

# TOYODA TEXTILE MACHINERY BULLETIN

Vol. 8



Idyllic A-frame houses in Shirakawa, Gifu

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TOYODA AUTOMATIC LOOM WORKS, LTD.

BR700 Rapier Loom Special Feature

# Toyoda's BR700 Rapier Loom extends the boundaries of the world of fabric

Toyoda's BR700 Rapier Loom was exhibited for the first time at the OTEMAS '97 Osaka International Textile Machinery Show. We wanted to provide our customers with a rapier loom of the highest possible reliability, so we solicited opinions and feedback from many of you. This issue introduces our BR700 Rapier Loom—being developed based on wide-ranging evaluations and rigorous testing.

*Weave Master*



## The BR700 rapier loom based on customer feedback

An interview with two members of the BR700 development team

This issue, we talk with two of the engineers involved in research and development for the BR700 Rapier Loom.

Mr. Mitsuhiro Iwasaki      New Product Development Group  
Mr. Masami Shinbara      New Product Development Group

**Iwasaki:** For many years, Toyoda has delivered air jet looms to customers throughout the world. However, air jet looms and rapier looms each offer distinct advantages depending on use and fabric type. So Toyoda decided to develop a rapier loom to meet the broadest range of customer needs and wants. By utilizing the merits of both air jet and rapier looms, we hope our customers can achieve ideal weaving strategy.

**Shinbara:** In developing the rapier loom, we first visited customers who run rapier looms and asked them what they thought was important. We became firmly convinced that “weft insertion performance” is the most important factor in a rapier loom.

**Iwasaki:** Rapier looms are attractive because they can be used to weave a wide variety of high-quality fabrics. So, in the development



Mr. Iwasaki and Mr. Shinbara in front of the BR700

process, we put the greatest emphasis on “high flexibility” and “reliable weft insertion” to enhance fabric quality. For each part of the weft insertion mechanism, we built special prototype looms, ran a series of tests, and found the optimum solution based on the results.

**Shinbara:** We made it easy to weave a broad range of fabrics by introducing a “guideless system” that allows the user to choose between either a “plate type” or a “piece type” to match the fabric being woven, simply by changing the parts. To achieve consistent weft insertion, we developed a “gentle weft insertion system” that optimally reduces the carrier head speed when gripping and releasing the weft yarn. And based on various tests and evaluations, we selected a highly stiff and durable carbon tape for reliable weft insertion.



**Iwasaki:** Another point we emphasized was “low-vibration operation.” The Toyoda JAT610 Air Jet Loom uses balance weights and a solid, one-piece side frame to achieve vibration levels so low that it can run at high speeds without bolting it to the foundation. We took full advantage of the knowledge gained in designing the JAT610 for low vibration and applied it to the task of minimizing vibration in the BR700.

**Shinbara:** Using computer analysis, we came up with an optimum design for the beating cam that resulted in very little vibration. Using this cam in combination with Toyoda’s patented “Perfect Balancer,” a rocking shaft that helps keep the beating motion balanced, made the BR700 run with extremely low vibration. It can rest on a thin aero-pad without foundation bolts, just like the JAT610.

**Iwasaki:** Visitors to OTEMAS '97 had high praise for the low-vibration operation of the BR700, and also complimented it for its well-made and compact design.

**Shinbara:** The electronic control technology we developed for the JAT610 Air Jet Loom is reflected everywhere in the BR700. We incorporated the same touch-screen LCD function panel that allows the user to enter settings for a wide range of conditions with just the touch of a finger. We also incorporated an overall network that links various mechanisms such as weft insertion, let-off, take-up, and shedding, to a main CPU. This allows users to optimally adjust each device while checking operating conditions and fabric quality.

**Iwasaki:** What’s more, we made various accessories interchangeable with those of the JAT610 so that users can make an ideal production plan using the JAT610 and/or the BR700 depending on the type of fabric being woven. Plus, users can set the fabric width according to the left side or center of the machine; a unique feature of the BR700.



We also improved its ease-of-use so that even inexperienced operators can run it successfully. This should make it easy to introduce the BR700 to mills that have only run air jet looms up to now. Our dream is to have as many customers as possible experience the powerful capabilities and outstanding performance of the BR700.



Weft insertion mechanism testing

## Outstanding Features of the BR700

- Versatile guideless weft insertion system
- Gentle weft insertion for improved weaving performance
- Low-vibration operation for high durability and reliability
- Superb operability thanks to easy electronic control of advanced functions
- High productivity made possible through sturdy frame structure



BR700 : WEAVE MASTER

## BR700 Rapier Loom

## Customers' Voices

**BR700 Popular for its Versatility and Ease-of-Use**

To develop an easier-to-use rapier loom, we asked customers to try out a prototype of the BR700. We then incorporated their opinions into further development. We will introduce some of their comments about the BR700 prototype and Toyoda.



President Yamaguchi

Yamaguchi Weaving, Kashima Town, Ishikawa Prefecture

**President Yoshinori Yamaguchi**

I was impressed with the BR700 at the 6th Osaka International Textile Machinery Show (OTEMAS '97), so I decided to try out a prototype loom.

Compared with other rapier looms I am using, the BR700 is much easier to adjust for fabric changes. The carrier head, which normally needs frequent maintenance, is very durable, and I can see this leading to cost reduction for us. It normally requires a high level of skill to do the fine adjustment for the

timing of the carrier head's weft gripping when the sizing conditions of the warp yarn and the twists of the weft yarn change even a little. However, the BR700's gentle weft insertion means it can handle a wider range of yarn, so you save time on fine adjustments and can weave difficult fabrics efficiently. I gave Toyoda advice on how to weave high-quality fabrics while the yarn twists and warp yarn tension of delicate synthetic fiber continuously change, and I think this helped improve the machine performance. I believe the new BR700 will enhance weaving versatility and productivity of rapier looms. And with Toyoda's own electronic positive dobby installed on the BR700, we can expect thorough after-sale service. We would be grateful if Toyoda's engineers would show us how to effectively tune and adjust the looms.

Fujii Co., Ltd., Tokoname City, Aichi Prefecture

**President Masahiro Fujii**

Beginning in July 1997, we took part in a weaving durability test of the BR700 with R/S 190, running the machine at a high speed of 560 rpm. In the beginning, we pointed out several things from a user's point of view. Toyoda was always quick to respond to our requests and we were happy to continue with the test. Now, more than one year later, we have had no problems and the BR700 has shown good durability. Currently, we are weaving double-layered fabric for underwear, something that is difficult to do with an air jet loom due to the up-and-down movement of the beating point. I think the BR700 is suitable for high value-added fabrics such as those with a lot of fluff in the yarn as well as those of various yarn types and yarn



President Fujii with the BR700

counts. I think the BR700 will allow us to try various new types of weaving so we can compete with imported fabrics.



President Sugita

Sugita Weaving, Hamamatsu City, Shizuoka Prefecture

**President Yoshihiro Sugita**

Taking part in the test for Toyoda's new rapier loom was a great opportunity for us. As well as

giving stable operation at high speed, the BR700 is easy to run thanks to its electronic control. Being a prototype machine, it needed a few improvements at first, but after the quick response from the Toyoda engineers, we could carry on smooth weaving without big problems. Toyoda really listened to our opinions regarding the various trial weaving we did, and I am sure that the BR700 has become an even better machine.

Weaving Preparatory Machinery Series—Part 2

# Mackee Eagle Spun Yarn Sizer: For High-Quality Sizing & Easier Operation

For air jet looms and rapier looms to achieve high-speed operation while maintaining consistent quality, it is necessary that fluff in the warp sheet be firmly laid down and that the warp sheet be uniformly sized and dried.

To satisfy these requirements, Toyoda introduces the Mackee Eagle Spun Yarn Sizer designed and developed based on invaluable feedback from our customers.

## 1 Tension control optimized for multi-variety, mixed fabrics

The Mackee Eagle takes each group of yarns as a batch and measures sheet tension at the front of each size box. According to the measured tension, it automatically distributes control of yarn tension on the beam stand by combining band brakes with pneumatic pressure. Plus, when simultaneously sizing beams with extremely different yarn densities or yarn types, such as dyed beams, the Mackee Eagle is optionally provided with a device that enables automatic tension control to be disengaged to allow manual tension adjustment. This versatile tension control system is designed to handle the widest possible range of today's increasingly diverse warp changes.

## 2 Reliable design eliminates drying defects and overdrying

The user can choose the optimum cylinder temperature control system to match the type of fabric being sized. Cylinder temperatures are controlled by a set of four cylinders, but a two-cylinder set is also available as an option. In addition, to prevent



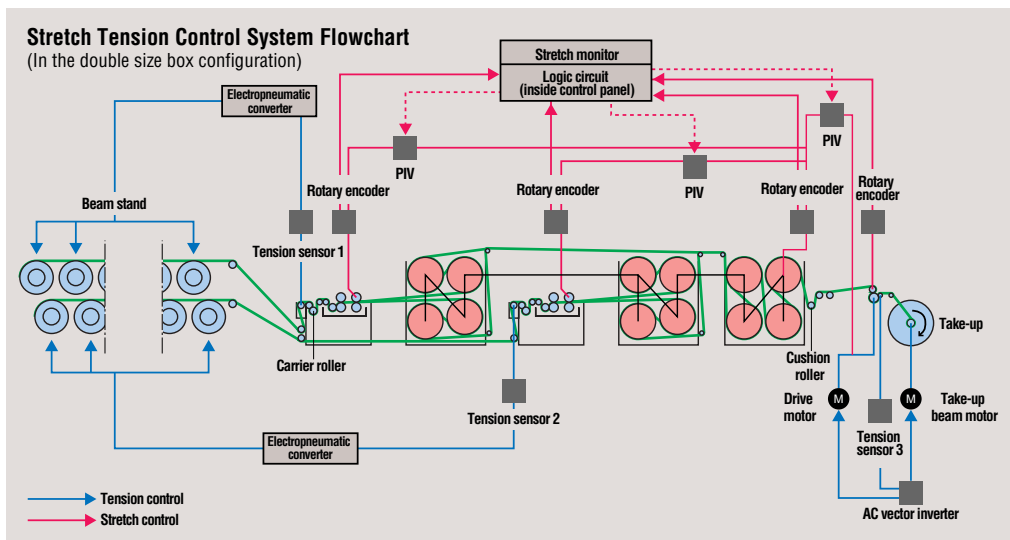
Mackee Eagle in operation at a factory

drying defects and overdrying, moisture content detectors are installed at the cylinder openings to automatically control operation speed, according to the degree of drying and yarn type.

## 3 Operating conditions set by "System Master" input

The System Master allows users to assign a code number for each set of yarn parameters. Simply enter the yarn type, yarn count, length, number of ends and reed width of the beam to be sized and store them in the System Master along with the machine setting conditions. The next time a beam using the same

parameters is to be sized, the operator merely enters its code number and the Mackee Eagle automatically adjusts, monitors, and controls machine speed, cut-marking, winding tension, temperature, squeezing settings, and other parameters, eliminating variations from lot to lot and bringing even greater reproducibility to the sizing process.



### Receive a Catalog of the Mackee Series

If you would like a TOYODA Mackee Eagle catalog, please contact us at the address or phone/fax number on the right and we would be happy to send you one. The catalog also includes information on the Mackee Warper and the Mackee Creel.

### Address Toyoda Automatic Loom Works, Ltd.

Attn: Mika Asai, Sales Department  
Textile Machinery Division  
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# Technical Information



## The TBC Bobbin Changer—Further Improving the Reliability of the RX240 Ring Spinning Frame

The TBC (Toyoda Bobbin Changer) was introduced along with the RX240 Ring Spinning Frame. The TBC removes full bobbins and supplies empty bobbins precisely, meaning you can count on the RX240 for stable operation every time. The TBC was developed with simplicity in mind. This emphasis on simplicity during the design process allowed us to create a reliable, easy-to-maintain bobbin exchanging system.

### Features of the TBC

#### 1 High Reliability

We improved the machine's reliability even further by simplifying complicated mechanisms such as the Fixed Full Bobbin Picker and the system for lining up empty bobbins.

#### 2 Easy Maintenance

As well as designing the TBC with excellent bobbin exchanging capability, we emphasized ease of maintenance, so users don't need to be troubled with cumbersome adjustments.

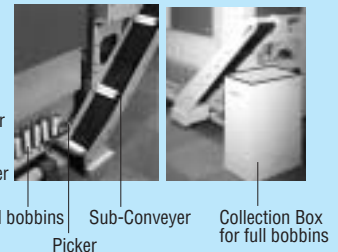
#### 3 Compact, Space-Saving Design

We eliminated all the unnecessary parts during the design process, resulting in a compact unit that doesn't take up valuable space.



### How the TBC Exchanges Bobbins

- 1 The Picker removes the full bobbins from the tray.
- 2 The Sub-Conveyer carries the full bobbins to the Collection Box.
- 3 Empty bobbins are taken from the Bobbin Stocker and supplied to the tray through the Bobbin Shooter.



## CUSTOMER SUPPORT & SERVICE

### A Look at Toyoda's Global Service Centers

- Part 3: China -

## Shanghai Service Center

No. 218 Tian Mu West Road, Shanghai 200070, China  
(Kerry Everbright City No. 1-703)  
Tel: (+86) 021-63170992 Fax: (+86) 021-63174980

To quickly respond to customer service needs, Toyoda's seven global service centers offer spare parts and carry out after-sale service. Each issue of the Bulletin will introduce one of these global service centers. In this issue, we'll take a look at the Shanghai Service Center.



The People's Republic of China has the world's largest population (1.2 billion) and boasts a history of more than 4,000 years. Since the country embarked upon policies of reform and liberalization, the economy has developed rapidly. With a population of over 14 million, Shanghai is the country's center of business.

The Shanghai Service Center is located in front of the train station from which you can go to Beijing and other major cities in China. Most customers visiting the Center come by train, and all are pleased with the convenience of the location.

The eight local staff members at the Center mainly deal in installation of air jet looms, inspection & repairs, and the sale of spare parts. Of these eight, four service

looms, one handles spare parts, one repairs electrical circuit boards, one handles interpretation and clerical duties, and one is the manager. The running of the Center is basically left to the local staff. However, when necessary, technical instructors are sent from Japan to help the Center staff polish its service.

It's been two years since the Center was established. In order to provide better service, six staff members visit customers around the country. It took a while for the service staff members to get used to the job, but they have become more competent and customers are pleased with the service they are getting.

The Center intends to raise the quality and quantity of service for customers by improving the level of staff ability and increasing the number of personnel in order to respond to user demands.



Manager, Shanghai Service Center

### Mr. Huang Guo Hua

I joined the Shanghai Service Center when it opened in 1996. I currently manage staff and oversee the running of the Center. Although we still have a way to go before our standard of

service is considered world class, we are doing our best to improve the staff members' skills and give our customers satisfactory service. By providing service representing Toyoda, I feel fulfilled because I am confident that we are doing our part to contribute to the development of the textile industry in China.

User Report

- Part 7 -

**Kyokujitsu Textile Mills Co., Ltd.**

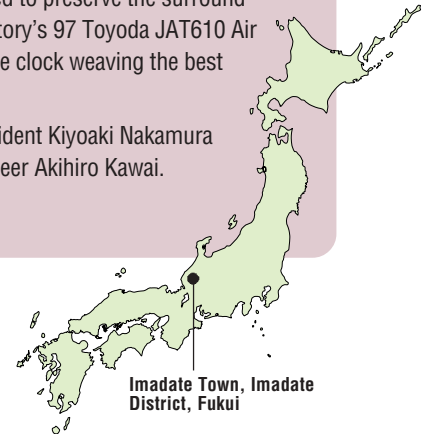
Imadate Town, Imadate District, Fukui, Japan



View of Kyokujitsu Textile Mills Co., Ltd.

Fukui prefecture is a main production center of filament fabrics in Japan, and from the town of Imadate you can gaze upon the beautiful Mt. Hino. Here, Kyokujitsu Textile Mills Co., Ltd., which is the production team of Asahi Chemical Industry Co. Ltd., produces high-quality filament fabric, Bemberg taffeta (cupra fabric). With a computerized production management system, the factory is thoroughly equipped to preserve the surrounding natural environment. The factory's 97 Toyoda JAT610 Air Jet Looms are on duty around the clock weaving the best quality fabric.

We spoke with company president Kiyooki Nakamura and technical development engineer Akihiro Kawai.



Imadate Town, Imadate District, Fukui



President Nakamura

**Interviewer:**

What is your company's strategy for getting ahead in today's tight textile products market?

**Mr. Nakamura:**

The Bemberg taffeta we weave is used mainly for the lining of high-end clothing. Recently polyester, which is relatively inexpensive, has had more demand, and in response to this, we've set a goal of producing the

highest quality fabric in the most economical way. As a result of experimenting with numerous ways to improve, we've become one of the leading manufacturers among mills in our product field.

**Interviewer:**

What do you think of Toyoda's JAT610 Air Jet Loom?

**Mr. Kawai:**

In selecting the JAT610 Air Jet Loom, we spent about a year thoroughly comparing and evaluating machines from several loom manufacturers. We took a detailed look at everything from the weft insertion performance to the quality of the fabric woven. We even bought a vibration gauge and measured the vibration of and the area around each loom.

**Mr. Nakamura:**

The JAT610's low vibration during operation is extremely attractive to us because it's important to consider the environment of the surrounding residential areas. We used to have to do construction during installation in order to absorb the vibration from the machines, but the JAT610 runs at low vibration without floor bolts. It's really great.

**Mr. Kawai:**

But low vibration isn't the only reason we chose the JAT610.



A JAT610 inside the factory

In addition to low air consumption, the entire machine is precisely controlled by computer, and fine adjusting of the settings can be done easily

with the function panel. Compared to synthetic filament yarn, the yarn for cupra fabric is very delicate. It breaks easily during weft insertion and has an uneven quality, making it a difficult yarn to weave. But we've found the JAT610 has done a superb job in using this delicate yarn to weave our Bemberg fabric. We are also very happy with the engineers from Toyoda, who have responded quickly to our various requests.

**Interviewer:**

Do you have any other comments or requests for Toyoda?

**Mr. Kawai:**

I'm very interested in the Automatic Inspection Device Toyoda exhibited at the last OTEMAS '97, which detects wrong warp yarn drawing and warp breakage. I hope that Toyoda will bring out more leading-edge technology like this.



Mr. Kawai

**Interviewer:**

What are your goals for the future?

**Mr. Nakamura:**

As the production team of Asahi Chemical Industry Co., Ltd., we want to create an integrated manufacturing system in cooperation with our yarn production, dyeing and finishing factories, making the manufacturing process more efficient, and bringing ever-higher quality fabrics to the market. In order to make even better quality fabric at high-cost performance, we will initiate our own original manufacturing methods as we aim to be the No. 1 company of lining weaving.

## The “Toyota Production System”—Imbued with Resourcefulness ③

Last time, I discussed how ‘cost’ varies depending on how it’s viewed, and how the Toyota Production System helps you reduce costs. To do so, I said that you must have an eye for uncovering ‘waste,’ or as we say in Japanese, ‘*muda*’ (pronounced *mō-da*). *Muda* means waste or loss, or as the Toyota Production System defines it, “anything that does not produce added value.” So this time, let’s talk about *muda*.

As I stated above, *muda* means more than just waste or loss. Therefore, I will use the term *muda* throughout this article.

If we do not constantly work to eliminate *muda*, it will gradually show up in every aspect of production, threatening the very foundations of the company. There are two kinds of *muda*—obvious *muda* and hidden *muda*. Accordingly, I have categorized eight different types of *muda* below, from which I hope you will develop an eye for uncovering *muda*.

### The eight types of *muda*

- |                                 |                                  |
|---------------------------------|----------------------------------|
| ① <b>Muda of overproduction</b> | ⑤ <b>Muda of inventory</b>       |
| ② <b>Muda of waiting</b>        | ⑥ <b>Muda of motion</b>          |
| ③ <b>Muda of transportation</b> | ⑦ <b>Muda of defective parts</b> |
| ④ <b>Muda of labor</b>          | ⑧ <b>Muda in the system</b>      |

People tend to think these types of *muda* are associated only with departments directly involved in production activities. But it is equally valid to apply them to administrative and support departments not directly involved in production. Depending on the company, these “indirect” departments must also be targeted for *muda* elimination.

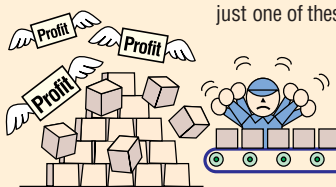
If we were to modify the expressions to apply them to indirect departments, we could say:

- |  |  |
|--|--|
| ① <b>Muda of making great efforts to do tasks not needed at the moment</b>                         | ④ <b>Muda of work itself</b>                               |
| ② <b>Muda of delays resulting from waiting for meetings, approval from superiors or higher-ups</b> | ⑤ <b>Muda of accumulating information and/or documents</b> |
| ③ <b>Muda of transferring information and/or documents</b>   | ⑥ <b>Muda of motion</b>                                    |
|  | ⑦ <b>Muda of making mistakes</b>                           |
|  | ⑧ <b>Muda in the system</b>                                |

So, let’s take a look at *muda* in a little more detail.

### 1) *Muda* of overproduction

“Just-in-time” is a manufacturing system where each process is supplied with the required items, at the required time, in the required quantity. But, if just one of these conditions is left out, some form of *muda* enters the picture.



Many people tend to think of multi-product variable-lot production as a bother, and consider the demand side as bad because it increases time and effort. However, is this really the case?

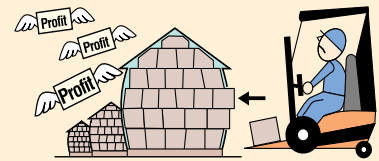
### Lectured by Rikizo Naruse

Rikizo Naruse joined Toyoda Automatic Loom Works, Ltd. in 1968. Based on concepts derived from the Toyota Production System, he constructed an innovative production control system for the Vehicle Division and Textile Machinery Division. He is currently the Sales Planning Office General Manager in the Textile Machinery Division’s Sales Department.



Everyone agrees that delays are bad, but almost no one thinks that overproduction is bad.

Until you realize that, just as delays are bad, making too many products before they’re needed is bad, you will not be able to see hidden *muda*. *Muda* invites more *muda*, and producing too much will lead to serious problems, including



excess inventory, earlier inventory consumption for the next lot’s production, excessive transport, a surplus of personnel, and excessive equipment resulting from expanding warehouse space and installing more machines. Note that these are also key factors making up costs.

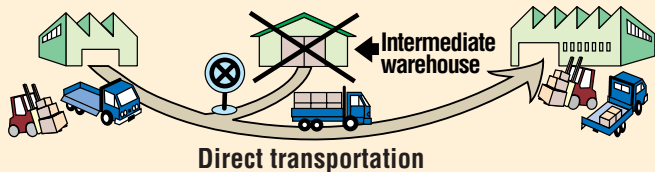
### 2) *Muda* of waiting

This type of *muda* is not only a state where one cannot do a task because materials are not readily available, but also the process of checking for defective parts and equipment failures, etc. This kind of *muda* is obvious. Preventing *muda* of overproduction turns it into the more noticeable *muda* of waiting, which any manager would take action to eliminate.

### 3) *Muda* of transportation

Transportation is considered *muda* because it is a cost that adds no value to a product. Transportation is not just moving large items on trucks, but also temporary storage, transshipment, and dividing large lots into smaller ones. Using an intermediate warehouse to transport parts from a vendor to the factory versus shipping them directly to the factory can mean a huge difference in costs, including personnel, equipment and warehouse expenses.

We may never be able to completely eliminate the transportation process. But once you acknowledge transportation as being necessary, you will eventually become used to this wasted time and energy, and will no longer be able to distinguish it as *muda*. That’s why I stress that we should consider transportation to be *muda*, and that it is important to try to eliminate it.



In the next issue, we’ll explain the remaining five types of *muda*.

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### About the Cover

Come winter, the village of Shirakawa is blanketed in deep snow. The gassho-tsukuri (literally, “hands held in prayer,” describing the steep-roofed design) houses of this area, along with Gokayama in Toyama prefecture, have been designated as World Cultural and Heritage Sites. The steep roofs keep off the heavy snows of the region, while the spacious interiors accommodate traditional activities such as silkworm raising.

### TOYODA TEXTILE MACHINERY BULLETIN Vol.8

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