The Fastest Weaving Machine in the World

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With the M8300 multi-phase weaving machine, Sulzer Textil has accomplished a quantum leap in weaving. Compared with conventional air-jet weaving machines, the weft insertion rate has been tripled. Customers already using the M8300 are very satisfied with this new weaving technology, which is now in the global market launch phase.

Over 60 M8300 multi-phase weaving machines are meanwhile in service in Europe and the USA. The first of them have been running for more than two years. During the International Textile Machinery Exhibition ITMA 99, held in Paris in June, a further order for 17 machines was received from the USA. The M8300 is used in the production of standard fabrics, which account for about two-thirds of all fabrics produced for the global market (Fig. 1■).

Weaving was invented some nine thousand years ago. The earliest documentary evidence of weaving (of wool) is Chinese, dating from around 7000 BC. The principle of weaving – by crossing threads at right angles to one another – has remained unchanged ever since. However, the speed of weaving has increased dramatically. Initially, only a few metres of weft were inserted per minute; today, with high-speed single-phase machines, the figure is in excess of 2000 m/min. In the course of the industrial revolution over the last 200 years, the speed of weaving has been greatly accelerated. A major step was the introduction by Sulzer of the projectile weaving machine, the first shuttleless weaving machine, in the mid-1950s: weaving was thus simplified and less energy-intensive.

In modern single-phase weaving, the weft thread attains peak velocities of more than 5000 m/min. During insertion, it is first subjected to extreme acceleration and then sharp deceleration, i.e., it is

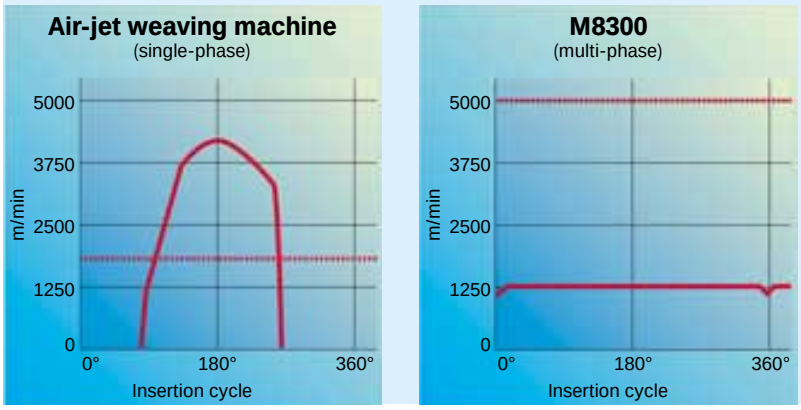
1■ With the M8300 multi-phase weaving machine, standard fabrics, e.g. for fashion prints, can be produced very fast – three times as fast as with a conventional air-jet weaving machine – and thus economically.

3■ *The M8300 is the only multi-phase weaving machine in the world to have reached series maturity. It inserts four wefts simultaneously.*

loaded almost to breaking point (Fig. 2■). However, not only the yarns, but also the mechanisms of the machines are approaching their stress limits, so that single-phase weaving can hardly be accelerated further. The central problem of high weft velocity can only be solved in a multi-phase system, where several weft threads are inserted simultaneously. For example, simultaneous insertion of four wefts at a velocity of 1250 m/min results in a weft insertion rate of 5000 m/min. A shed is needed for each weft, and so at the same time four open sheds must also be available. After many years of intensive work, Sulzer Textil has now succeeded in developing the M8300 multi-phase weaving machine, based on the linear shed principle, to series maturity (Fig. 3■). Compared with the prototype, the M8300 has meanwhile become a further 20% (1000 m/min) faster – which alone is equivalent to half the speed of a conventional air-jet weaving machine. The machine's potential is far from exhausted. With the M8300, Sulzer Textil has finally succeeded in overcoming a weaving principle – single-phase weft insertion – that is thousands of years old.

WEFT INSERTION ON A ROTATING DRUM

The M8300 inserts four wefts simultaneously. To simultaneously open several sheds for this purpose in warp direction, the warp passes over a continuously rotating drum – the weaving rotor. The sheds are formed on its circumference by shed-retaining elements (Fig. 4■). The curvature and motion of the rotor cause the shed-retaining elements to open the consecutively arranged sheds. Minimal movements of the warp positioners posi-



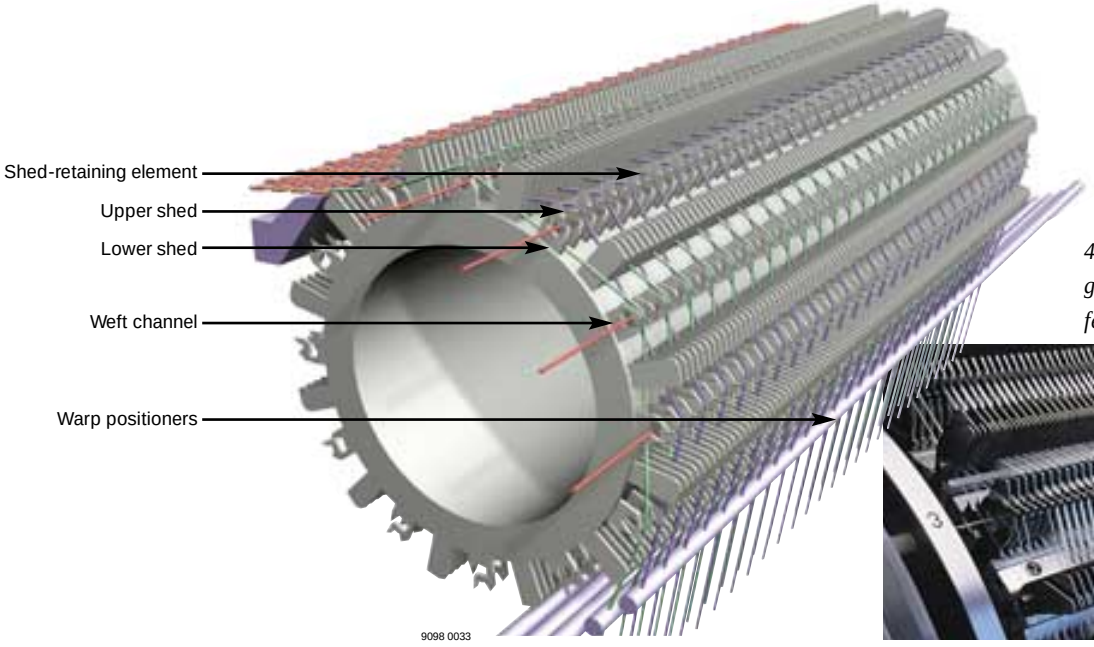
2■ *Comparison of the weft insertion rate and weft velocity of single-phase and multi-phase weaving machines. In multi-phase weaving, the weft thread is neither accelerated nor decelerated sharply. Yarn loading is thus minimized.*

tion the warp ends so that they are either taken up by the shed-retaining elements to form the upper shed, or remain in the lower shed position. Each warp end is threaded individually into the thread eyelet of a warp positioner, the number of which depends on the required warp density. Due to the extremely low mass moved and the very short stroke, the motion frequency can be very high – a crucial precondition for the M8300's performance potential. The motion sequence of the warp positioners is controlled, thus enabling a variety of standard fabrics to be produced.

The second function of the shed-retaining elements on the weaving rotor is to form a weft channel. The weft is inserted into this channel by compressed air over the entire fabric width, additional nozzles between the shed-retaining elements ensuring that it is reliably conveyed. The four wefts are drawn off simultaneously and at constant speed, i.e., yarn loading due to acceleration, as described above, is eliminated.

NEW CRITERIA FOR PRODUCTION

With a weft insertion rate of over 5000 m/min, the M8300's output in the production of standard fabrics is up to three times that of current single-phase weaving machines. At the ITMA 99, a world record weft insertion rate of over 6000 m/min was achieved. And the modular design of the machine, with new control and drive technology, brings other benefits for the textile industry: due to the lower energy consumption and space requirement – up to 50% and 60%, respectively, as compared to air-jet weaving machines for the same output –, the low dynamic building load thanks to the reduction in oscillating motions, reduced air-conditioning costs and increased fabric output per weaver, weaving costs are reduced by 20–30%, depending on the type of fabric. Moreover, compared with conventional weaving machines, the M8300 is significantly quieter in operation, and the air treatment system integrated in the machine (Fig. 5■) reduces the dust content in the air. Both of these factors make a major contribution to improved working conditions.



4■ The wefts are inserted in staggered formation and guided to the fell by the movement of the rotor.

5■ The M8300 has an integrated air treatment system: hot, dust-laden air is extracted from the rotor housing (1), filtered (2), and exhausted via the air conditioning (3). The dust is evacuated via a central vacuum system.

ALSO ATTRACTIVE FOR HIGH-WAGE COUNTRIES

With a reduction of 20–30% in weaving costs, improved working conditions, and fabric quality in line with market demand, production of standard fabrics is once again an attractive option even in high-wage countries. Jobs in the textile industries of those countries can be saved or new jobs created. This is one of the reasons why Sulzer Textil began the market launch of the M8300 multi-phase weaving machine in Europe and subsequently in the USA. Four customers in Europe meanwhile have M8300s in operation, the first of which were installed over two years ago. The customers are very pleased with the results obtained. In the USA, there are five M8300s installed in a pilot plant at Ramtex Inc., of Ramseur, NC. A further 17 have meanwhile been ordered (see box). These 22 multi-phase weaving machines will produce as much cloth as existing installations with around 100 projectile and 72 air-jet weaving machines, respectively. Ω

FOR MORE DETAILS

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M8300 – THE RAMTEX EXPERIENCE

In the course of a videoconference, Jim Patterson, Executive Vice President of Operations at Ramtex Inc., talked about his company's experience with the M8300 multi-phase weaving machine. Ramtex has a pilot plant with five of these machines installed. At the ITMA 99, the textile manufacturer based in Ramseur, NC, which ranks among the leaders in the US textile industry, ordered a further 17 machines.

"When the M8300 was introduced at the ITMA 95, we started talking about having this machine because we recognized that, in our minds, it represented the future of weaving, particularly the type of weaving we do.

At the moment we have five machines in a trial installation. Over the first months, I have to say we are pleased with the performance of the M8300. The machines run as fast as Sulzer Textil says. They run excellent quality, and there are very few weaving defects. There are some issues that we are confident that together, us and Sulzer Textil, we will overcome. Of course, with any trial installation you always have issues.

The one thing that I want to stress is that the M8300 requires commitment. You cannot just buy 25 machines and snap out your old machines and set the new ones down where those were, because they require some different engineering. We still have a lot to learn about the M8300. We are confident as a Sulzer Textil customer that the machines are going to work, not just for us but for the US industry."

Jim Patterson, Executive Vice President of Operations at Ramtex, is satisfied with the performance of the five M8300s in Ramtex's pilot installation.