



**KARL MAYER**

# DENIM Special



Customised solutions for the denim sector  
The INDIG-O-MATIC dyeing technology made by KARL MAYER

**T**he current worldwide financial crisis has led to consolidation of the international textile machinery building sector, and is facing European companies with a whole set of new challenges.

The KARL MAYER Group is reacting to this changing market situation by developing a new generation of economical, eco-friendly warp preparation machinery. The activities of this company in the DENIM sector illustrate how the textile machines produced by this well-known manufacturer are contributing to the success of future, innovative weaving preparatory operations.

The setting-up of a special centre of excellence forms the key element of the company's increased concentration on DENIM products, which brings together the full-width dyeing technology of three specialists in the KARL MAYER Warp Preparation Division, i.e. the former textile machinery groups of MOENUS-SUCKER, the weaving preparatory operations of Benninger AG, and IRA L. GRIFFIN SONS Inc. The machines in the INDIG-O-MATIC DENIM processing range are complemented by the company's new rope-dyeing technology (Fig. 1).

### DENIM processing technology

Integrating new functions and processes into the weaving preparatory processes (spinning - direct beaming/warping/assembly beaming - sizing/dyeing) is the main objective behind increasing quality, flexibility, economic viability and productivity.

An important criterion in traditional DENIM processing is characteristic ring dyeing, i.e. the inside of the yarn core remains undyed or is dyed differently.

By comparing the usual processing sequences within the DENIM industry, the distinction can be made between the following production processes:

#### 1. Semi-continuous, full-width dyeing/ sizing

(Known as the SLASHER-DYEING-PROCESS, Fig. 2). For many manufacturers, the DENIM processing sequence starts with producing or taking delivery of the yarn packages. The direct beaming process feeds and winds the individual yarns from a package creel (having 300-700 packages) next to each other onto a beam.

In the second stage, the yarns from 8-24



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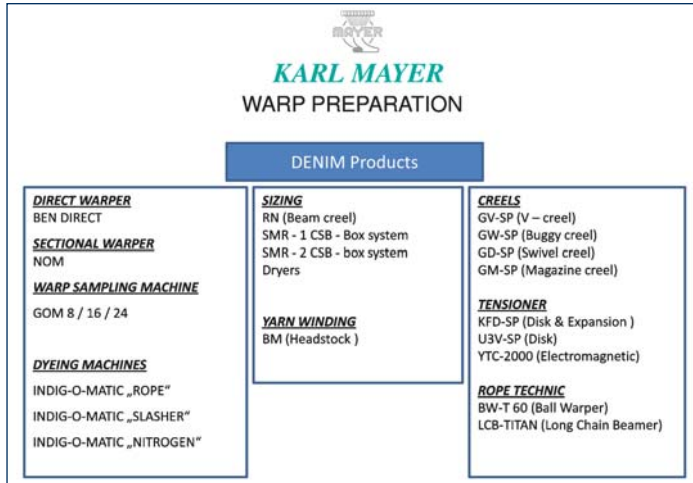


Fig. 1: KARL MAYER’s machine range for the DENIM industry

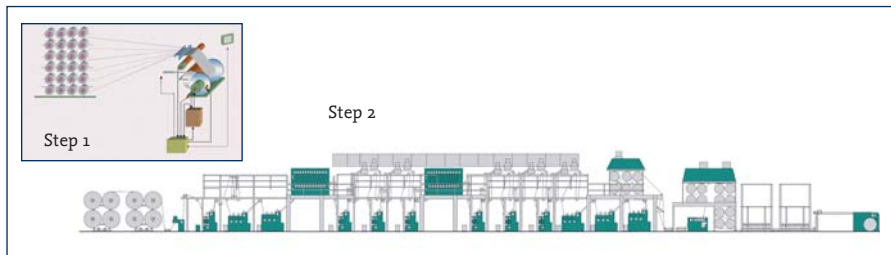


Fig. 2: Semi-continuous full-width dyeing/sizing process

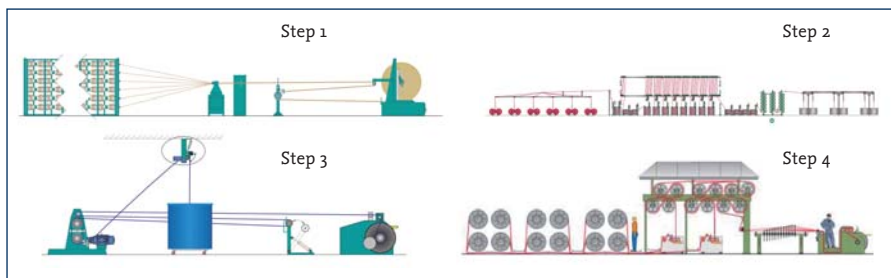


Fig. 3: Discontinuous hank/rope dyeing and subsequent sizing

	INDIG-O-MATIC SLASHER DYE NORMAL CAPACITY	INDIG-O-MATIC SLASHER DYE DOUBLE CAPACITY	INDIG-O-MATIC ROPE DYE
Yarn coverage [%]	70 – 100 %	130 – 180	> 180 (during Dyeing process coverage varies 160 – 300) *
Uniformity of coloration	Even Product	Even Product	Varies dyeing Products* (melange effect)
Max. in count no.	Up to NE 40 (special plant design for NE 50 – 70)	Up to NE 40 (Special plant design for NE 50 – 70)	Around Ne 24
Rear view characteristic of fabric	Less thin / thick & knot points	Less thin / thick & knot points	High thin / thick & knot points
Dye - dipping time for effective dye result	<= 14 s (standard 10 – 14 s regulated by speed)	<= 14 s (standard 10 – 14 s regulated by speed)	<=21 s (standard 15 – 21 s regulated by speed)
Production capacity / a	Approx. 9 to 11 mill. m	Approx. 18 to 22 mill. m	12 rope = 9 to 11,5 mill. M 24 ropes = 18 to 23 mill. M 36 ropes = 27 to 34,5 mill. M

Fig. 4: Differences between the various production processes in the DENIM industry

beams are then taken off together under a controlled tension and passed through the dyeing and sizing section. At the end of the dyeing and sizing section, the adjacent yarns are wound onto a weaving beam.

2. Discontinuous hank/rope dyeing with subsequent sizing

(Known as the ROPE-DYEING-PROCESS, Fig. 3). This processing stage also begins with producing or taking delivery of the yarn packages. In the ball warping process (first stage), the yarns coming separately from the creel are wound to form a rope, which is then wound onto a beam (the ball). The second stage involves dyeing. In this process, 12 to 36 balls are taken off under a controlled tension and fed to the dyeing section as ROPES. Once they have passed through the dyeing section, the individual ROPES are coiled into cans. In the third stage, the ropes are opened out and the yarns are wound next to each other onto a beam. During sizing, which is the last stage in the processing sequence, 8 to 24 beams run together under a controlled tension through the sizing machine. The final weaving beam is produced by a beaming/winding process.

Fig. 4 shows the differences between the two processing sequences. Both processes are becoming more and more important because of the different quality requirements of the market.

The DENIM articles produced have to meet international quality standards (Wrangler Blue Bell, Levi Strauss, etc). Conventional INDIGO dyeing (up to 5 % fixing) is more important now than ever before. The simultaneous move away from traditional DENIM work clothing towards avantgarde, high-fashion leisu-rewear means that the processing machinery has to be extremely flexible and adaptable.



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**Control technology**

Modern drive technology in the shape of KARL MAYER's KAMCOS® control technology represents a milestone in terms of user-friendliness and reproducibility. Customer-oriented process monitoring and control of the yarn tension, squeezing force and dye uptake represent the perfect product for the market (Fig. 5). The use of high-resolution, accurate yarn tension measuring rollers (load cell), conical edge yarn guides, specially designed grooved guide rollers, and an integrated yarn compensating roller lifting system guarantee accurate, reliable and compact material feed through the entire machine.

The resulting uniform working width, homogeneous yarn loading and high machine efficiency herald a new era in terms of product quality and also reduce wastage (rejects, seconds).

The KAMCOS® technology supplies the operators with accurate information on the tension and elongation behaviour during and throughout all the various chemical treatment stages.

The INDIGO PILOT ancillary system, with integrated ONLINE titration, as well as evaluation and calculation software (Fig. 6) guarantees accurate starting recipes and constant dye liquor concentrations for the indigo dyes, alkalis and reducing agents.

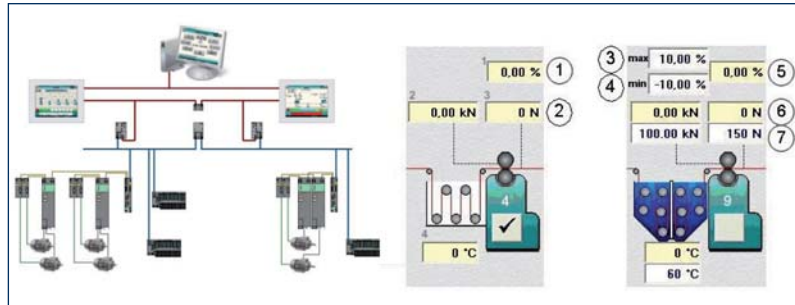


Abb. 5: Control technology used on KARL MAYER's machines



Fig. 6: The INDIGO PILOT ancillary system, with integrated online titration as well as evaluation and calculation software



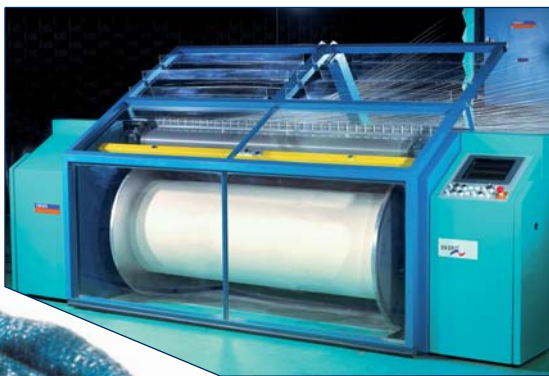
# Machine technology for DENIM processing

## Creels (Fig. 1)

- customised parallel, swivel-frame, magazine and „V” creels (for extremely fine menswear, womenswear and fashion garments), equipped with ancillary equipment, such as balloon breakers, tension-equalising rods and knotting and cutting devices
- customised configuration of the creel for carrying packages having diameters of up to 320 mm and for a package number of < 1,000
- controlled and regulated yarn tension with braking devices tailored to suit the article being processed



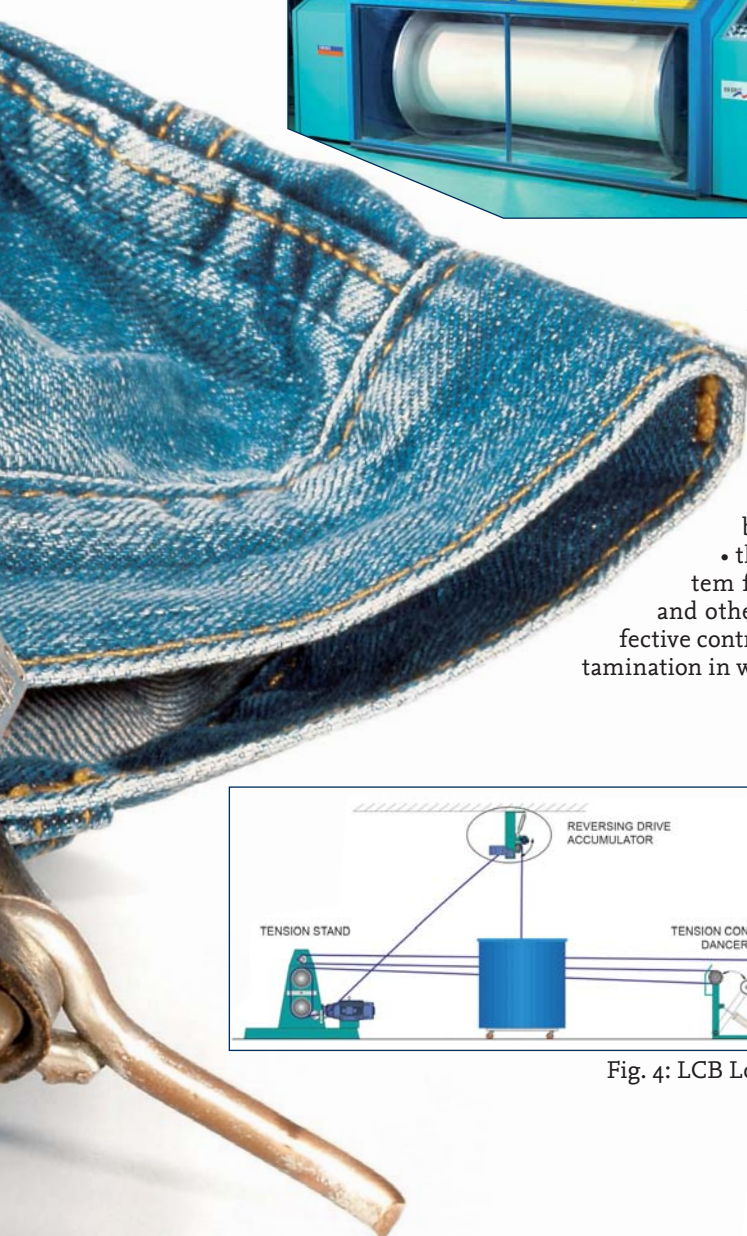
Fig. 1: Yarn delivery to the warp preparation machines



## BEN DIRECT direct beaming machines (Fig. 2)

- can produce beams having diameters of up to 1,400 mm and uses an electro-hydraulic, self-centring, toothed, sharply-tapered beam mounting
- an accurate presser roller mechanism, including an automatic kick-back facility, ensures that the beams are wound so that they are perfectly cylindrical

Fig. 2: BEN DIRECT direct beaming machine



## BW-T60 ball warper (Fig. 3)

- regulated, tension-controlled, gentle and accurate formation of ropes for producing beams having a maximum diameter of 1,500 mm
- synchronous braking using pneumatically controlled disc brake technology
- the SVS integrated suction system for reliably removing dust, fly and other loose particles makes an effective contribution towards reducing contamination in wet treatment

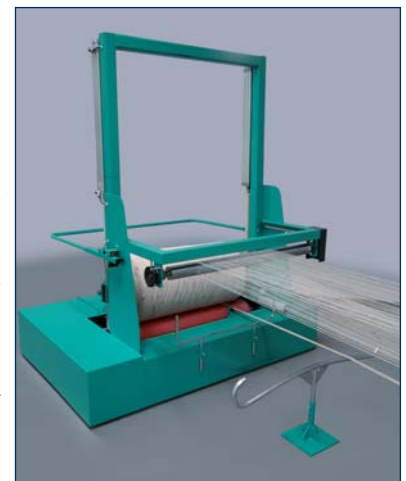


Fig. 3: BW-T60 ball warper

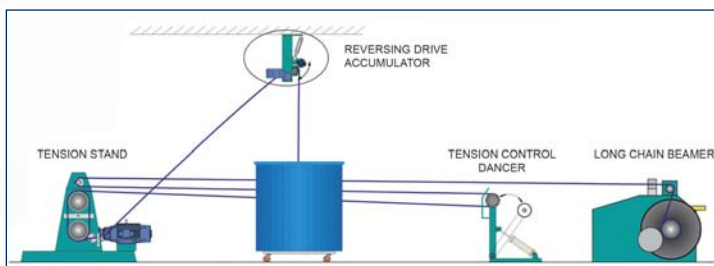


Fig. 4: LCB Long Chain Beamer

## LCB long chain beamer (Fig. 4)

- pneumatically operated, self-centring, toothed, sharply-tapered beam mounting for producing beams having a maximum diameter of 1,000 mm
- an infinitely adjustable presser roller device, including automatic kick-back mechanism, guarantees perfectly cylindrical beam winding
- rope feed, with integrated, reverse-driven compensator, enables the operating status to be changed at high speed at constant rope tension levels
- ancillary systems, such as a coiler can drive, single-end winder and a yarn strummer



Fig. 5:  
RN beam creel  
with tension  
controller

**RN beam creel with tension controller (Fig. 5)**

- shaftless beam mounting with ball-bearing guide rollers for beams having a diameter of up to 1,400 mm
- pneumatically operated band brake for beam braking
- controlled braking pressure for keeping the yarn tension constant for speed-dependent start/stop ramping

**VARIO SINGLE and VARIO DOUBLE application systems (Fig. 6)**

- optimised application systems with efficient flow patterns guarantee flexible and process-specific immersion lengths (1.5 m to 11.5 m) and immersion times during pretreatment and dyeing
- improved handling, reduced cleaning times and stable liquor baths during machine downtimes, thanks to an integrated system for raising the immersion roller
- 25 % reduction in the consumption of chemicals, thanks to efficient liquor exchange at the textile material
- Circulation rates of > 6 x/h in the cross-flow process guarantee completely uniform liquor mixing
- integrated, indirect heating systems enable a range of dyeing techniques, such as reactive, sulphur and indanthrene processes, to be carried out flexibly and reliably
- ancillary systems, such as steamers and contact and radiation driers, complete the range of equipment available for effecting dye diffusion and penetration
- squeeze roller pairs operating at 100 kN and roller diameters that are harmonised with each other guarantee uniform fabric transport, and avoid variations in the circumferential speed at the textile material



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**QUICKOXIDATION, the quick oxidation zone (Fig. 7)**

- a blowing unit, which is controlled by means of the temperature and volume of air, accelerates the oxidation process during indigo dyeing
- the production equipment guarantees stable climatic conditions over the whole day and at all times of the year



Fig. 6: Graphic und Layout of VARIO SINGLE and VARIO DOUBLE application systems

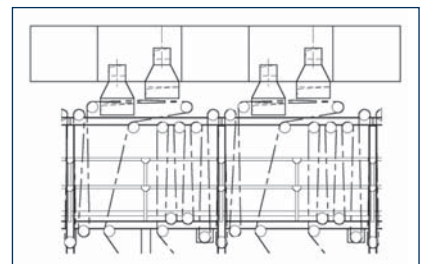
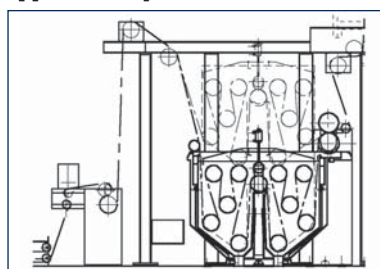


Fig. 7: Graphic und Layout of QUICKOXIDATION, the quick oxidation zone

**WT-3 and WT-4 wash troughs (Fig. 8)**

- integrated 3- or 4-cascade wash liquor zones conserve resources
- optional additional intermediate squeezing units, a wash liquor separator, fresh water spraying devices and integrated liquor circulation for additive preparations
- use of squeeze roller pairs operating at 100 kN and roller diameters that are harmonised with each other are also used during washing to optimise material transport

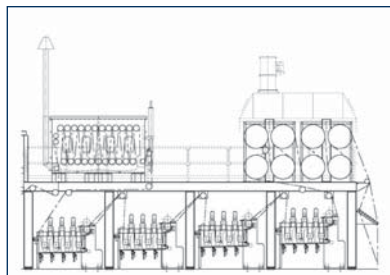
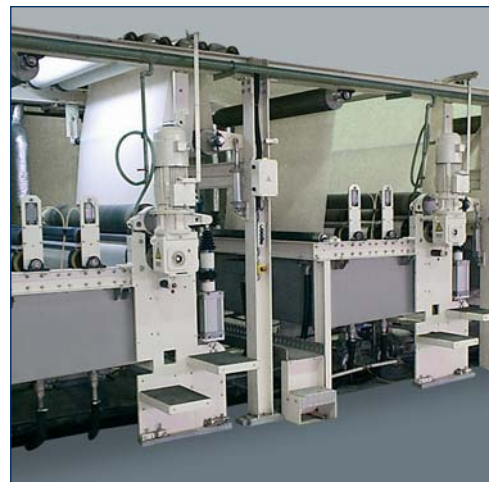
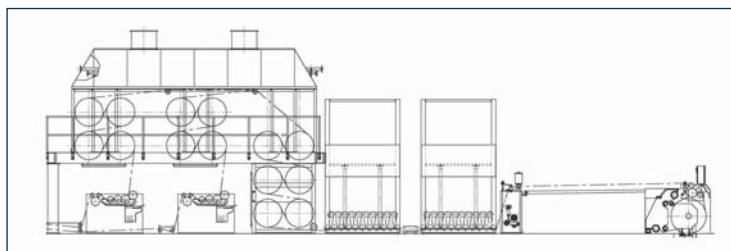


Fig. 8: Graphic und Layout of WT-3 and WT-4 wash troughs

**SMR sizing machine (Fig. 9)**

- combines KARL MAYER's KAMCOS® control technology with user-friendly operation, exact reproducibility and first-rate process control
- the CSB universal size application system guarantees compact yarn feed and short yarn paths, with and without a prewetting unit
- exceptional sizing quality and top performance during weaving can be achieved with yarn loading volumes of  $\leq 100\%$
- cylinder driers available as „full warp” or „sectional warp” versions (with partial Teflon coating) for rapid drying without damaging the yarns
- tension-controlled roller compensators, together with weaving beam changing times of  $< 3,5$  minutes, guarantee constant production speeds

Fig. 9: Graphic und Layout of SMR sizing machine

**Summary**

The innovative, client-oriented INDIG-O-MATIC dyeing and sizing machine is a cleverly engineered machine for economically and ecologically producing uniformly dyed and sized weaving warps. The developments introduced over the last few years have not significantly changed the principles of indigo dyeing. However the processes and existing techniques have been systematically improved and revamped, so that optimum solutions, which conserve resources, are now available to suit every application.

The INDIG-O-MATIC machinery produced by KARL MAYER, and the KAMCOS® control technology, which is applicable to all the machines, enable users to determine where and how faults and weak areas in the processing chain can be eliminated most economically.

The users must decide for each individual case whether it is more economical to buy in a yarn of better quality, or to put greater value on dealing with faults than on productivity.

It is important that any weak spots in the yarns are detected and eliminated before the dyeing and sizing processes.



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