rise in interest in PE for billboard materials. The interest in eco-friendly materials has now reached a crescendo. So for a New Year's Resolution, consider switching to PE.

Since PE is a completely non-PVC material you need to handle it as a non-PVC material, hence you would weld with heat, not RF.

- PE is lightweight: so you can mail it, ship it, and handle it so much easier than PVC.
- PE can be recycled.
- PE is chlorine free.
- PE is printable with HP latex ink.
- PE is printable with UV-cured ink.

As with any new material, not all new materials are easy to print on. So for PE, the inks most favorable are LED-UV cured, and also some mercury-arc UV-cured printers as well. "UV-cured" inks come in many flavors and some work better than others.

Why PE and not PP?

Since both PE and PP are olefins most factories that can handle PE can also manufacture PP. So the YEONG JEOU factory can handle both PE and PP, but presently they produce exclusively PE. You can apply corona discharge treatment both to PP and to PE. For some other materials you might apply plasma (flame treatment).

So far, as a technical textile, PE is much more common. PP is common as a thin wrap (in the food market), so not often for billboard size, nor for vehicle wraps.

How to know which substrate manufacturer to focus on?

At every trade show there are scores of booths that offer signage substrates. How in the world can you know which substrate is capably manufactured by an experienced company, which is cheap junk cranked out on obsolete equipment, and which is such low price that the chemical components may be a bit iffy?

So, during 2010 onward the FLAAR Reports has been adding inspections of substrates factories and printable materials to our continuing evaluation of UV-curable printer, textile printer, and ink factories.

To research the first edition of this FLAAR Report I flew about 20,000 km round trip and spent a week inside two factory buildings of one of the more experienced PE technical textile production companies in Asia, Yeong Jeou.

During 2011 YJ continued testing their PE materials for inks of diverse chemistries. Also during 2011 the manufacturer tested surface treatments. Now, after plenty of experience, they are coating and corona treating the surface. In this manner the surface will better accept the UV-cured ink.

By winter 2011 YJ was ready for FLAAR to visit the factory to inspect all the improvements, so I spent several days. Fortunately they are in southern China (near Hong Kong), so the weather was pleasant. Now we are issuing our second FLAAR discussion of the manufacturing workflow for PE so that attendees at trade shows in 2015 will have background.


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During my visit in late December 2011 I noticed lots of new equipment. The larger item of equipment is the control for the start of the tape manufacturing.

Here is another addition; I will show the various units in different positions, as you don't often see this level of sophistication in a factory in China.

The monitor shows the results of the scan, so the operators and engineers can always know the thickness of the substrate at any point in time.

Row after row of weaving stations are at work 24-hours a day in the Yeong Jeou factories. This photograph shows only one side of one floor of one factory building! There is another row of weaving machines on this same floor.

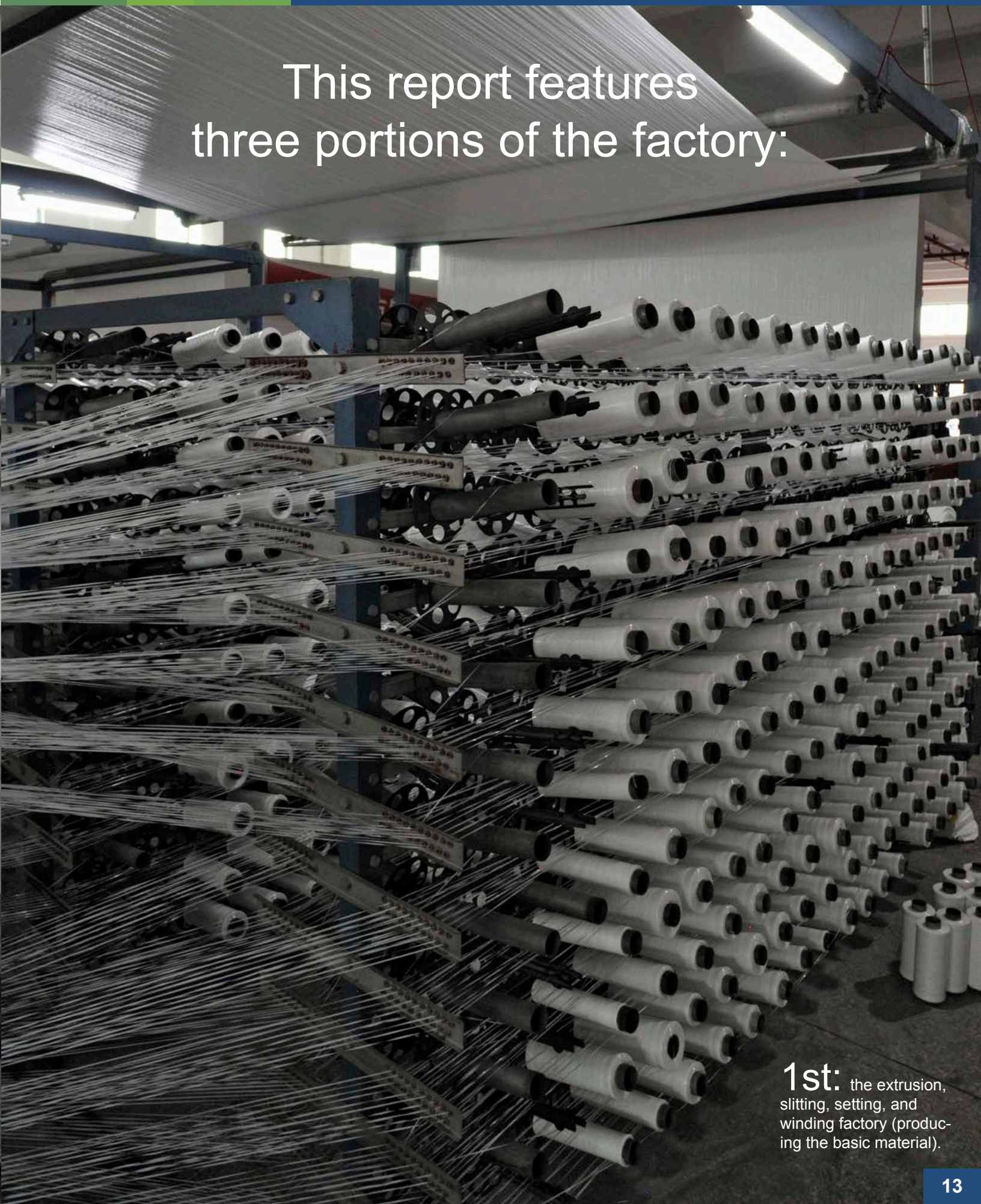
In the foreground you can see that this factory is in full production; plus in the middle background you can see master rolls stacked up. So clearly this is no small operation and clearly they already have a growing market for their PE technical textiles.

Here you can see how many weaving machines exist (this row is for 3 meter PE materials). There are also the dozen additional 6 meter weaving machines on the other side of thesame factory.

Beginning already a decade ago, FLAAR gradually began to visit paper mills, initially in Germany. Now in 2010 we are moving into becoming leaders in evaluation of substrates for signage and display graphics.

We do our FLAAR style of evaluation by going, in person, to actually study selected manufacturers, in-situ, around the world. Dr Nicholas Hellmuth flies over 200,000 km a year, often literally completely around the world within a three week period.

This FLAAR Report will assist the printshop owner, manager, printer operator, distributor and reseller to better understand what is inside a technical textile; and how to understand which manufacturer can produce PE with experience for years.



This report features three portions of the factory:

1st: the extrusion, slitting, setting, and winding factory (producing the basic material).

2nd: weaving.

3rd: laminating and corona treatment.

Creating the PE material

First the resin (HDPE or LDPE) is loaded into a hopper. It is then heated (melted) and then passed through an extruder. Immediately as it leaves the extruder the material is under water in a bath to cool down. Then the material goes up and over a room sized station to be slit into individual threads.

This photograph shows one of two complete lines; in other words, this is not a small factory; they have multiple production lines because they produce many kinds of woven PE material: different colors, different consistencies: based on what is optimal for the client.

The sacks you see here are HDPE (High Density Polyethylene).

Now the material comes down from the mixing hopper into the heating unit (the long horizontal blue section). Then at the left end the melted material is extruded into a sheet, cooled in a water bath, and rises up (at far left) to be slit into threads (in engineering jargon, into tape).

Since the factory is presently making outdoor tent, indoor tentlike playhouses for children, and outdoor tarps to cover parking spaces, they also make black material for internal parts of some of these structures.

Here you can see the freshly extruded black material being slit (with razor-like blades).

The melted PE material passes behind this control section into the extruder (at the left).

We just saw the start of the black material (for tents and comparable uses.) Now let us now follow the white HDPE material, as this manufacturing line can be used to obtain printable signage material. The process starts with the raw material: either HDPE resin or LDPE resin, in dry form.

The extrusion unit is across the right size. The extruded material comes out of the cooling bath and up and over to be slit on the other side (far left, shown in the next section).

Here the freshly extruded material comes up out of the water cooling bath. It will then go up, around, and over to be cut with “razor blades” that we see in the next section.

Creating the PE threads:

slitting the freshly extruded material

After extrusion (at left behind what you see here), the material is put under traction to prepare it for slitting into individual segments (at top right).

Here is the start of each “thread;” actually they are rectangular in cross-section, not round. They are rectangular (“tape”) to provide a smoother surface and they are rectangular because they are slit. The extruded sheet is cut by hundreds of knives. This is the start of the life history of the woven aspect of your banner or billboard material.

A new technology added during 2011 is the sophisticated scanner system to keep track of precise material dimensions before slitting.

Here is more of the new scanner system.

Now the material passes out of the slitting area and moves into the sequence of machines that will fashion the capabilities of the threads.

Improving the capabilities of the PE threads

Here is an overview of the different stations after the material is slit in the traction station (at the left).

Stretching is the first station after slitting which is after traction after extrusion.

Then when the material leaves the stretching station (at the right), it passes the first set of shaping rollers.

This shows the shaping rollers between the stretching station (lid up, to the right) and the setting oven (to the left, lid down).

These are the shaping rollers, in a station after the setting oven. In one photograph, in the background you can see the size of the factory. And this is only one floor; I visited four of the floors. And this is only one building (out of three). Plus there are earlier factories in Malaysia, before they moved to China. Altogether this company has plenty of years experience working with PE woven technical textiles.

This is the setting oven (the oven with the lid closed). The purpose of this oven is to remove any elasticity. The result is a stable material, as useful in tents, tarps and especially helpful for signage substrates.

Here is another view of the fixing oven (last of the ovens before winding stations, at the left).

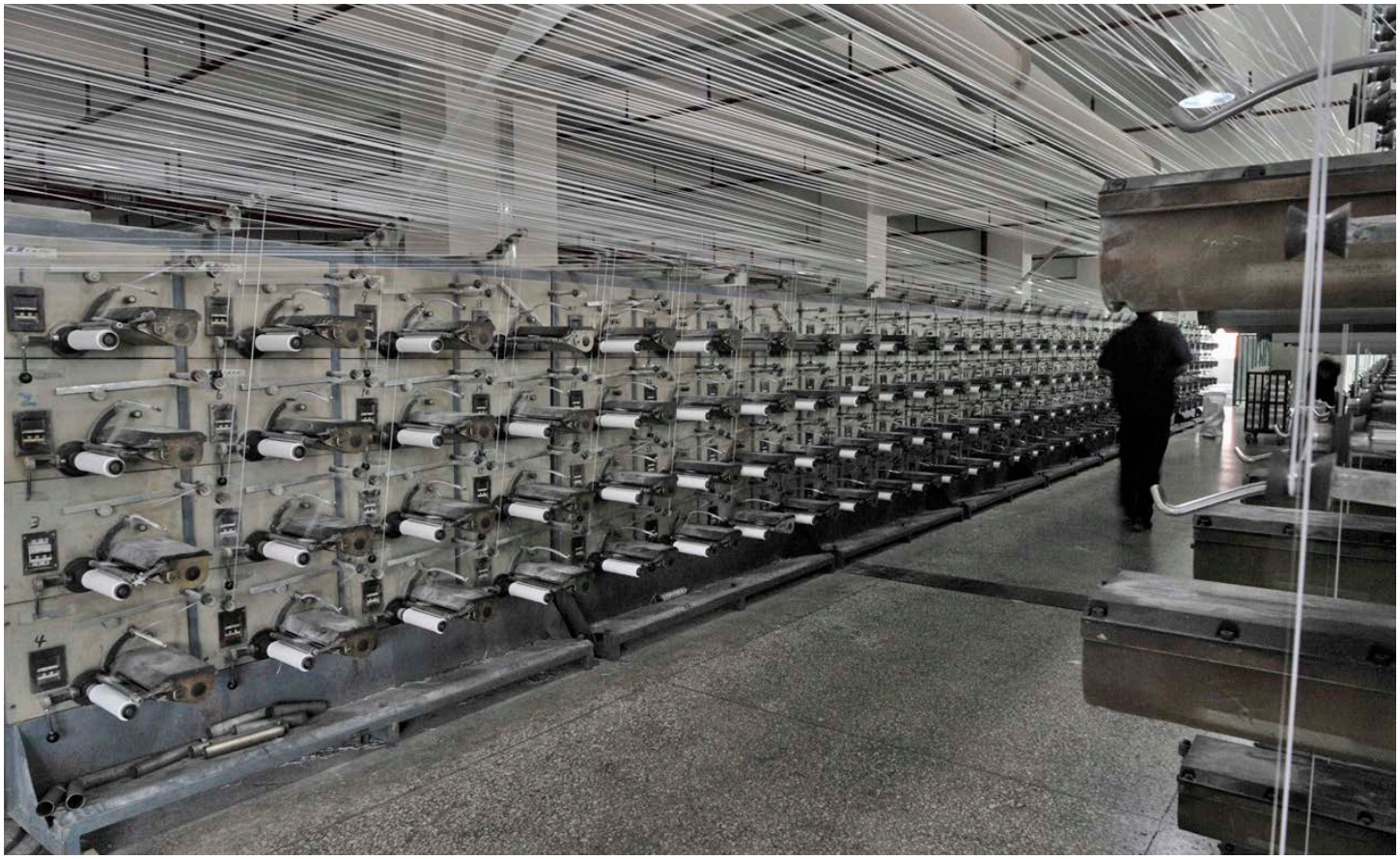
Now we can review the entire manufacturing line, from the raw resin (at far right) through extrusion, stretching, setting, and now into the winding (far left; see next section for photo essay on the winding).

The fixing oven is the last of three or four ovens in a line. From the fixing oven the PE goes into the winding stations (at the right).

Here you can see the middle third of the sequence of work stations. The setting oven is the large device. At the far left you can see the start of the winding station.

Now the thread is moving off the final shaping roller station which was after fixing oven, into the winding station (which is behind me as I take this photograph).

Winding the PE threads onto the bobbins



This is inside the winding area. Each bobbin winds one thread that was slit after extrusion. This machine is in full operation while I am inside, which is why the threads are moving and hence not in sharp focus

Inside the winding area.

Testing the thread

The thread has to be a quality level that is required for the application.

Weaving

The production of the basic material is in one part of the factory. All the weaving is on the ground floor, so now we move to the ground floor to see the almost endless production of the woven fabric.

I spent days inside the factory to understand the rocess so I could provide an evaluation for the many distributors and thousands of print shop owners who seek information on the FLAAR web sites. I brought special ultra-wide angle lenses (15mm, which produces 110 degree angle of view). The purpose is because at ISA, SGIA, FESPA, VISCOM, there are so many dozens of manufacturers that you can't understand which are sophisticated, which are just starting, which are distributors, which are real manufacturers. Thus it is essential to visit the company headquarters and see the factory production lines.

Bobbins with PE thread carefully loaded as part of the weaving process.

Here I have arranged the wide-angle view to show the weaving process, from the bobbins along both sides to the tower of the 6-meter circumference resulted oval material.

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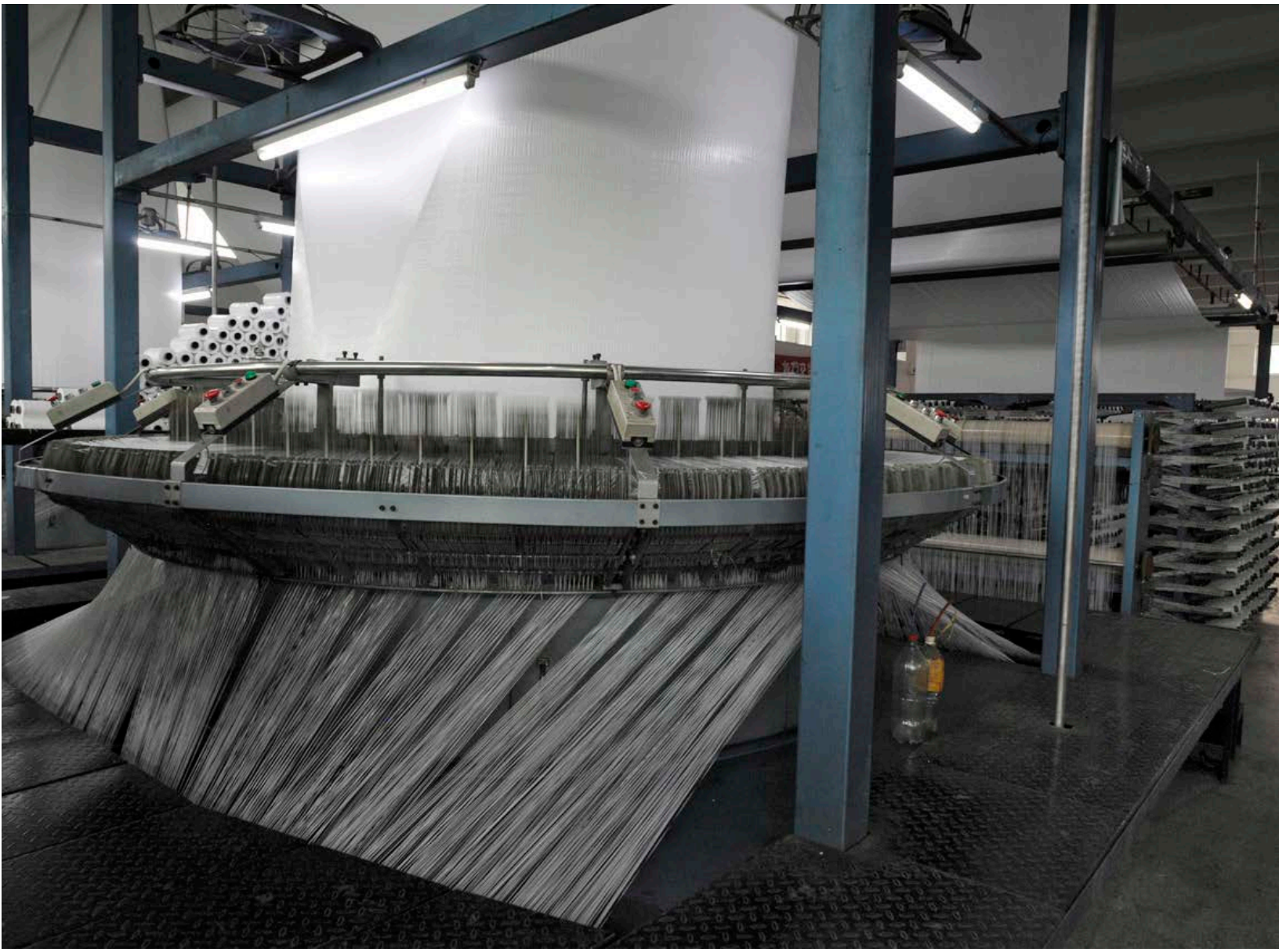
Here you see the workflow leading into the circular weaving area (off camera to far left). Then the material runs over the top of everything and then down to the master roll (at far back, behind the bobbins). So everything starts, and stops, at the far back.

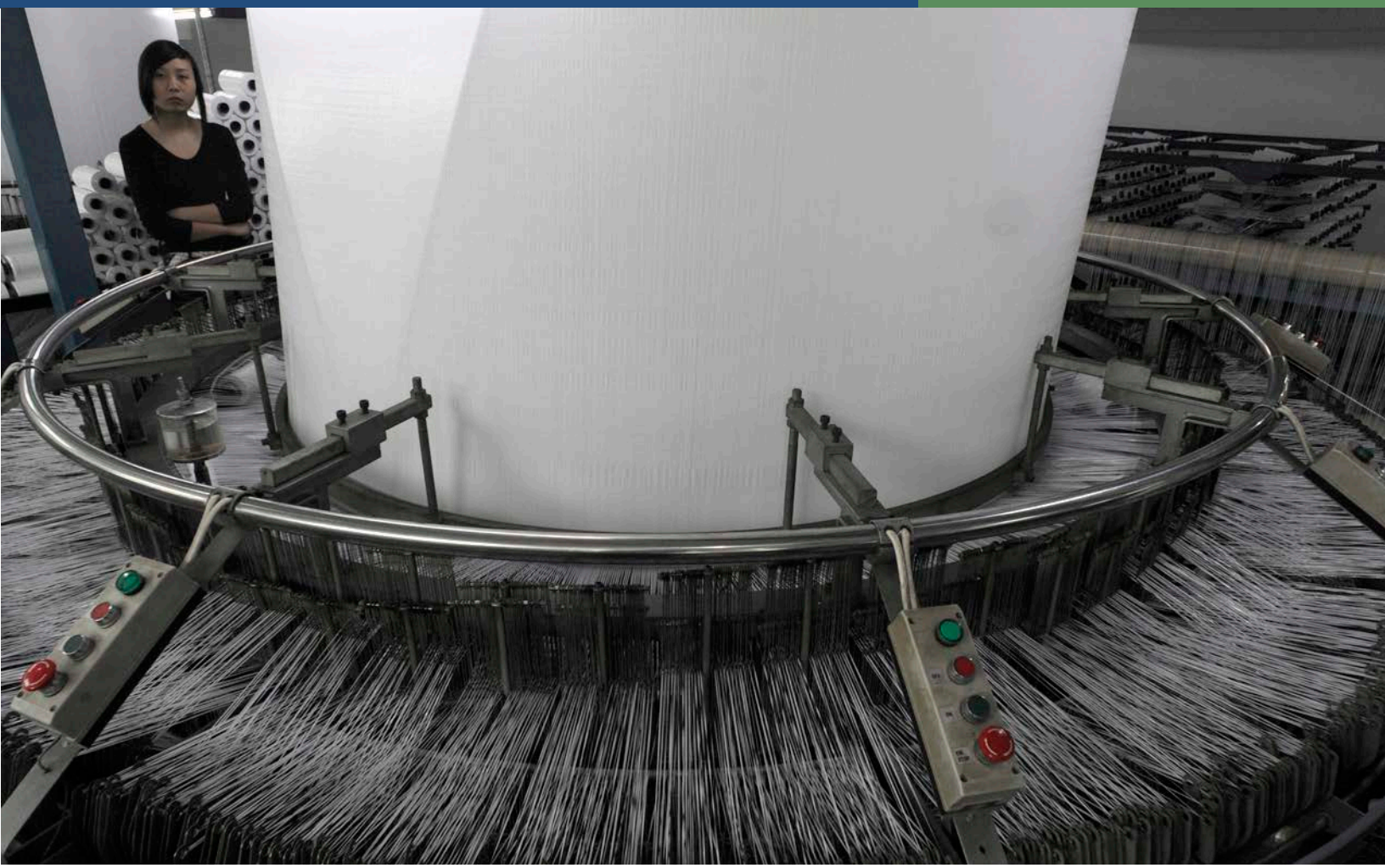
This is a great angle (and it sure helped to have a super-wide angle lens). It is actually a fish-eye but is non-distorting. This is typical of FLAAR to have equipment of this sophistication for our evaluation visits

The material goes from the bobbins into the weaving machine and then next to the circular weaving area. Notice that there is not just one machine, or two, or three: there are a dozen and each of these products 6-meter+ material!



The weaving is very clever; the circumference is 6 meters (I use the term 6 meters but in reality it is a bit more; but it is quicker to just write “6 meters”). You need the bit extra so when it is trimmed down it will be a full 6 meters wide. For solvent and UV and latex printable substrates the widths will be 5 meters and 3.2 meters since those are the norms for billboards, banners, and signage.

Here you see the 6-meter oval rise out of the weaving system. Very clever.



Weaving yarn in action.

I enjoy seeing engineering capability and knowledge, based on years of experience, dedicated to producing a useful product. Here I am inside the weaving system.

Testing the woven material

This is tension strength testing of the material that will be laminated and coated.

Here you can see the size of the laminating equipment. Remember, this is for 6-meter width. This is generally cut to a 5-meter roll, and of course also available in 3.2 meter and other widths.

The laminating material is LDPE. The woven material that is being coated is HDPE. Here is an overview of the resin loading area. You put the resin into the hopper; it goes up the diagonal tube and is heated and distributed at the top.

Laminating one or both sides

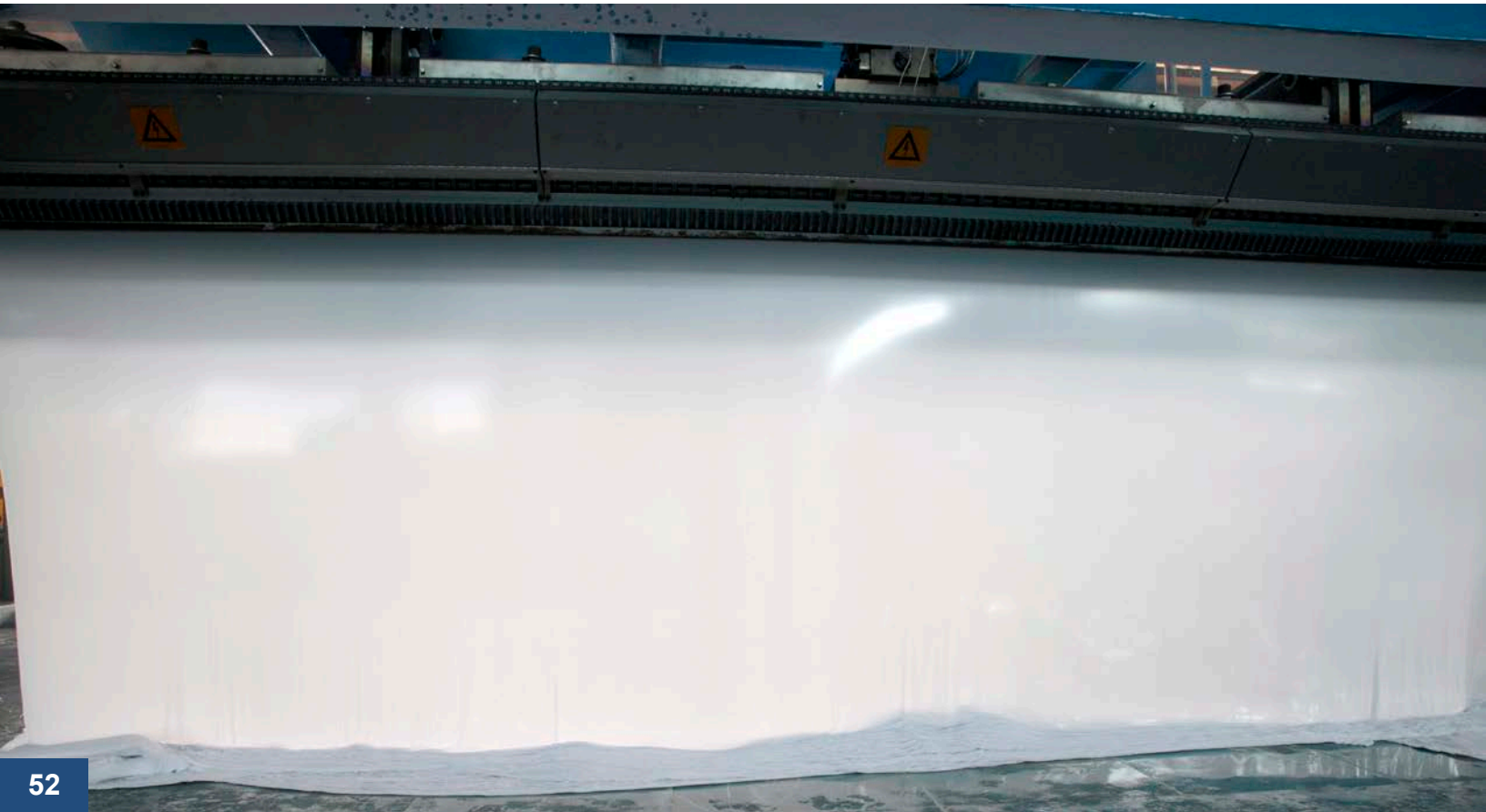
Here are the pellets of LDPE resin. HDPE is also used; depends on what kind of PE material and surface and enduse is desired. Yeong Jeou can do both the client can request either LDPE or HDPE.

Here you can see the size of the laminating equipment. Remember, this is for 6-meter width. This is generally cut to a 5-meter roll, and of course also available in 3.2 meter and other widths.

This photograph reminds you that you are really up close and beginning to understand the substrates that are already replacing PVC. My being able to see the entire process is what enables me to state clearly that this company has experience making PE (they have two generations of family which means several decades!).

Not many companies in China can coat 6-meter widths.

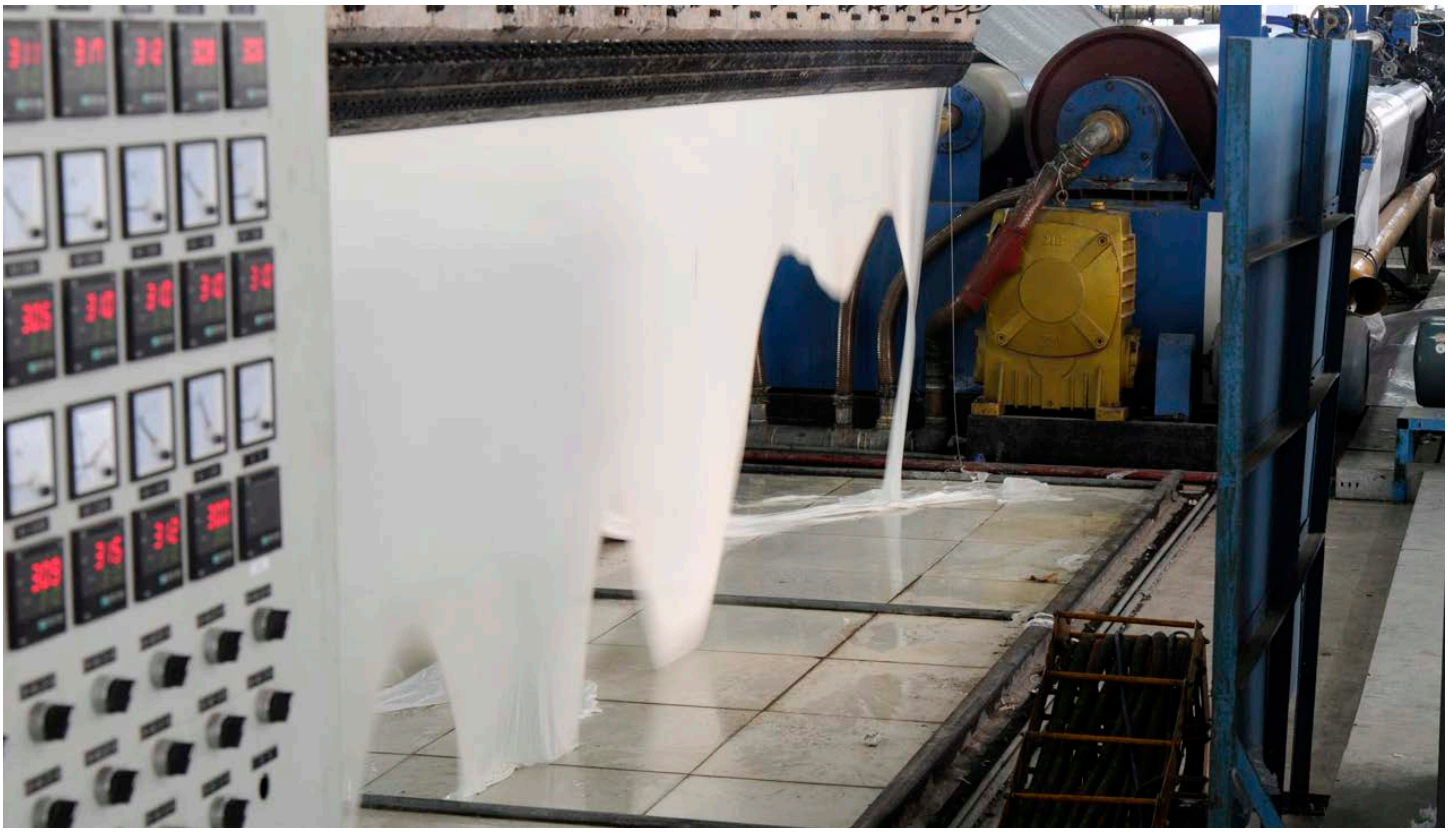
Bringing autodie up to temperature.



Coating the other side (with white)

Now that the clear-coat is accomplished, now they are preparing the white (printable) surface layer. So they clear the machine of the clear material and add the white material. Now that the clear-coat is accomplished, now they are preparing the white (printable) surface layer. So they clear the machine of the clear material and add the white material.

Now the white layer is ready.



The best way for me to document how thick the layer is to have it opened up for the purpose of this photograph. Keep in mind that during the actual coating, there will be woven PE material being laminated with this material. The purpose of this photography was to help potential distributors, print shop owners, managers, and printer operators see how thick the printable layer material really is.

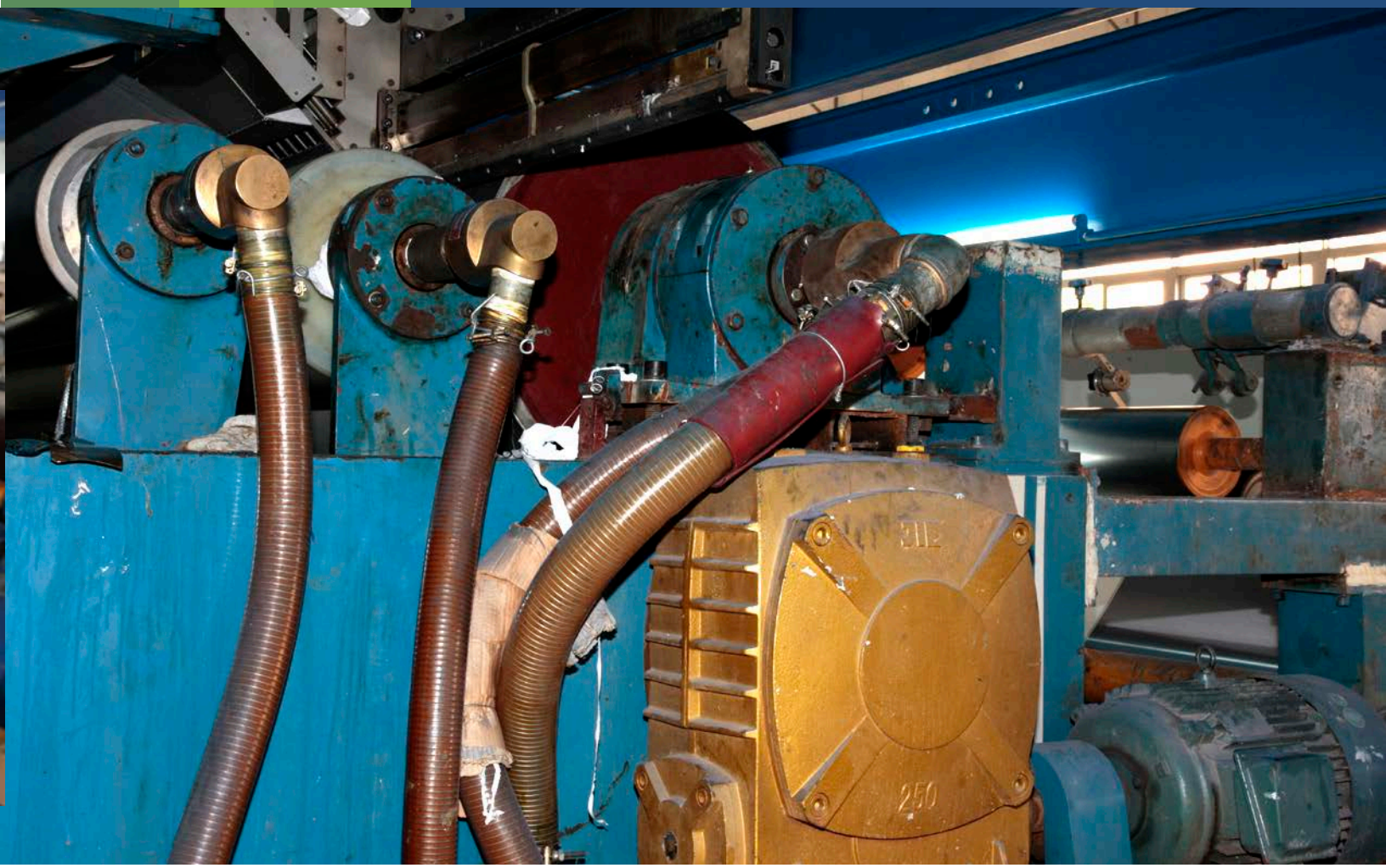
Here the white layer is fully prepared for coating.

Laminating equipment (also called coating equipment)

Now the 6-meter roll is transferred to the laminating equipment. The factory obviously has all the heavy duty listing and transporting equipment as you would find in a factory elsewhere in the world.

Laminating is a process that Yeung Jeou is achieving experience accomplishing successfully.

Covering six-meter wide woven PE with PE coating.



The autodie machine is rather heavy-duty. This reminds me of the solid iron machines of a serious factory. Notice that we do not Photoshop the image; this is a real factory that operates 24-7, so there is oil drip and cleaning rags in position. If everything were spotlessly clean, I would be unsure whether it was really a functional factory!

Here is the autodie machine section of the factory. My lens shade was screwed on crooked (I had jet lag the first day). As you can see,this is a solid-machine.

Here I am overlooking from the top of the autodie machine looking towards the coating and corona treatment sector. When I visit a factory, anywhere in the world, naturally I like to check and see and learn everything. This is precisely the unique part of a FLAAR Report.

Different angle, looking down; you can see the 6-meter wide roll feeding through the system.

One of many advantages of being FLAAR is that I have the curiosity to get inside the machines.

With each phase of coating, the first step is to bring the coating material up to the correct temperature in the autodie machine. Here you are looking at 6 meters width and about two meters flow of the liquid. Notice that it is now ready to move the entire autodie transfer module, by rail, over the top of the PE feeding roller system.

Here is the coating material at optimum temperature; the entire machine will now roll itself 20 meters to fit precisely on top of where the 6-meter rolls are fed through to be coated.

Here is the coating material.

The orange box is out of focus because it is moving across the entire surface, back and forth. This is the sophisticated new scanning system. This was not present when I was first at the factory the previous year; now it has been added. It allows the engineers to keep track of the thickness of the material.

Here you can see the tough woven PE technical textile for about three meters; this material has to be tough enough for a trampoline (which is the previous main business of Yeong Jeou). Their PE has used in tents, car ports, and comparable structures, so has to hold up. But for printing you will prefer the new coated form. That's the beauty of this photograph: you can see the coating layer flowing over the tough substrate.

Here you see that the factory is long-ago experienced with 6-meter widths. This is because for car park roofs and architectural PE technical textile you really need these widths.

Corona discharge treatment

You can find everything about corona discharge treatment via Google. So the process is no secret.

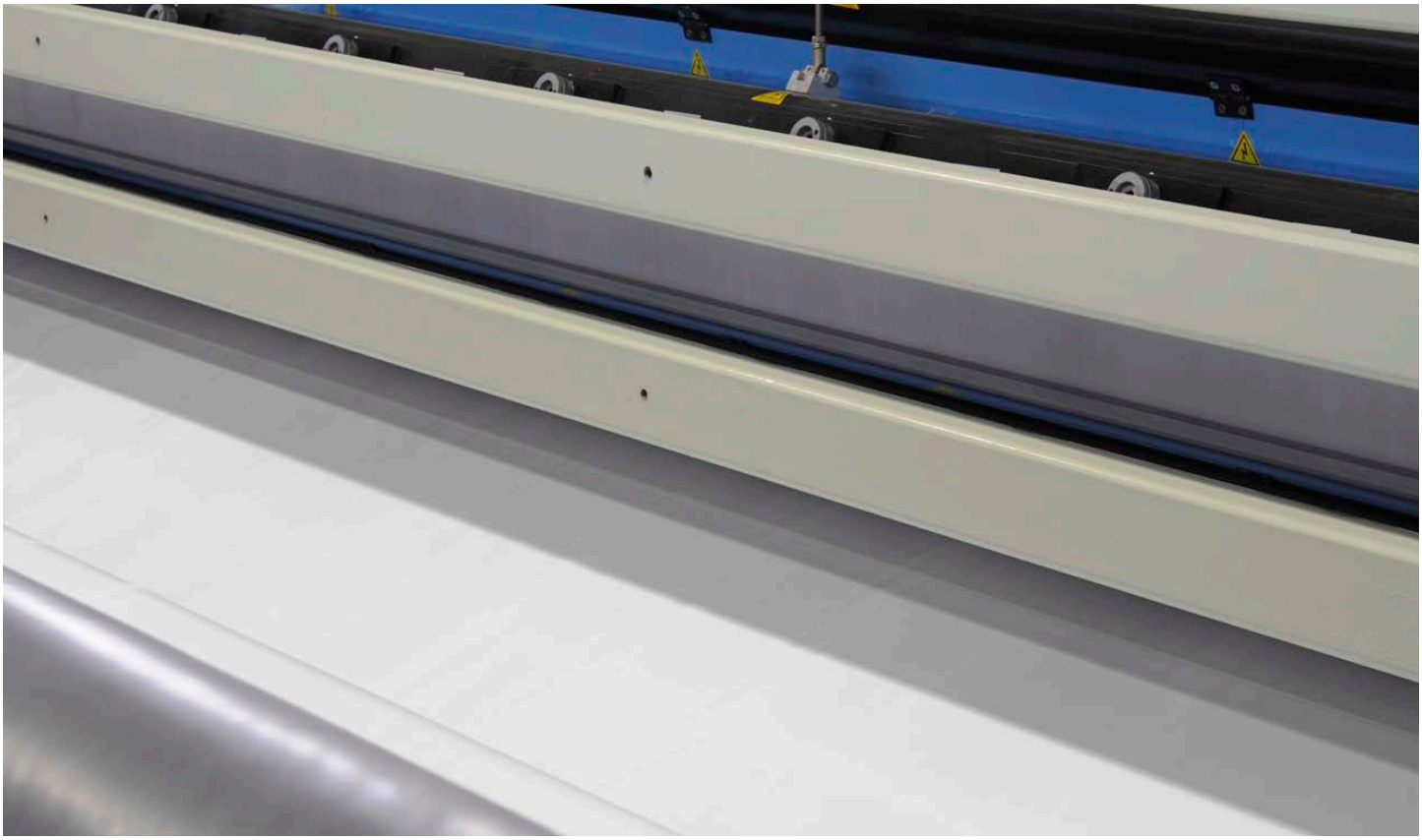
Here you can look down inside the corona discharge area. But you have to be here in-person to appreciate this. Rather obviously the actual treatment area is deep inside: can't get inside with a camera!

Again, notice the sophistication of the equipment used by Yeong Jeou .

Everything is controlled with appropriate instrumentation.

Now the 6-meter roll is transferred from the laminating equipment to the corona treatment machines. The factory obviouslyhas all the heavy duty listing and transporting equipment as you would find in a factory elsewhere in the world.

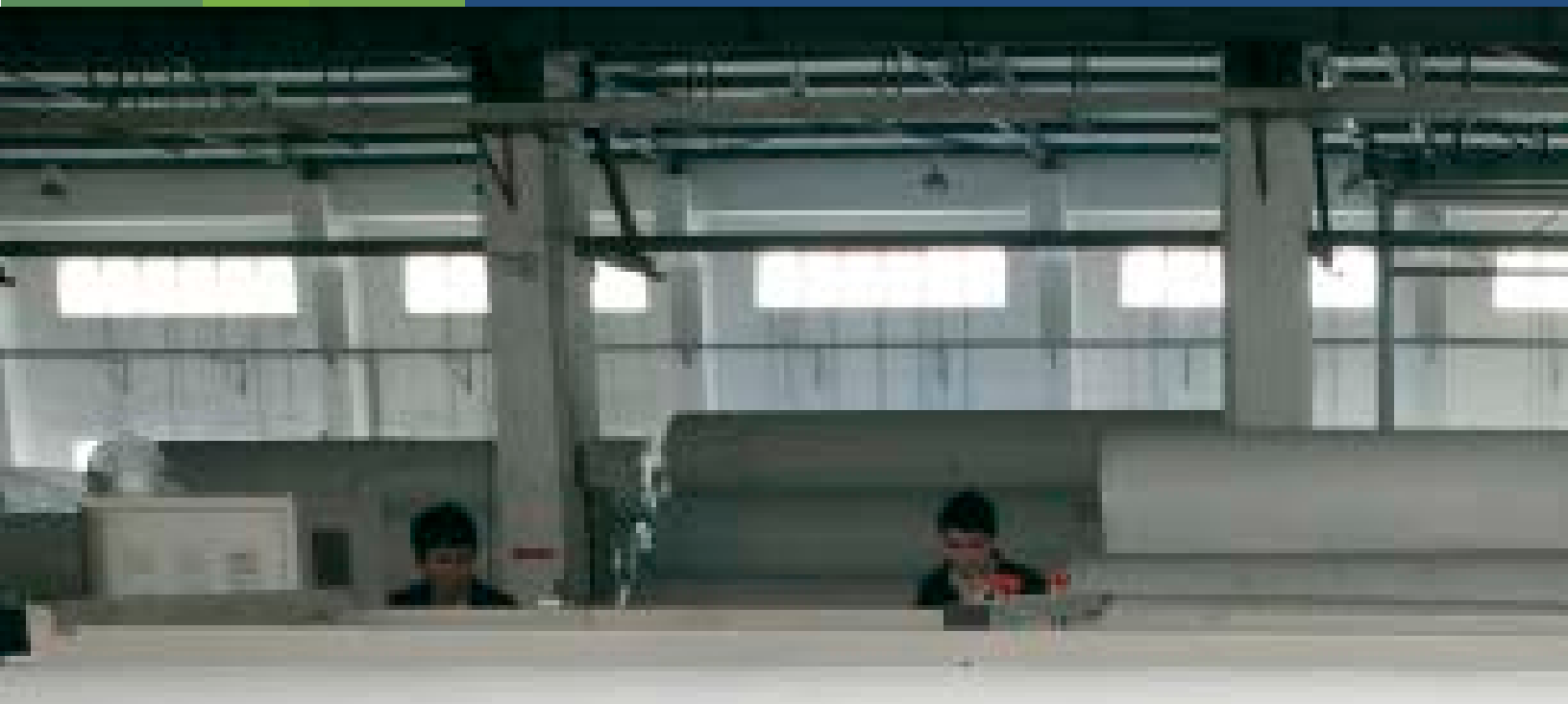
Here is the 6-meter roll being loaded.



Here is the 6-meter material coming out of the corona treatment.

The advantage of a distributor in US and/or Europe of interacting with Yeong Jeou is because Yeong Jeou has experience with corona treating in general and corona treatment of 6meter material in particular.

Corona treatment provides appropriate surface tension (measured in dyne). As you notice, this is new equipment. Yeong Jeou has fresh experience with corona treatment.



Here you can see the finished material after the corona treatment.

One reason that PE has not been used in earlier years was printability with solvent ink

Studies has documented that the surface of PE is not ideal for solvent inks. So it is only now, that Yeong Jeou has new coating line that this remarkable material can be used for wide-format and grand format inkjet printing with the more capable brands of UV-cured ink.

Next Step:
Documenting whether or not HP latex ink can handle PE

A major plus of HP latex ink is that HP lists pertinent media that work acceptably in the curing heat of latex ink printers. I consider the HP courtesy of listing alternative media as a significant plus of their company policy. Yes, naturally HP seeks their own substrates, but it helps encourage a printshop to consider buying an HP latex ink printer if there is a nice long list of other alternative substrates.

So one of my follow-up steps during 2015 will be to find an opportunity for a site-visit case study of Aria being tested with HP latex ink. For HP latex ink they use a material over 170 gram. The chemistry of HP latex ink has been improved about every two years. It will be interesting to see how the next generation of ink is improved.

Summary

Weaving at Yeong Jeou is 24-hours a day.

The tent, tarp, car canopies, gazebos, kids cottages and associated products for PE woven material is high enough to require significant production. Here you see mother rolls. Yeong Jeou sells to WalMart and other big-name brands in the US and around the world.

In each part of the factory you witness significant production capacity. Once you visit this factory (or once you see the photographs of this FLAAR Report) you can understand that this company is not afraid to let outsiders in to see their capability, their experience, to meet their engineers.

As you note, this is not an insignificant-sized factory.

This photo essay helps both the enduser (print shop owner, manager and printer operator) as well as distributor and reseller, to understand the difference between the dozens and dozens and dozens of manufacturers whose booths fill ISA and FESPA (and all the Chinese trade shows).

Here is a view of one of the main buildings, seen from the adjacent lamination and corona treatment building.

Now, the next time you see the name Yeong Jeou, you will know the experience, expertise, and factory capacity that stands behind this corporate name.

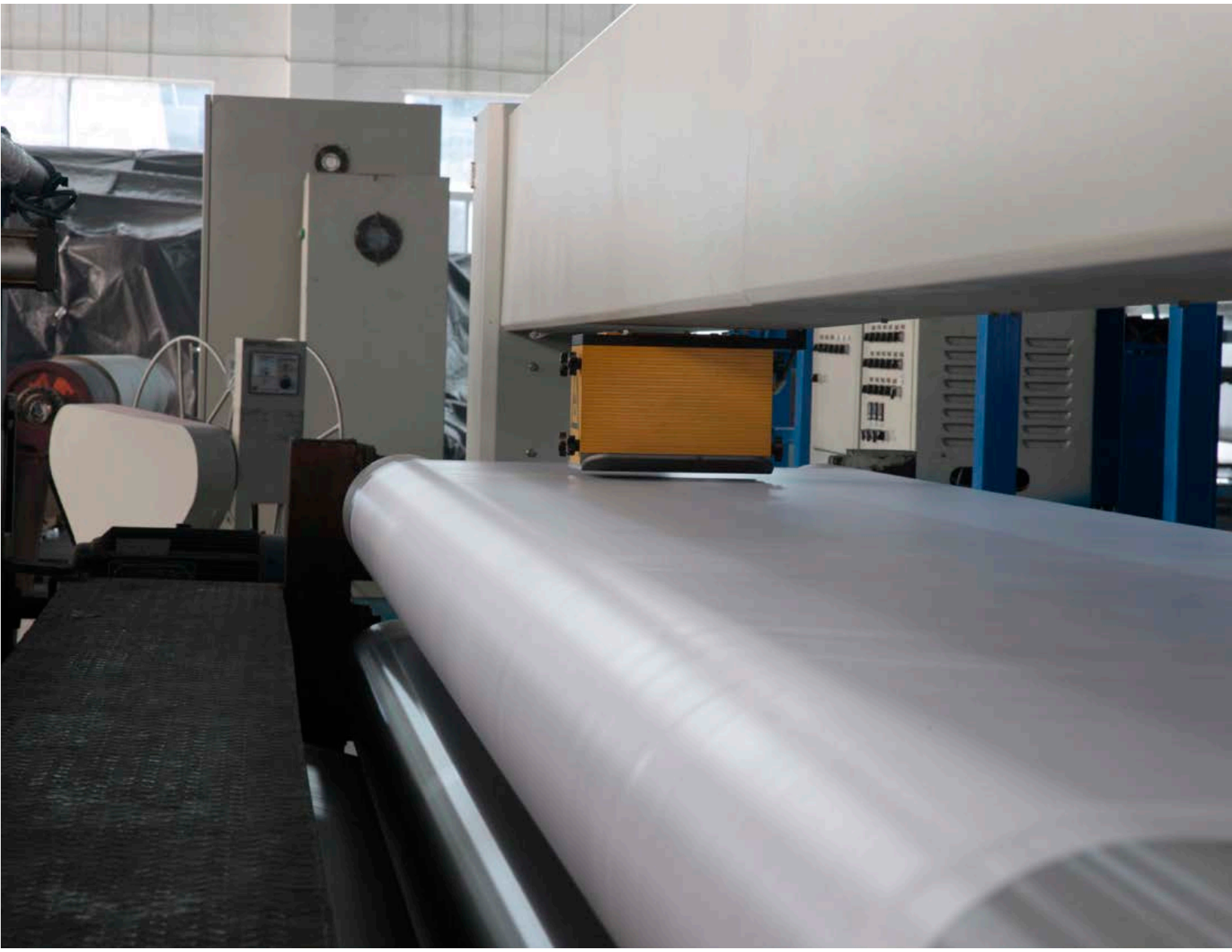
Weave at far left; then up, over, and down before being rolled up as master roll (6.2 meters seamless).

Now, the next time you see the name Yeong Jeou, you will know the experience, expertise, and factory capacity that stands behind this corporate name.

This is another good summary photograph for the capability of this company with weaving 6-meter+ size.

This is not a cheap low-bid company. They have international consultants and executives; they have international partners with experience. Yeong Jeou already sells PE technical textile material (as tents, trampolines, and children's play houses) to Wal-Mart and a dozen giant international outlets. Yeong Jeou already has an office with staff in USA. YJ exhibits at FESPA Digital.

Plus we at FLAAR have been providing contacts to Yeong Jeou with key potential partners. So now in 2012 YJ has access to multi-national chemical companies (for the coating) and access to other partners for knowledge of what is essential for success.



Plus, one of the main partners of YJ, Orson Lin, has abundant experience in Malaysia and Taiwan (and an additional asset is that he speaks English; a major tool for internationalization of a manufacturer).

The facility of YJ has added sophistication in the sense of monitors so they can observe pertinent locations on the complex machines from a single vantage point.

In closing, as an example of the difference between YJ and low-bid: YJ uses steel instead of easily-breakable cheap wooden pallets. Orson Lin stated clearly, “our goal is not to produce a low bid product, but we prefer to engineer and manufacture a functional PE technical textile that is price effective.”

Another fact to be reiterated is that this system at YJ produces printable PE technical textile at 6 meter width! Most other factories can't produce at even 5 meter widths.

Here is more documentation, while we are in the stage summarizing the two visits, here are a few master rolls. As you can see, Yeong Jeou has plenty of experience producing PE technical textiles.

FLAAR Reports are unique in the industry

The FLAAR Reports provides you with eye-witness access

- That you can't get at any trade show
- That you will NOT see in any trade magazine

FLAAR suggests (indeed recommends) that you attend trade shows (ISA, SGIA, NBM, GoA in USA and FESPA, VISCOM in Western Europe; T-Rex and Reklama Moscow in Easern Europe).

We also realize that trade magazines offer material that we at FLAAR do not attempt to duplicate (like immediate notices of new products). Since trade magazines already publish these PR releases, we see no need to crank out the same PR that is already everywhere else). So at FLAAR we provide additional and alternative information.

Instead of fluff-and-puff, I prefer to provide in-person inspection of manufacturing facilities, and in-person interviews with the company owners and managers. No matter how good a product is, if the owners and managers are shysters, you should be wary. Yeong Jeou has been in business for years and sells to Fortune 500 brand-name companies in the US.

As an example of their engineering experience, here is my view inside the autodie (coating/laminating) machine.

Glossary

There are hundreds of books on weaving and dozens of industry glossaries, so no need to repeat all that here. But I will mention a few words that may help the general reader.

Bobbin is a cylinder-shaped spindle, used for winding thread or yarn or comparable materials (Wikipedia).

Creel (weaving creel) is the rack which holds the bobbins which hold the thread or tape or material that you will use in weaving or knitting.

Knitting compared with weaving (for technical textiles).

Master roll means a full-sized roll that comes directly off the assembly line. These are available for converters (distributors).

Scrim, the woven material before it is laminated (coated) in the factory.

Tape is the flat yarn for weaving; used to make the final product. Making tape is the first stage.

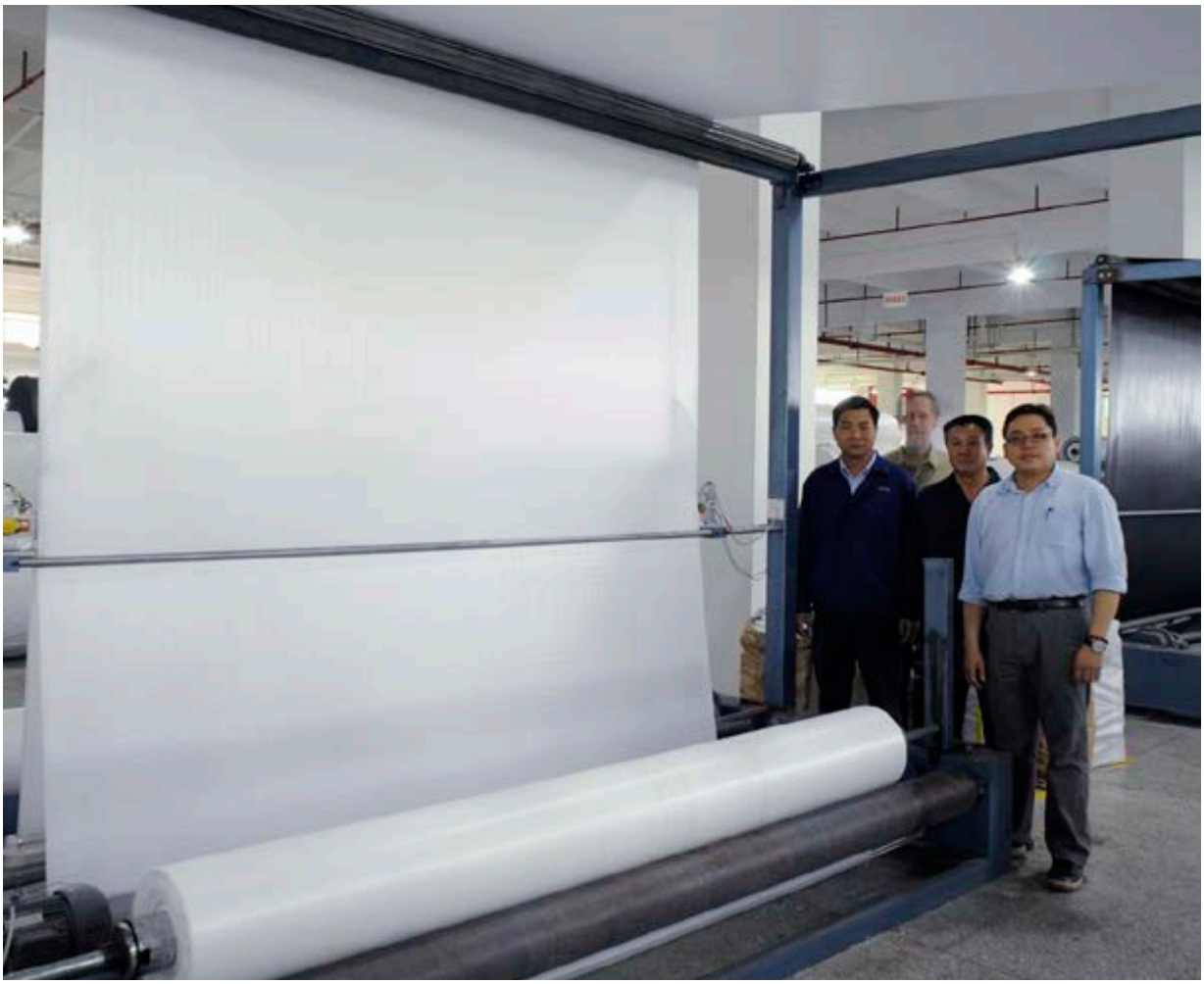
Warp is lengthwise; weft goes across.

Weaving results in a technical fabric that is stronger than one which is knitted. Cheap materials are knitted; more durablematerials tend to be woven. Yeong Jeou makes only woven technical textiles, not knitted.

Weft is across (width of the weaving).

Acknowledgements

I thank Orson Lin (owner, Yeong Jeou) and Craig Adams (YJ USA) for arranging the two visits and Eric Kiu for explaining step by step what each machine was responsible for. May Leng handles marketing for Europe, Middle East, Africa and Asia. Sheena Lin is General Manager, YJ USA.



Here is Eric Kiu Miin at the right with two of the factory managers and me.

Contact info:

If you are a distributor in Europe, Asia, Middle East, or Africa, contact May Leng, yjm@yeongjeou.com.my.

If you are a multi-national company, or a printer manufacturer that wishes to consider private labeling PE for your world areas, and wish to contact the key people, start at the top with Orson Lin yjm@yeongjeou.com.my.

If you are in North America or Europe, add a cc: to Craig Adams yjusa@me.com. Sheena Lin is General Manager, YJ USA, sheena@yjusa.com.

If you have technical questions, write Eric Kiu yjc@yeongjeou.com.cn, with cc: to the others.

Most recently updated November 2014
Previously updated January 2012.

Here are May and Craig inspecting the updated autodie machinery in one of many buildings that comprise the two factory complexes.

Appendix A
Experience of Yeong Jeou

Here are examples of the knowledge of Yeong Jeou with materials. They have decade(s) of experience making materials for trampolines and children's play houses.

Here you can see their capability engineering and producing metal parts (in their other factory). YJ also owns a metal pole factory (I believe near Beijing). Their main factory is an hour from Hong Kong by ferry.

YJ has an office in Texas with about a dozen people to handle sales of their technical textiles for the world of trampolines, tents,etc.

Appendix B
Factory Size & Capabilities

This view is looking out the window of the PE production factory across over to the several buildings in the background. So there are two complexes: headquarters buildings (which you see here) and PE factory (where I am standing, taking the photo).

Here is part of the headquarters complex. As you can see, the company is not small.

Appendix C

Here are the booths of ARIA PE material in recent years.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