Fiber & Filament Making

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1. Preface

While racing to develop and introduce conventional high-speed, large package, automated and high production models, the machine makers tended to exhibit equipment aiming to make high-value added yarns instead of regular yarns. To improve the efficiency of corporate plant and equipment investment, some machinery exhibits offer labor, energy and space saving as well as practical computerized production control. They were an attention getter. Now a variety of machinery exhibits are outlined below.

2. Chip Dryer

Hosokawa Micron Corporation exhibited a dryer which uses infrared as a heat source. The dryer is shown in Fig. 1. Hosokawa has much experience with chip crystallizing and drying equipment. The crystallizing system—which uses the radiant heat and counter rotation agitation—heats inside the chip first, so the system permits (i) quick crystallization, (ii) minimization of fine dust generation and (iii) handling of even sticky materials.

The exhibited dryer capacity is 100 Kg/h, but maximizing the capacity up to 120 t/d is also possible. The dryer can successfully handle even sticky hard-to-crystallize super bright PET chip for bottles and films.

3. Filament Yarn Spinning Equipment

The race to increase the take-up speed and lengthen the bobbin holder (Spindle) has temporarily ended with each machine maker introducing similarly improved high-speed winders and lengthened spindles. Each maker’s machinery exhibits show that machine makers are apparently taking a close look at themselves and the direction in which they are headed.

(1) Teijin Seiki

In addition to a narrow gauge take-up winder unveiled at the previous OTEMAS, Teijin Seiki introduced a winder that is not as tall as its conventional counterpart. The company has come up with this compact model to re-equip the UDY spinning plant. Thus being able to be retrofitted in the existing plant, the compact model is beneficial from the viewpoint of capital investment and plant re-equipment.

The NS612, a high-speed take-up winder whose specifications are listed in Table 1, impressed visitors with its 1,200mm bobbin holder and 12 package winder. It is true that the number of packages/spindle must be increased to handle fine denier yarns. However, the problems with such a winder are the yarn path (the long bobbin holder causes yarn-to-yarn tension variations) and the too much floor space occupied by the winder.

(2) Toray Engineering

Toray exhibited a double-deck winder which it has developed realizing that a winder equipped with long spindles causes such problems as too much floor space and yarn path (long bobbin holder causes yarn-to-yarn tension variations). Conventionally, a high-speed winder was modified into its double-deck counterpart without changing the arrangements of a pair of lower and upper spindles. The resultant winder is too tall, difficult to operate and causes yarn-to-yarn tension variations. For this reason, the winder was not well received in the textile industry. The improved version of a double-deck winder is now equipped with pair of spindles located at the same height. Being 1,500mm in overall length, the winder permits easy threading. Since per spindle cost of spinning equipment is very high, the use of 8-package or 12-package winder can not only cut re-equipment costs but also solve the problem of fine denier yarn winding.

Using life-size pictures and illustrations attached to booth panels, Toray showed the Position Hybrid Control System. It features (i) downsized control panel with integrated inverter, (ii) improved operation and (iii) measures for momentary power dips, caused by continuous thunders. Even if power supply is interrupted repeatedly for less than a second, caused by thunders, the system uses the inertial force of, for instance, an operating winder to keep it running without causing any yarn breakage. This system may be especially effective for a regions where power dips are prominent.

(3) Murata machinery

Having obtained a license from Rieter to manufacture and sell equipment for textile yarns, Murata manufactured and exhibited a Spin beam and a Quickfit Spinpack. They are field-proven, featuring simplified operation and energy saving. Murata also exhibited a high speed take up winder, model No. 778, Bobbin holder length 1,200mm, yarn speed 6,000m/min. and 8-package winding. See table 1. The winder gives full packages of
good shape, so they unwind well in the subsequent processes.

Murata also exhibited its performance–proven, unique spandex yarn winder, model No. 456. The spandex yarn is transferred less easily, but the winder permits easy transfer of spandex yarn from the full package to the empty tube in a fail–safe manner.

(4) Barmag AG.

ASW600 and ASW920, high–speed take up winders which Barmag unveiled at 6th OTEMAS were an attention getter. Refer to Table 1 for ASW600’s specifications. They are equipped with 600mm and 920mm long spindles which are not so novel. They are turret–equipped, automatic versions of SW4 well received in the textile industry as a manually doffing type winder. The use of groove roll traverse system eliminated the need for godet rollers, thus being able to cut equipment costs. Using life–size photos and illustrations, Barmag showed CRAFT winder and Ultra Compact High–speed Spinning Machine.

Barmag exhibited a PROMIX Melt Spinning Pump. As shown in Fig.5, a pair of rotating mixers is incorporated into the pump at its inlet. The mixer serves to homogenize the melt whether it flows at the center or near the inner wall of the pipe and equalize the resultant yarn quality. The pump can easily replace the existing one, being particularly effective in extruding 4– or 8–end filament yarns.

(5) Pipe heater

Toyo Electric demonstrated the subject heater. Installing it under the yarn path of the quench box permits conversion of POY into HOY.

About 20 years ago, an European machine maker introduced the similar heater, but it had too many problems to be put to practical use, gradually disappearing from the textile industry. It is reported that, in recent years, this type of heater has been used in Korea to convert a POY spinning machine into its HOY counterpart. Anyway, the pipe heater embodies a noteworthy technology as it can produce either POY or HOY on an interchangeable basis according to users’ needs.

(6) Spinneret Inspection Systems

Toray Engineering and Aspex exhibited the subject system. In the case of fiber extrusion dies used for fine denier, high–value added yarns, the inspection for their defects is crucial. Nowadays, they are inspected visually.

For this reason, not a few problems occur with inspection accuracy and speeds depending on who inspected these dies. However, the use of the Spinneter Inspection Systems assures quick inspection of the spinneret and serves as a powerful tool in producing high–value added yarns. The Spinneter Inspection Systems of the two companies can automatically detect defects as shown in Fig. 6.

(7) Synthetic Fiber Molecular Orientation Tester

Kanebo Engineering exhibited this tester. The molecular orientation is an important category of quality control, but its frequent measurements are limited because the method of measuring it is difficult and time consuming and readings vary from person to person.

Being able to ensure a quick and easy determination of the molecular orientation of many test specimens without human errors, the tester is expected to play an important role in the textile industry.

4. Staple Fiber Spinning Equipment

Takehara Kikai Kenkyusho demonstrated only a super high–speed crimper because the whole spinning range is too large to be exhibited. The crimper which Takehara unveiled at the previous OTEMAS was apparently employed by a customer for the polypropylene spinning equipment. At the 6th OTEMAS, Takehara exhibited a cutter that enables high precision, high–speed cutting of fibers to be used for resin reinforcement.

(1) Crimper

Using life–size pictures and illustrations attached to the booth panels, Fleissner showed an improved and enlarged version of the crimper exhibited at the previous OTEMAS. Its specifications are : Roller diameter x working width is 300mm x 650mm and maximum crimping capacity is a tow of 5,600,000d.

(2) Baler

Autefa and Gualchierni say that since balers are least automated in term of labor saving, the two companies have received many inquiries for their automated balers. Using life–size pictures and illustrations, the two companies showed fully automatic balers. The two companies also demonstrated many examples of post–baling transportation facilities. They have a full range of performance–proven POY transport and baling
equipment, getting attention.

(3) Compact Spinning Equipment

Using life-size pictures and illustrations, attached to the booth panels, Maccaniche Moderne and Filteco showed the subject Compact Spinning Equipment. Although no state-of-the-art technology is incorporated in the equipment, it can produce high-value added yarns, attracting attention.

5. High-speed Draw False-Twist Texturing Machine

Teijin Seiki, Murata Machinery and Ishikawa Seisakusho demonstrated the subject machines. Their specifications are listed in Table 2. Barmag exhibited H1 heaters, cooling plate portion and Cradle.

(1) Teijin Seiki

HTS-15V, a draw false-twist texturing machine (specifications listed in Table 2) realized a yarn speed of more than 1,200 m/min by (i) improving not only the yarn guide arrangement of a high temperature short heater but also the construction of the two-stage cooling plate and (ii) using a TF-5 friction unit, capable of faster resonance-free rotation of up to 20,000 rpm. Using an autodoffer that doffs each spindle independently, slitted type 2nd heater, and pushup rods, the HTS-15V texturing machine allows easy threading operation. The operation control system—which enables operators to get readings from T2 monitor as product quality information—quickly offers accurate data on the yarn quality determination and production control. Using vibration-free cradles, HTS-15V texturing machine builds packages of good winding shape which are capable of unwinding at high speeds. Able to store two full packages in the storage space, the machine deserves great credit as an ingenious, high-speed texturing machine. The machine price is only a cause of anxiety, but it is hoped that its performance will allay such an anxiety, making it affordable.

Teijin Seiki unveiled a new version of HTS-15V or a SZ simultaneous texturing twister. Murata Machinery is currently unchallenged in the manufacturing of non-torque texturing machine. It is hoped that Teijin Seiki will catch up with Murata in this area.

(2) Murata Machinery

Murata exhibited No. 333J, a draw false-twist texturing machine (specifications are listed in Table 2) which was exhibited at ITMA '95. It is capable of operating at 1,300 m/min. or higher because (i) The high temperature heater, (ii) The forced air cooling plate and (iii) The nip twister are all aligned with the running yarn. The tension control system capable of T2* Tension control embodies Murata's ingenuity, and can rectify the spindle-to-spindle time-dependent yarn tension variations. A monitor serves to displaying the processing yarn quality data, contributing to yarn quality control. The machine is easy to operate its overall height is 3,900mm, which is low compared with other companies' machines.

* T2 = post tension

Murata exhibited No. 333H, a draw false-twist texturing machine (SZ simultaneous texturing machine and specifications are listed in Table 2)

It was an attention getter as a model well suited for the production of heavy denier torqueless textured yarn. On one side of the machine, booth attendants demonstrated the production of thick and thin textured yarn. In present circumstances, the regular yarns are oversupplied worldwide, so it is inevitable to produce uniquely distinguished yarns like multi-component yarns. This is one of the reasons why the demonstration of thick and thin yarn production attracted attention.

(3) Ishikawa Seisakusho

This company exhibited IVF 810, a draw false-twist texturing machine (specifications are listed in Table 2). The machine is a model developed for unique and sophisticated yarns produced using the twin feed system. It was an attention getter at the convention. Today, the independent auto doffing is the order of the day worldwide. However, IVF181 texturing machine permits (i) simultaneous autodoffing and (ii) production of small lots of large varieties and (iii) processing of different yarns on each machine side independently. The machine is more compact and can be installed in a preparatory weaving plant.

(4) Barmag AG.

This company exhibited components of AFK, a draw false-twist texturing machine (specifications are listed in Table 2) which was also exhibited at ITMA '95. The post-ITMA '95 improvement made in the AFK is the dual transfer tail. For cheese dyeing, the AFK texturing machine winds yarn on a plastic tube. This eliminates the need for rewinding. The first few layers are discarded as yarn waste because they cause uneven dyeings.
Barmag claims that it is trying to develop a new model, to be unveil at the next ITMA.

6. Air Texturing Machine

Four companies exhibited the subject machines in response to users' needs to produce multi-component and Taslan® textured yarns.

(1) Murata Machinery

Murata exhibited No. 35A and No. 35B, an air texturing machines.(Specifications are listed in Table 3)
They are false twister–based Taslan® texturing machines. They meet users' requirements to produce various yarns in small lots and can be equipped with an on-line monitor and an autodoffer that doffs each spindle independently.

(2) Ishikawa Seisakusho

This company exhibited STP 320, an air texturing machine.(Specifications are listed in Table 3)
It offers a twister–based production of various yarns composed of different types of yarns. Each yarn is wound onto a pirn and the inter–filament cohesion of twisted yarn ensures constant, trouble–free unwinding at the subsequent processes. Being equipped with polyurethane yarn feed units, the STP 320 is field–proven as a preparatory weaving machine for stretch fabrics.
Table 3. Specifications on Air Texturing Machines Exhibited at 6th OTEMAS

<table>
<thead>
<tr>
<th>Maker</th>
<th>Murata</th>
<th>Ishikawa</th>
<th>Aiki</th>
<th>Nakagoshi</th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>N0.35A/35B</td>
<td>STP320-3D</td>
<td>AT-501 EX II</td>
<td>MT-CW</td>
</tr>
<tr>
<td>Number of Spindles</td>
<td>16~144</td>
<td>24~96</td>
<td>12~84</td>
<td>40~100</td>
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<tr>
<td>Mechanical speed (m/min)</td>
<td>Max.600 or 900</td>
<td>60~900</td>
<td>Max. 800</td>
<td>Max 600</td>
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<tr>
<td>Hot pin heater (mm)</td>
<td>φ 34 50~150°C</td>
<td>φ 48 50~200°C</td>
<td>φ 40</td>
<td>-</td>
</tr>
<tr>
<td>Plate heater (mm)</td>
<td>835L, for 35A,45SL, for 35B</td>
<td>500L 100~240°C</td>
<td>1st:450L/2nd:1,000L</td>
<td>-</td>
</tr>
<tr>
<td>Air Jet Box</td>
<td>Option</td>
<td>Option</td>
<td>Option</td>
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<tr>
<td>Interlacing nozzle</td>
<td>Option</td>
<td>Option</td>
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<td>Option</td>
</tr>
<tr>
<td>Mode of winding</td>
<td>on Cheese</td>
<td>on Pirn</td>
<td>on Pirn</td>
<td>on Pirn</td>
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<tr>
<td>Package dimension (mm)</td>
<td>φ 270 x 250L</td>
<td>420L</td>
<td>φ 250 x 200L</td>
<td>420L</td>
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<td>Yarn quality monitor</td>
<td>Exhibited</td>
<td>Exhibited</td>
<td>Exhibited</td>
<td>Exhibited</td>
</tr>
</tbody>
</table>

(3) Aiki Seisakusho

Aiki exhibited AT-501EX II, an air texturing machine. Specifications are listed in Table 3.

It is equipped with a hot pin heater, a plate heater and a Taslan® air jet box (option), and can texturize a wide spectrum of yarns.

Customers can select components depending on the purpose for which they are used, so they can buy a machine made up of parts only they need, thus saving money.

(4) Nakagoshi Machinery

This company exhibited MN-CW, an air texturing machine. Specifications are listed in Table 3.

Using a 2-yarn feed system, the machine assures production of multi-component yarn composed of different types and different denier yarns. The machine uses spindles to take-up yarn on each pirn. The ring twisting process gives the multi-component yarn a satisfactory cohesion, ensuring easy unwinding in the subsequent processes. Being equipped with an air jet box, the machine can produce yarns with a special hand.

(5) Heberlein

This company exhibited air jet nozzles with which the air texturing machines of many companies are equipped. Regarding the jet core of Hemajet® LB, Heberlein has developed the S-series out of the existing T-series and plans to launch it in the near future. The S-series attracted attention as it can increase the processing speed by 30% even if the yarn is textured under the same processing conditions.

7. Conclusion

Although no revolutionary technology has been found at the current show, it was impressive to see booths displaying improved versions of machinery developed from the customers' standpoint. The machinery show reflects the result of makers' efforts to (i) cut costs without sacrificing the machine performance and (ii) develop equipment that meets users' needs. It is hoped that each maker will come up with more innovative, sophisticated and the state-of-the-art technology than ever before.