

BENNINGER



BEN-DIMENSA
Mercerization Systems.



Precise
Mercerization





15 opportunities for decisively improving the profitability of your operation

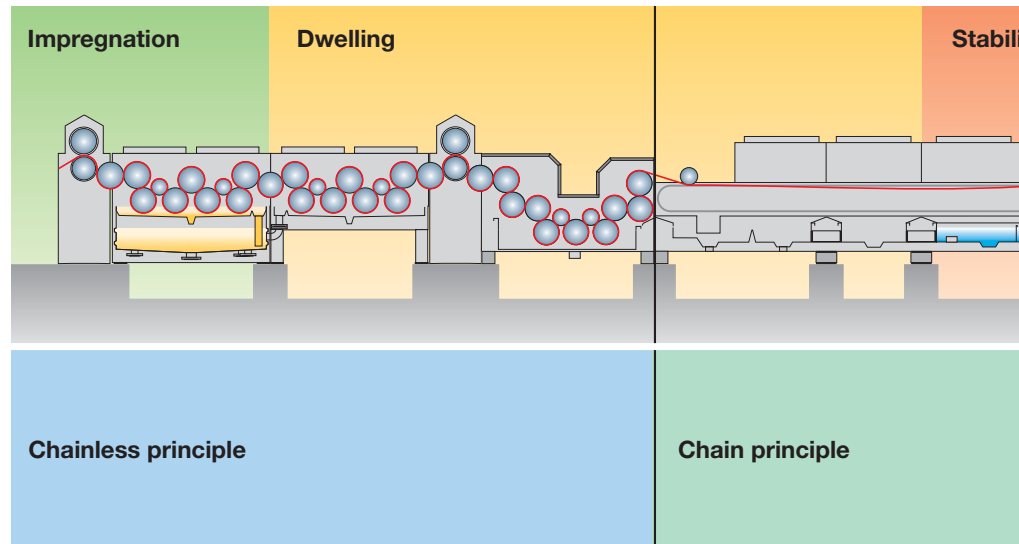
1. Less lye, water and steam consumption
2. Shorter downtimes and set-up times
3. Length and width gains
4. No pre- or post-stentering operations
5. No off width claims
6. Less 2nd quality dyed goods
7. More rational cutting of yarn-dyed fabric because of selvage to middle consistency
8. Less resin treatment
9. Better dimensional stability
10. More level appearance; fuller touch
11. Lower space requirements
12. No expensive cooling for reaction heat
13. Up to 30% less lye, water and steam usage
14. Better finished width for a given residual shrinkage
15. Better length for a given finished width

You have 15 opportunities to decisively increase the profitability of your operations. And also exactly the same number of reasons to rethink your mercerizing process and to invest in a DIMENSA. With the DIMENSA you improve quality and simultaneously lower costs to an astounding degree.

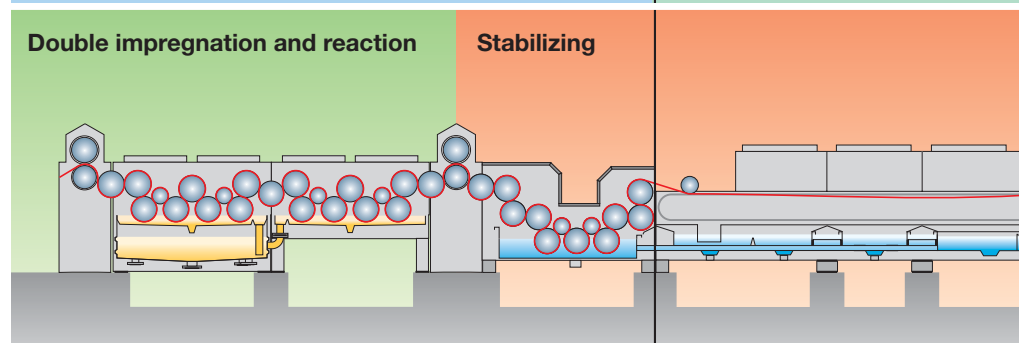
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DIMENSA for lightweight and heavy woven fabric, with the same machine concept

For light and medium fabric



For heavy fabric

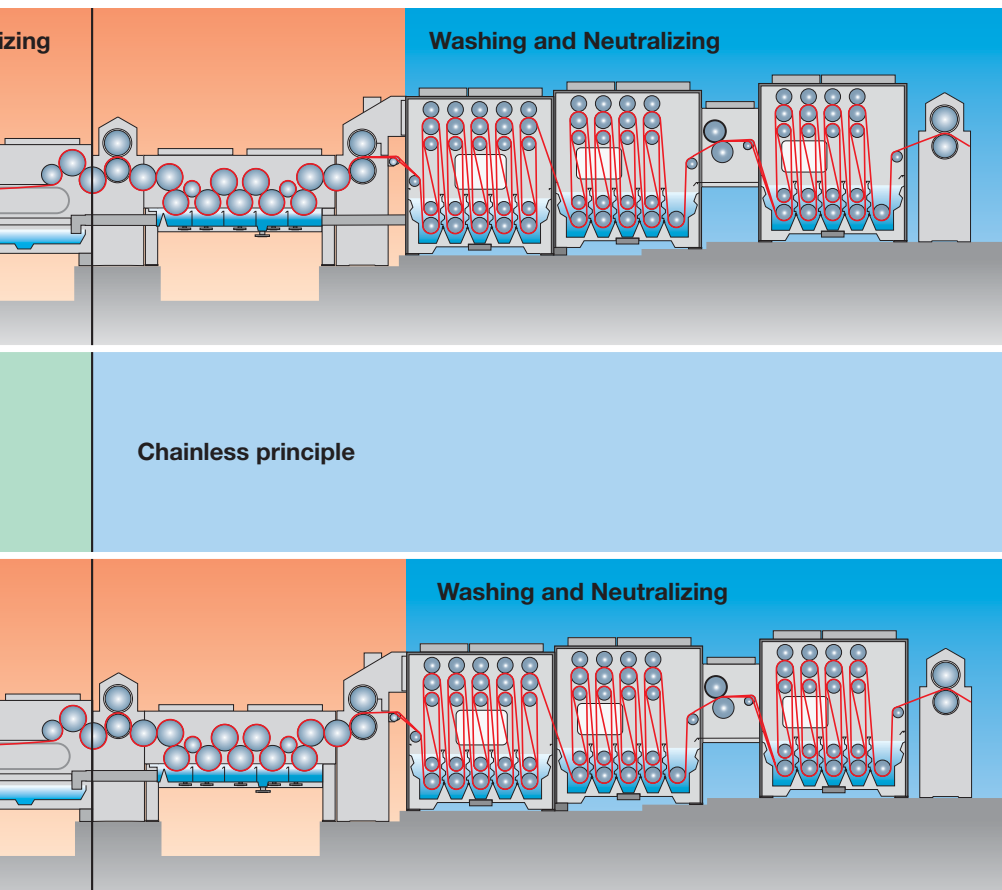


- **Patented and unique combination of a chain and chainless system with permanent positive fabric guidance**
- **Hot mercerization with all its advantages**

Alongside lustre, colour and touch, dimensional stability is the most important objective of present day mercerization. These demands are possible with the DIMENSA which no other machine can provide. The length and width of the fabric can be influenced at will within the physical limits on the DIMENSA. This as a result of the combination “chainless positive guidance” and stenter frame.

The layout of the range can be seen in the fabric run diagram. The intensive impregnating zone is followed by the reaction zone. In this area fabric guidance is on the chainless principle. At the start of the stabilizing zone, that is immediately after the mercerizing section, there is a stenter section using the chain principle. Ultimate stabilization is in a conventional, highly effective stabilizing compartment with chainless guidance. The final section comprises a high-efficiency washing and neutralizing zone consisting of EXTRACTA, or TRIKOFLEX compartments.

Best dimensions after mercerizing



How do we define the mercerizing process?

There are two conditions that have to be met for wet-on-wet mercerizing:

- Lye content 200–240 grams NaOH per kg fabric
- Concentration of the entire liquid film 28 °Bé

Today the same demands are made on mercerizing for light as for heavy fabrics. Despite logistic difficulties, nowadays on account of price practically only the wet-on-wet process is practised. This imposes new demands on process engineering and machine design alike.

Impregnation/reaction zone

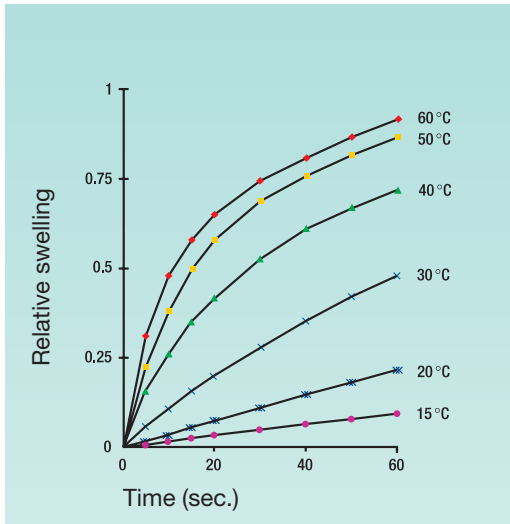
- With lightweight fabrics a high liquor exchange is attained, so that both limits are maintained (grams NaOH per kg fabric and °Bé) with a short impregnationzone.
- The same concentration is used with heavy fabrics, though excess caustic soda solution is made available to the cloth during the reaction phase. The fabric is repeatedly impregnated with caustic soda by additional spray pipes in the roll passages. Squeezing is effected by the weight of the rolls and the cloth tension. This ensures that both the concentration in the liquid film and the lye content satisfy the requirements.

Stabilization zone

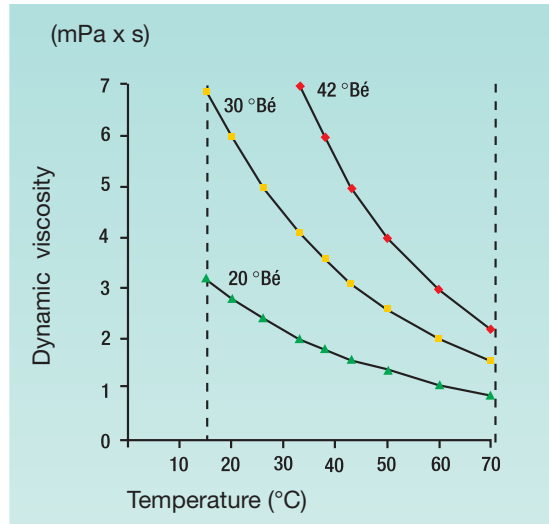
With the classic DIMENSA concept the lye extraction process is initiated by intensive spraying with weak lye after the transfer compartment in the middle of the stenter frame. Heavy cloths are sprayed immediately following the stabilization compartment in the transfer compartment, i.e. preliminary lye extraction. In this way the same lye extraction levels are reached at the end of the stenter for light and heavyweight fabrics.

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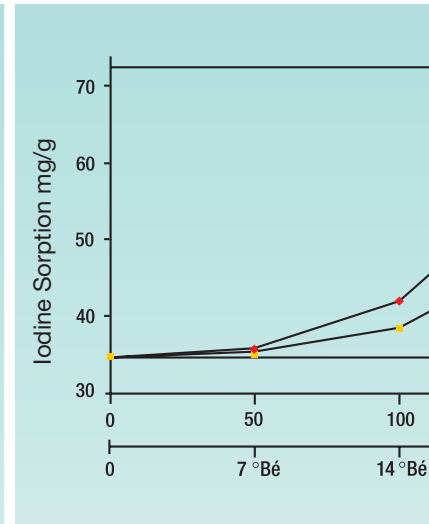
Intensive impregnation in hot lye



Relative swelling of cotton vs. temperature.



Viscosity of caustic soda solution vs. temperature.



Comparison hot-cold mercerisation.

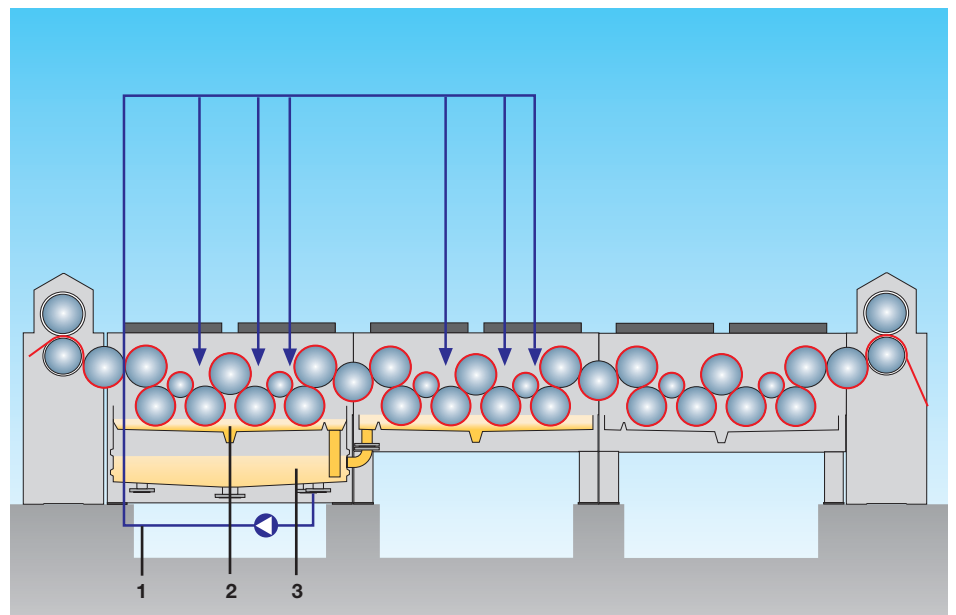
- Faster caustic soda penetration, speedier swelling
- High swelling uniformity, no ring mercerizing
- Better dye penetration
- Smoother cloth appearance
- Softer handle

- Shorter impregnation times
- No cooling needed for mercerizing
- Maximum squeezing action at infeed squeeze
- Lower investment cost through shorter impregnation sections

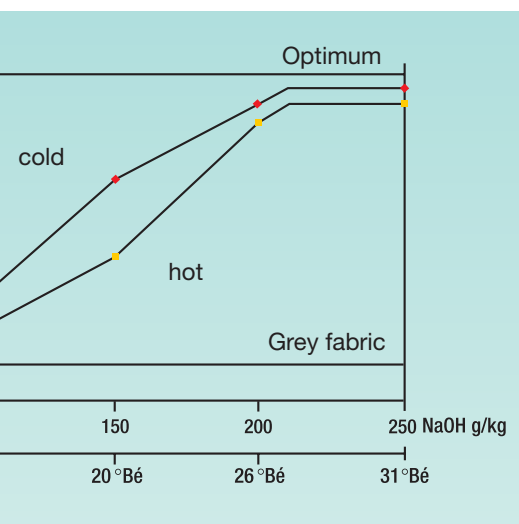
Investigations by Bechter reveal that with an impregnation concentration of 28–30 °Bé, or 250–300 g NaOH 100% per litre (215–240 g NaOH 100% per kg) there is no significant increase of iodine sorption or dyestuff uptake. This means optimal mercerization is accomplished with a concentration of 220–240 g NaOH 100% per kg cloth on the fabric.

With unchanged process lye concentration the combined impregnation and reaction compartment can be flooded or drained very quickly. That way optimal impregnation conditions can be provided by single impregnation for lightweight fabrics and double impregnation for heavy cloths, allowing mercerizing at the same speed. Our experience indicates a weight range around 250–300 g/m² for changing the impregnation conditions.

- 1 Liquor supply
- 2 Impregnating trough
- 3 Preparation tank with temperature and concentration



Short and hot ...



Short and hot ...

During hot impregnation the lye penetrates faster and more evenly into the yarn core. Swelling therefore does not take place only on the fabric surface. As compared with cold impregnation the swelling behaviour is considerably better and has a positive influence on the dimensional stability. The more uniform

swelling gives, with dyed goods, a more equal appearance. With the wet-on-wet method the exchange factor is increased thus permitting a shorter impregnation zone than with conventional processes.

In addition, the lye volume is kept very low. The lye concentration is simple to control. The lye bath has been kept purposely small and under it there is one single lye tank integrated into the machine.

The process lye is continually circulated and the temperature and concentration monitored. The automatic lye control permits the addition of fresh lye, water or recovered lye of 20 to 40 °Bé from recycling.

Reaction heat is emitted when mixing the process lye. In hot mercerizing this is utilized, while in cold mercerizing it causes an energy consuming lye cooling process.

Squeezing to lower lye content is possible with hot mercerizing. The lower lye consumption provides savings in water and steam at lye extraction.

The versatility of the DIMENSA permits every textile result concerning the mercerizing effect. This is achieved by objective selection of the process parameters such as:

- Lye temperature
- Lye concentration
- Lye reaction time
- Fabric lengthwise and crosswise tension

The thus optimized process provides the best mercerizing effect with savings in lye, water and steam.

In comparison with other mercerizing ranges the small lye volume permits very fast changes in concentration and, therefore, short production interruptions. No lye losses occur at changes. Therefore change over to a lower lye concentration is profitable with the DIMENSA for the covering of immature cotton.

Savings of lye, washing water and steam are money for your account.



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The reaction takes place during the dwell time

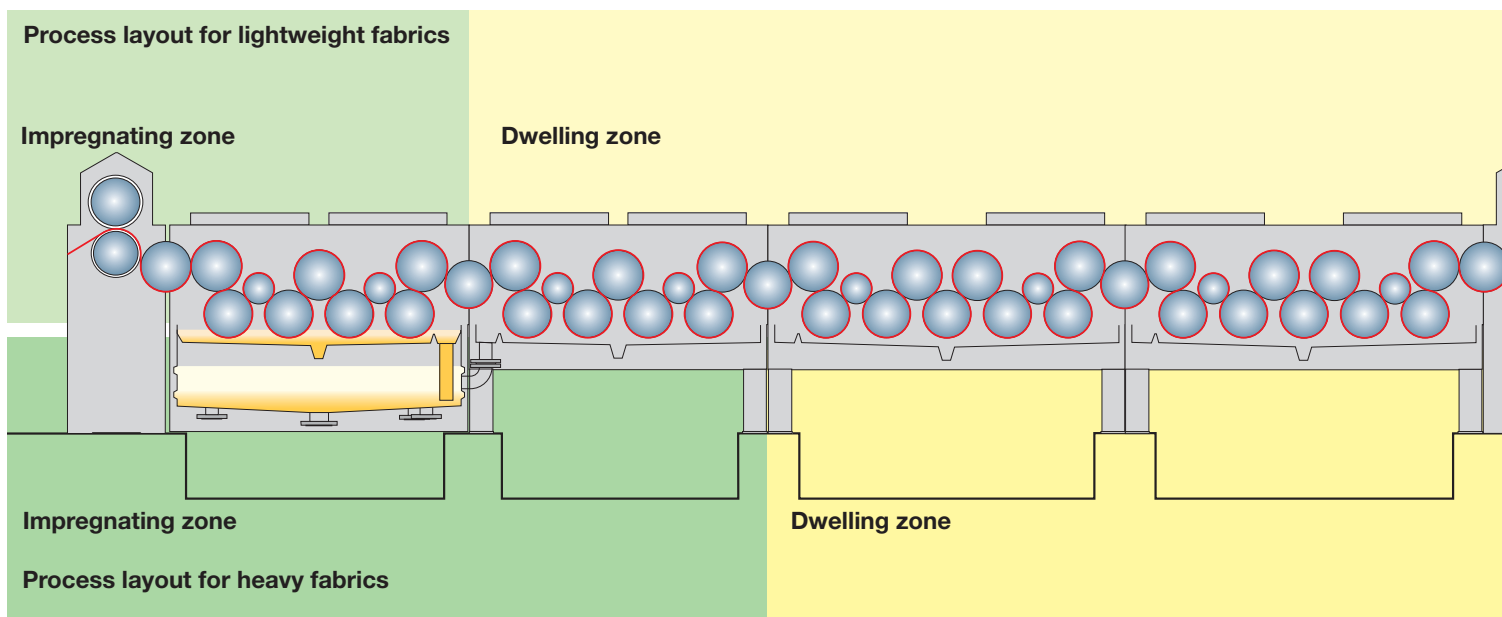
Instead of 45–50 seconds as with cold mercerizing, the same effect can be obtained in only 25–30 seconds with hot mercerizing. In order to keep width contraction as low as possible, the fabric is kept under constant tension during the reaction phase.

No selvage to middle differences occur with the DIMENSA

In the retention compartment of the DIMENSA the proven chainless principle with lifting top rolls is employed. The retention compartment is not flooded.

On the DIMENSA MS the cloth is pinned onto the integrated stenter at the end of the retention compartment.

On the DIMENSA ML the retention zone consists of a chainless reaction compartment only.



DIMENSA highly superior



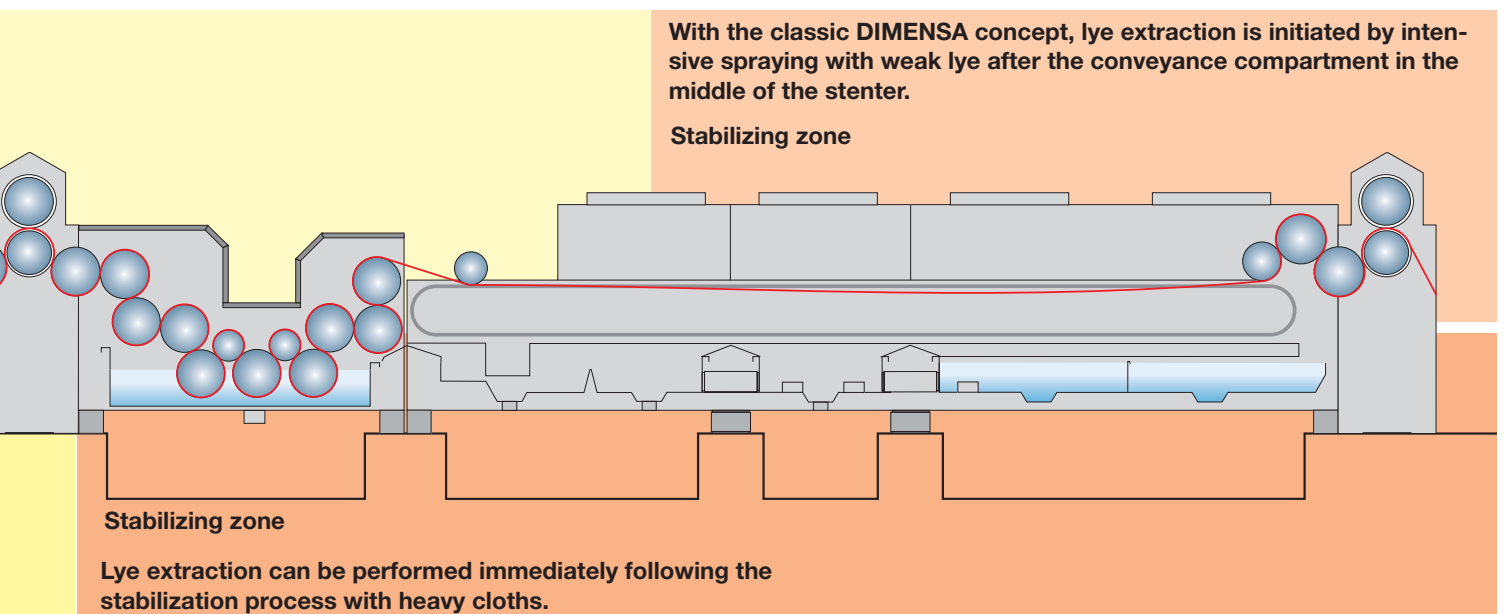
An economic factor par excellence

It is common knowledge that the dimensions of cotton fabrics can be stabilized by the effects of caustic lye. The values decisive for the results are:

- The dimensions warp and weftwise
- The lye concentration on the fabric, and both at the moment when the fabric leaves the positive guidance at the end of the stabilizing zone. The residual shrinkage present at this point is memorized by the fabric and remains unchanged even after subsequent mechanical distortion

In the forefront of the requirements is usually the adherence to a given finished width with a given residual shrinkage after a wash test.

With optimum mercerizing and ideal fabric guidance values can be realized which can come up to shrinkage-free performance. This is the case on the DIMENSA.

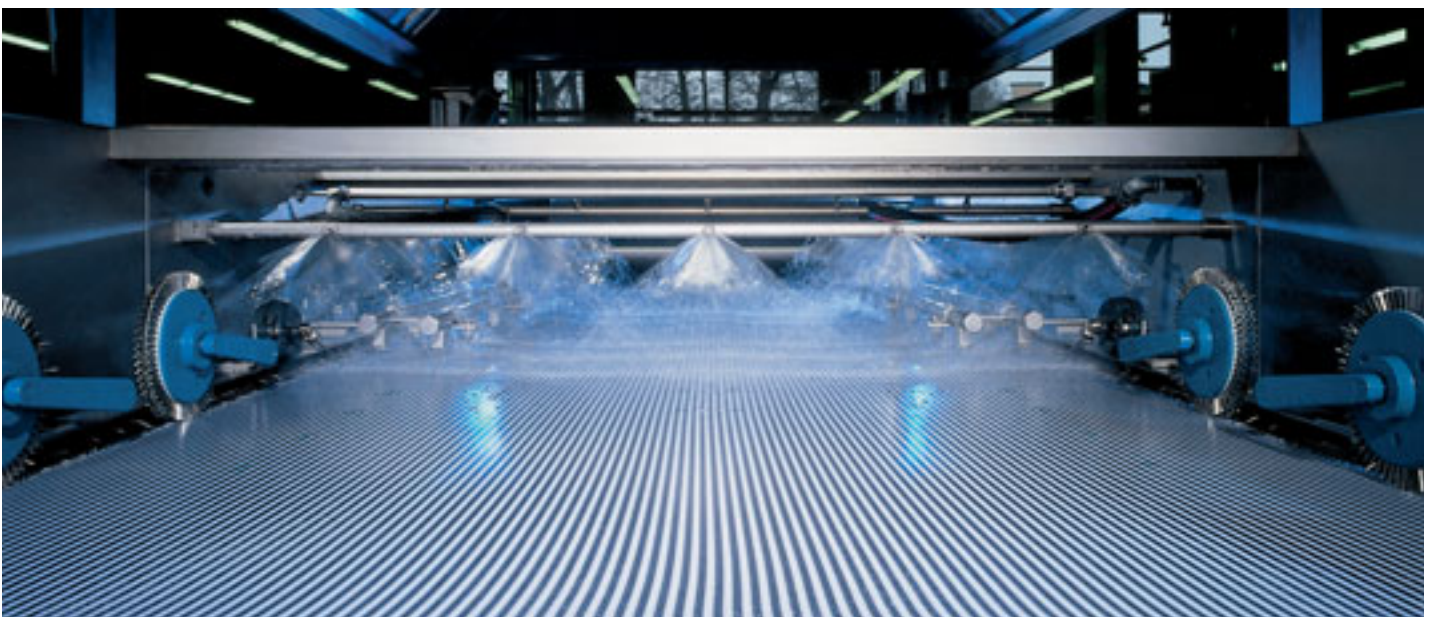
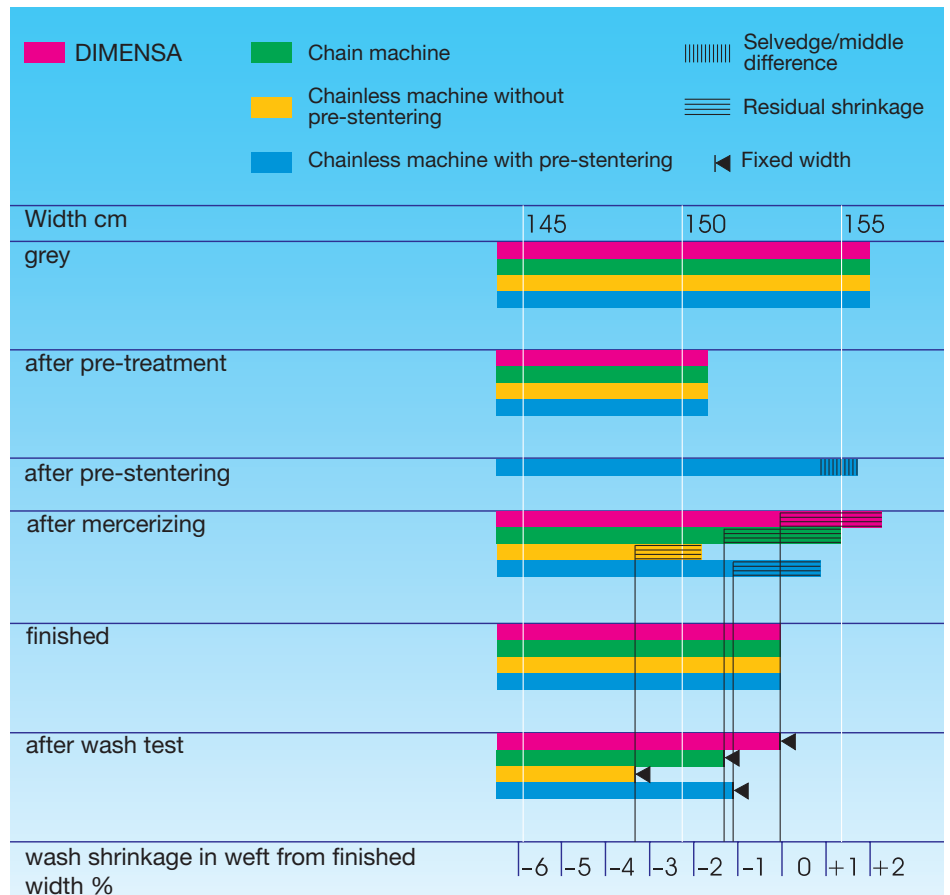


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DIMENSA memorizes the fabric dimensions

The uniformly applied lye is now to be removed. On the DIMENSA hot weak lye is first sprayed onto the fabric. In this manner the shrinking forces are partially decreased. In this condition the fabric can be stretched to the desired width with comparatively little force. Selvage to middle differences are prevented or compensated by a special selvage lye extraction process.

In the stenter frame an increase in the fabric width can also be very well achieved. Longitudinally the needle chain permits stretching by increasing the speed, or shrinking through fabric over-feed. The needle chain leaves no marks in the selvage and guides the fabric accurately, even under the extreme conditions of high width tension and high shrinking forces.



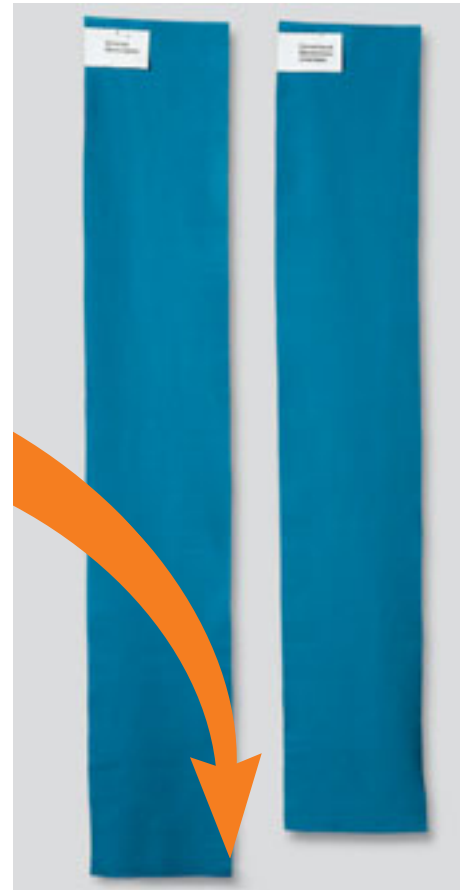
Washing and neutralizing with a concentration controlled water supply

Lye extraction on the stenter frame does not suffice to prevent subsequent shrinkage in the washing machine. When washing with free shrinkage, the opened spiral coils in the cotton fibres are partially closed causing irreversible dimensional changes. In order to suppress this effect and to carry-out-further lye extraction before entry into the washing compartment, Benninger has a further zone with permanent positive guidance after the stenter frame. Only completely opened spiral windings in the cotton fibre lead to the acknowledged improvement in dimensional stability, tenacity, lustre, etc.

At the end of the stabilizing operation the caustic soda concentration has been so far reduced that no further permanent changes occur. The molecular changes in the morphological structure in warp and weft at the end of the stabilizing zone are memorized. In subsequent finishing operations such as stentering, dyeing and washing the dimensions are not irreversibly influenced.

Any residual alkali is now washed out in the washing machine. Depending on the fabric elasticity the EXTRACTA roller vat or the TRIKOFLEX drum washing machine is used to prevent longitudinal distortion and width contraction.

The amount of washing water is economical and objectively controlled by measuring the weak lye concentration at the fabric infeed in the stabilizing zone (stenter frame or chainless stabilizing compartment). Exact neutralization of the fabric is ensured through automatic pH control.



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DIMENSA enhances the fabric appearance and the quality



The use of hot lye in the DIMENSA is important for more level and uniform dyeing results. With this method a more consistent wetting and swelling is achieved, without the use of auxiliary chemicals. Only the patented DIMENSA mercerizing process fully utilizes the action of the alkali treatment on cotton.

Mercerizing processes which permit partial or full free shrinkage in the reaction and stabilizing zones also provide an improvement in the dyeing behavior, but do not provide optimum exploitation of the potential for dimensional stability, tenacity and lustre. Mercerization with the DIMENSA encompasses all possible improvements of these properties.

Further positive features of tensioned mercerizing are:

- Orderly orientation in the crystal areas
- Removal of fibre unevenness
- Increasing the number of micropores
- Unification of the pore size

And from these result:

- Better residual moisture
- Better lustre
- Better dyeing behaviour with an increased dyestuff yield
- Better handle
- Coverage of immature cotton



Profit from the advantages of the DIMENSA

Test a shirt or blouse. In yarn dyed fabrics selvedge-middle differences become conspicuous faults when poorly cut. You do not have this problem with the DIMENSA.



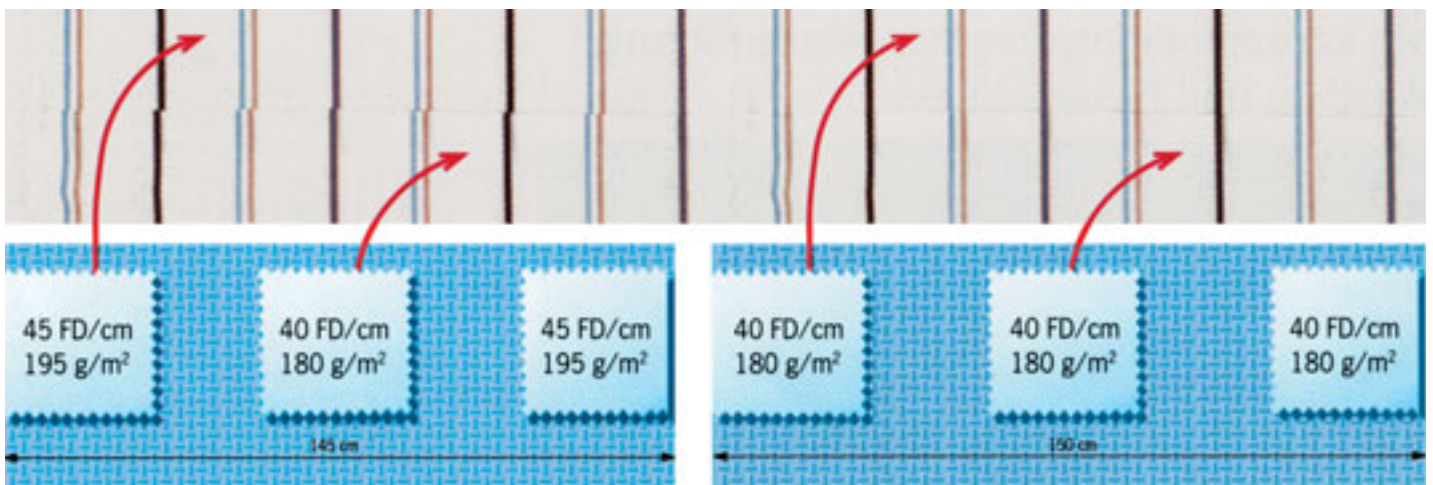
Width gain and high dimensional stability are compatible on the DIMENSA

You achieve a bigger finished width. In spite of that, the quality standard of the shrinkage value is not impaired. On the contrary, through the width stretching in the stentering frame and the subsequent excellent stabilizing, a distinctly better stabilized width is achieved than on conventional mercerizing machines. The relationship of finished width to shrinkage in the weft direction is clearly improved.

Constant warp density over the whole fabric width

An increased number of ends in the selvedge zone leads to pattern distortion in yarn dyed fabrics, and in dyed fabrics to side-to-centre shading. With the DIMENSA denser selvages are avoided. In spite of the gain in width the mass per unit area does not proportionally diminish as mainly the denser selvages are equalized.

The DIMENSA fulfils textile producers' wishes.

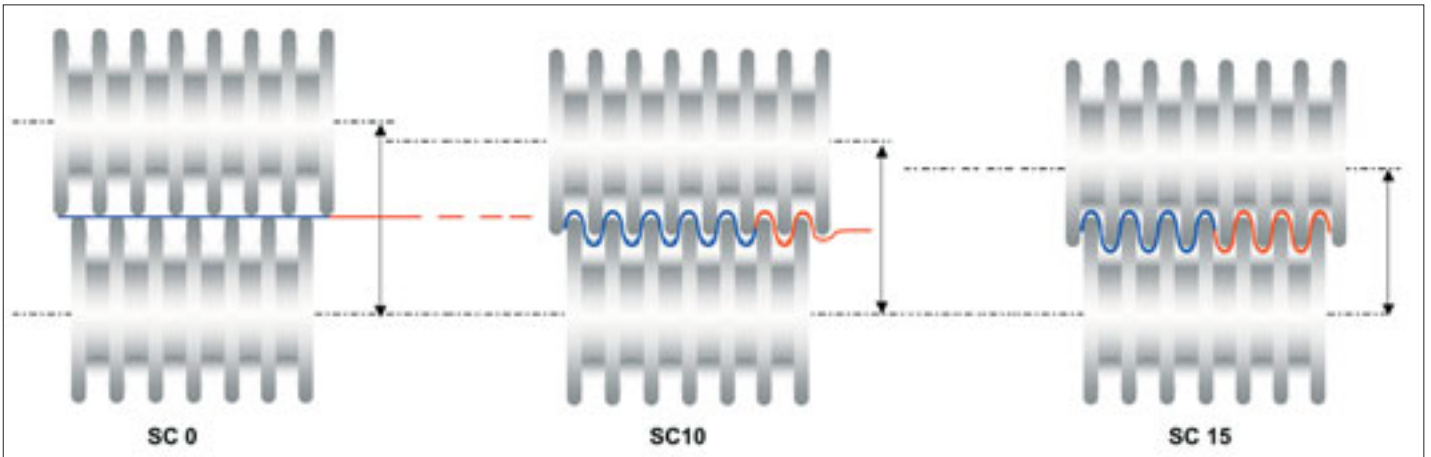


Traditional mercerizing results with selvedge thickening and deviations in weight per unit area.

DIMENSA corrects irregularities caused by processing and increases the stabilized fabric width.

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Section Control



Section Control

This newly developed innovation is a mechanical selvage stretching unit integrated into the machine concept of the DIMENSA.

With the section control an instrument is available that effectively prevents selvage thickening on woven and knitwear.

No more incorrect dimensions

Fabrics can be contracted or stretched. Compared with conventional mercerization, the shrinkage values are substantially better.

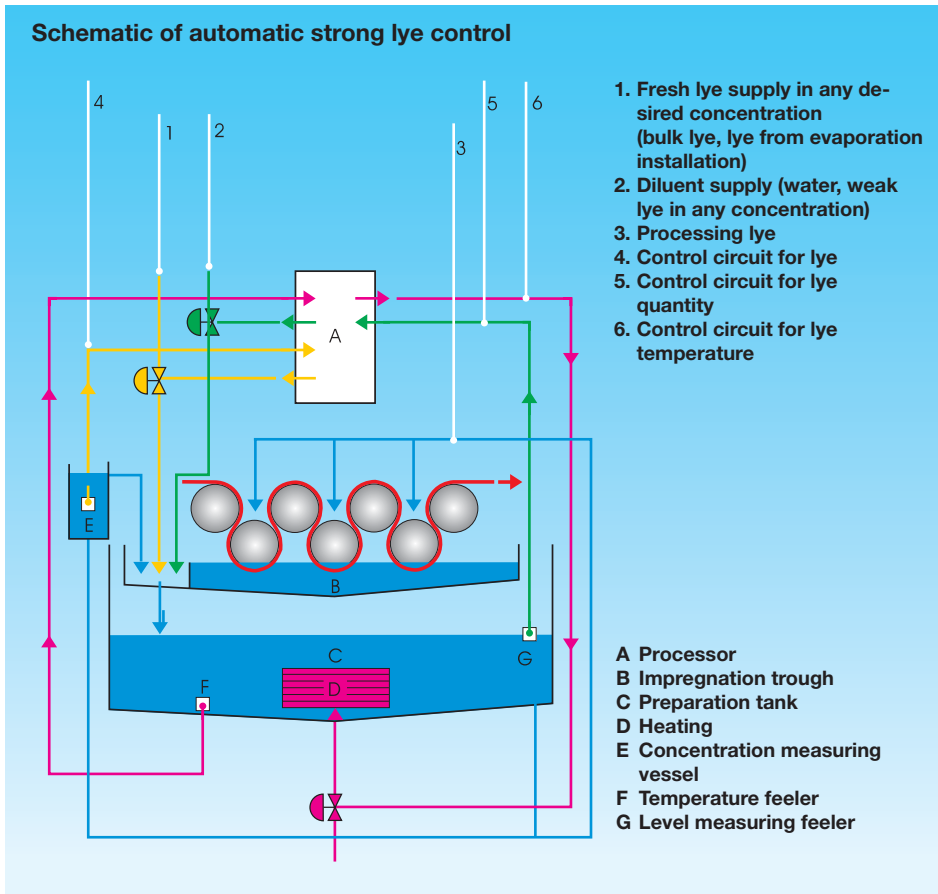
In order that no fabric destroying tensions are created, it is important to set a length or width gain. The fabric tension has a positive influence on the mercerizing process in that the opening of the spiral windings in the cotton fibres is increased. Even as fibre contraction occurs when mercerizing, the tension leads, in the end,

to lengthening. According to requirements this can be achieved in the warp or weft direction on the DIMENSA.

Selvage lye extraction to correct edge thickening.



DIMENSA predestined for automation



High degree of automation, simple operation

The DIMENSA concept provides very good requisites for automation. Benninger can automate the range to any degree. The decisive factor are the customer's requirements. All important data can be set and monitored on a central control panel or CRT screen.

Elegant strong lye management

The short impregnation compartment results in a low liquor volume. With the DIMENSA, neither topping-up nor storage tanks are necessary. Temperature and concentration are preselected at the control panel, automatically prepared and held constant during production by the control system. It is quite possible to supply the strong lye and the liquor for diluting with differing concentrations. Increases in lye volume as a result of changes in concentration are collected in the preparation tank under the impregnating trough. Changes are possible within a few minutes.

Constant fabric speed, constant lengthwise tension

The drive is automatically kept at a constant fabric speed and constant lengthwise tension. In the standard model the lengthwise tension control is over oscillating rolls, but at the entry to the stenter zone by means of ratio-metering. On request and with knitted goods only ratio-metering is foreseen.

Automatic control of the weak lye concentration

Usually only a part of the weak lye can be used in the preparation of the strong lye and in bleaching. Instead of delivering the excess to drain, it can, as an economical solution, be evaporated.

Because of the special configuration of the stabilizing zone on the DIMENSA, a weak lye concentration of 6–10 °Bé can be achieved, which is very favourable for evaporation, without reducing the lye extracting effect. Practice has shown that 75–80% of the strong lye needed can be recovered from the weak lye.

Reproducible effects

Through the high degree of automation, all parameters which influence the fabric appearance such as reaction times, bath temperatures and concentration, fabric length, fabric width, etc., are constant and reproducible. Thus any treatment effect which has been achieved once can be reproduced without any trouble whatsoever.

Locations

BENNINGER

- 
- **Head office**
Uzwil, Switzerland
 - **Subsidiaries**
Mumbai, India
Shanghai, China
Zell, Germany
Zittau, Germany
 - **Representative office**
Moscow, Russia

The Swiss company Benninger has been the textile industry's leading partner across the globe for one hundred and fifty years with global branches and service representatives. Benninger develops and manufactures textile finishing and cord production ranges as well as providing complete system solutions. As the market leader Benninger will continue to rely on its comprehensive process know-how in order to be able to offer high-quality installations with excellent customer service.

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