DILO SYSTEMS

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VDMA
MADE IN GERMANY

DILO
MACHINES
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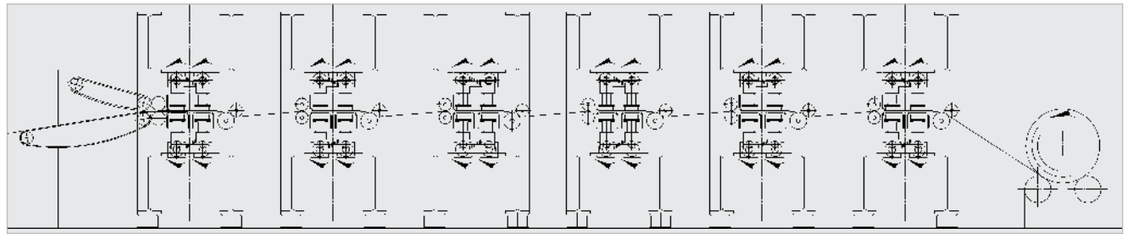
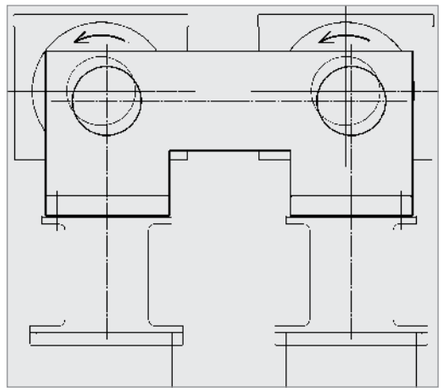
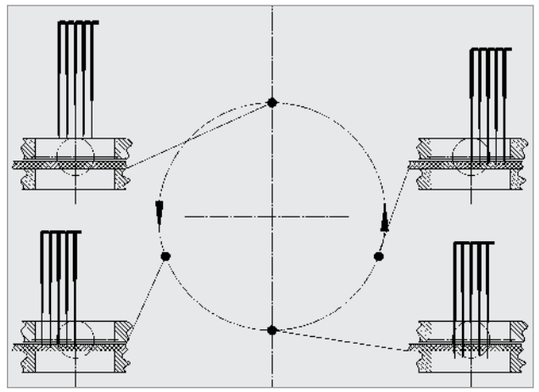


▲ Hyperlacing line



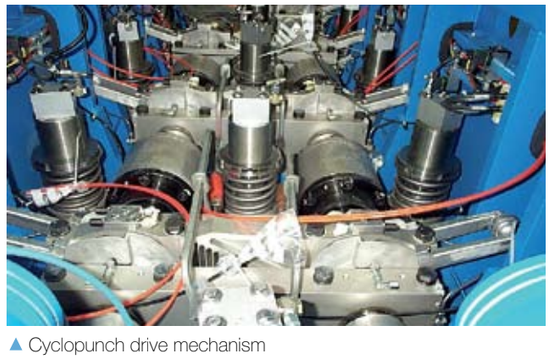
▲ Excentric drive systems needle beams



▲ Circular needle kinematic

HPLC TECHNOLOGY HYPERLACING WITH CYCLOPUNCHING

There is growing demand for light-weight disposable nonwovens in the medical and hygiene fields. An array of products is to be manufactured with an area weight between 30 and 80 g/m² out of polyester, polypropylene and viscose fibre blends with a related fineness of 1.7 up to 3.3 dtex.
Increasingly aspects of environmental protection have to be taken into account in the nonwovens industry.
Global warming is a threat and therefore energy conserving production methods have come into focus. Lack of fresh water supply is an additional argument for wider applications of the needle punching technology which is a preferred bonding method when low energy



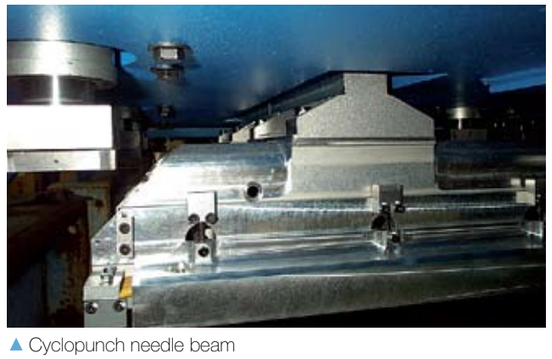
▲ Cyclopunch drive mechanism

consumption and raw material savings are to be considered.
So far, needle punched staple fibre products are dominant at weights above 100 g/m². New needling techniques for elliptical and circular needling will, however, become a valid alternative to other bonding methods in the light-weight area. Together with advances in the field of web-forming, high-speed and high-precision crosslapping as well as web and batt drafting, needling for the lighter range between 30 and 80 g/m² has become very interesting.

Dilo has therefore developed the “Hyperlacing technology” which is a high-density needling method for light-weight nonwovens out of fine fibre.

Hyperlacing line

Hyperlacing technology is based on fine staple fibre from polypropylene, polyester and viscose fibre blends of about 1 up to 3.3 dtex. The minimum weight is as low as approx. 25 g/m². The web-forming is carried out by high quality carding, using even card-feeding with the “VENTOFEED” and a double doffer DeltaCard for homogenous



▲ Cyclopunch needle beam

blending of the fibres during the carding process. High speed crosslapping with the “HyperLayer” provides maximum throughput and layering precision. A closed-loop control system including online measuring of the batt weight distribution is recommended.
The crosslapped batt or a direct card web of several layers, or a combination of both is provided to the pre-needling station with batt-feeding and “EPMC Hyperpunch” pre-needling.

The fine surface quality and regularity provides a special appeal. Since the high density entanglement holds the individual fibres firmly in the fibrous structure, there is a high degree of abrasion resistance against frictional surface forces.

The “Cyclopunch” needling unit has introduced a completely new kinematical concept for the needle beam movement.
It provides a translatory and circular moving path for the needle which is driving the light-weight fleece actively through the needling zones. High-density needling is performed with small dimensional changes and distortion in the fabric plane. Each Cyclopuncher unit applies 4 needle boards – 2 down-stroke, 2 up-stroke – in the alternating or simultaneous needling mode. The stroke frequency of up to 2,000/min. allows throughput speeds of over 100 m/min.

The “Cyclopunch” units are arranged in a series on rails to provide easy access to the individual unit for maintenance and cleaning.

Cyclopunching

Subsequent in-line or off-line intermediate and finish needling stations based on Hyperpunch or “Cyclopunch” units allow high density needling which is based on the concept of individual fibre transport. Specialty needles with one barb at one edge and a very low barb depth transport one or two fibres only per stroke. Consequently, a high number of needles has to be arranged on a special needle board with a needle density of approximately 20,000/metre/board.
Large board widths of around 350 mm and fine gauge needle spacings are a prerequisite to provide enough needling capacity.

A new specialty needle inserter “Needle Master” which is supplied by Groz-Beckert allows high speed automatic needle insertion with up to ca. 200 needles/min.

Due to the single fibre transport and a very high stitching density from around 1,500 stitches/cm² up to 2,500 stitches/cm² virtually all fibres are entangled in the batt structure. Because of the fineness of the needle very little surface marking is to be expected.

Needling calculation example

feed speed: ca. 50 – 60 m/min.
exit speed: over 100 m/min.

stitching density: $\frac{2{,}000 \bullet 7 \bullet 4 \bullet 200}{7{,}750} = 1{,}445/cm^2$

Online 6-8 needle looms of the Cyclopuncher type are applied.
Off-line a series of 2-4 Cyclopunchers may be chosen for several needling passages.

Hyperlaced material has soft touch and textile hand, good drape and high liquid resorption.

Economic considerations:

On the basis of a 2.5 m wide Cyclopunch line including seven needling units the following comparison between a water-entangling and a Cyclopunch line is outlined:
Working width: 2.5 m
Production speed: 100 m/min.
Final product weight: 50 g/m²
Capacity: 300 kg/h/m working width

Criteria	Cyclopunching line without preparation and web forming	Spunlace line incl. drying, without preparation and web forming
Space requirement	ca. 200 m²	ca. 700 m²
Investment	ca. 4,000,000.00 EUR	ca. 6,000,000.00 EUR
Power	ca. 150 kW/m working width at 0.10 EUR/kWh	ca. 1,000 kW/m working width at 0.10 EUR /kWh
Water consumption Waste water anti-pollution requirements?	———————— ————————	ca. 1.1 m³/h/m working width 20 l/min./m working width ca. 1.1 m³/h/m working width at 5.00 EUR/m²
Fibre loss	————————	ca. 5 %/kg product at 1.50 EUR/kg
Consumables	needles and needle boards ca. 0.133 EUR/kg/m working width; needle life: ca. 300 mill. strokes	Jet strips ca. 0.004 EUR/kg/m working width; strip life: ca. 1 year at 50 bar
Operating costs for energy, water, fibre loss, needles and boards, jet strips (without depreciation, interest, personnel, fibre material, chemicals for water treatment) at 7,000 working hours/year	ca. 0.995 EUR per min. and m working width	ca. 2.061 EUR per min. and m working width

All data approximate, without obligation
It is assumed that preparation and web forming as well as personnel costs are the same for Hyperlacing and spunlacing.

Range of applications:

Medical products: gowns, drapes, cover sheets, towels, wound dressings, wet tissue, pads
Sanitary products: baby wipes
Household and industrial wipes, car wipes
Home furnishings: table cloths, napkins, interlinings, coating substrates, synthetic leather
Automotive applications: headliners, interior trim
Filtration material