



SETTING STANDARDS IN FILM ORIENTATION

MDO Machine Direction Orientation



HOSOKAWA ALPINE

Process technologies for tomorrow.

MACHINE DIRECTION ORIENTATION TECHNOLOGY BY HOSOKAWA ALPINE

Machine Direction orientation is a proven technology based on monoaxial stretching of blown films. The process optimises barrier properties and significantly reduces material costs.

Hosokawa Alpine is the technology and market leader for MDO lines with 25 years of experience and a high number of installed MDOs worldwide.

**» CONTINUOUS IMPROVEMENTS
TO OFFER THE BEST SOLUTIONS
TO OUR CUSTOMERS – THIS IS WHAT
WE WORK FOR EVERY DAY.**



1997
FOM, FTM

» Roll orientation system

1998
MDO 02

» 1 gap orientation
» Flexible gap

2003
MDO 03

» Fixed gap

2011
TRIO SYSTEM

» Unique system for trim reduction

2017
MDO 04 MODULAR

» Flexible gap
» New roller concept

2020
MDO 04 V+

» Alpine Vacuum Technology for outstanding roll quality

»» IMPROVE FILM PROPERTIES

Monoaxial film orientation lines allow the improvement of selected film properties to suit specific application:

- Optical properties
- Haze and clarity
- Stiffness
- Machinability
- Barrier properties
- Shrink properties

»» SAVE MATERIAL COSTS

Produce packaging film with:

- Reduced thickness
- Reduced material requirement
- With properties similar to non-oriented film



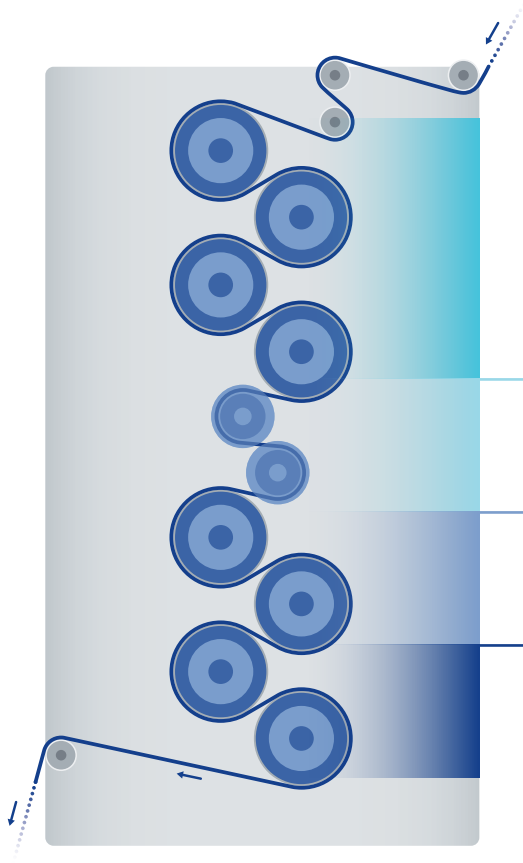
2022

NEW: TRIO 2.0

➤ Single layer measurement



THE MDO PROCESS



The MDO film orientation process is divided into four phases: heating, stretching, annealing and cooling. Depending on the application, the MDO is based on an 8, 10 or 12 roller concept.

- 1 HEATING PHASE (2 OR 4 ROLLERS)**

The film is conveyed on heated rollers to obtain the required temperature
- 2 STRETCHING PHASE (2 ROLLERS)**

The heated film is stretched between two rollers to obtain the required stretching ratio
- 3 ANNEALING PHASE (2 OR 4 ROLLERS)**

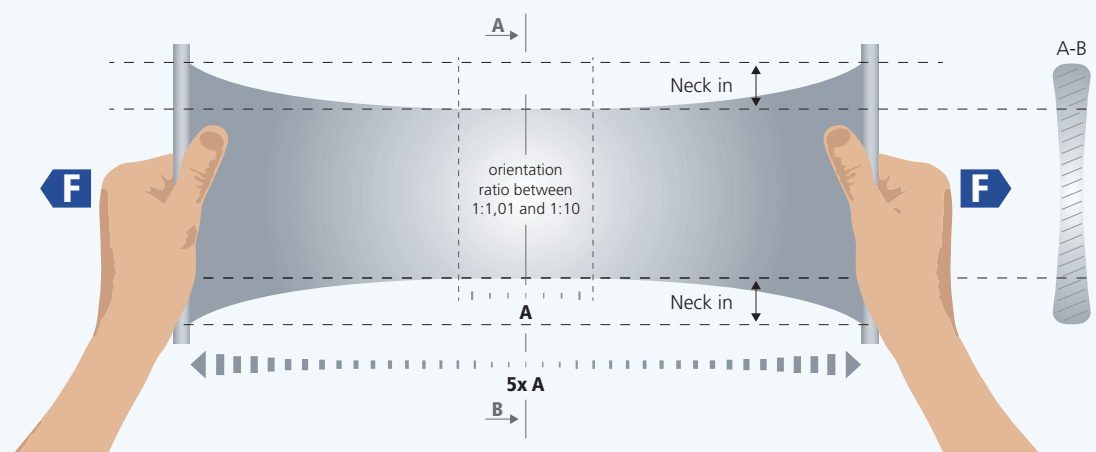
Annealing rolls reduce the stresses created during the orientation process
- 4 COOLING PHASE (2 OR 4 ROLLERS)**

The film cools down and compensates for thermal shrinkage

» THE PHYSICS OF STRETCHING

In a monoaxial stretching line, the film is drawn between two rollers. The rollers rotate at different speeds. During the stretching process, the film thickness is reduced while optical and mechanical properties are improved. This significantly ...

- reduces the raw material requirement
- conserves resources
- and increases efficiency



OPTIMIZED FLATNESS AND TRIM REDUCTION

» TRIM REDUCTION FOR INLINE ORIENTATION (TRIO SYSTEM)

For neck-in reduction and optimized flatness.

The unique TRIO system optimizes the film thickness profile inline. The result: minimum thickness variations across the entire layflat width. Compared to systems without TRIO, edge trim is reduced by up to 50%, while

the flatness of the film is greatly improved for converting. As the thickness profile after MDO with TRIO system is much more even, the loss due to trimming is greatly reduced.



» Thickness profile after MDO **without** TRIO system



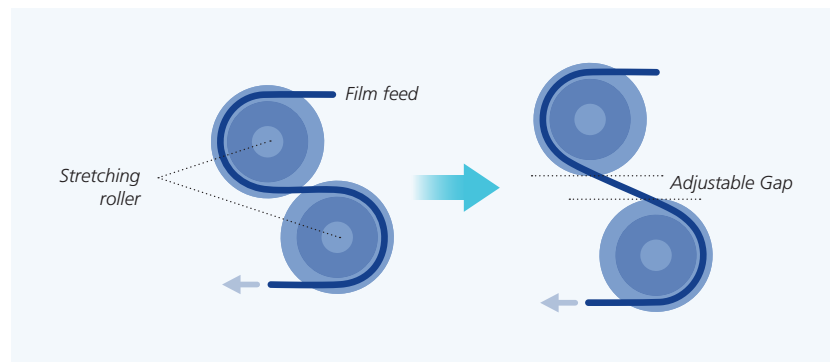
» Thickness profile after MDO **with** TRIO system

» GAP ADJUSTMENT

For neck-in reduction.

With our MDO 04V, the gap between the stretching rollers is adjustable. As a standard configuration, the gaps are defined in four steps.

The adjustable gap allows the stretching settings to be individually adapted to the requirements of different applications.

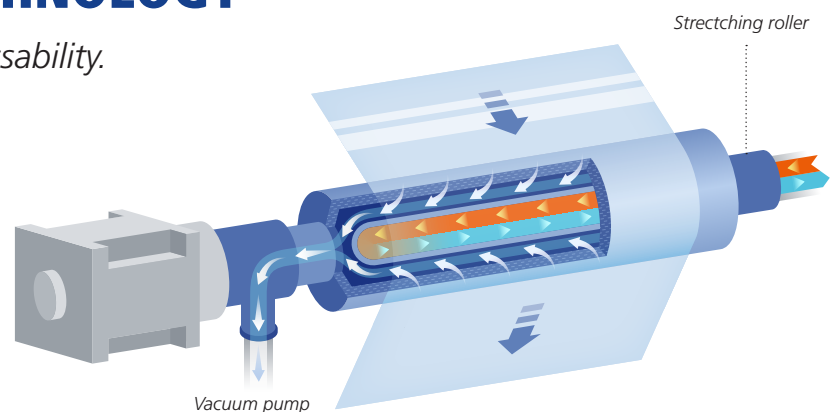


» ALPINE VACUUM TECHNOLOGY*

Optimized flatness for excellent processability.

Vacuum technology optimizes the production of high-performance oriented films:

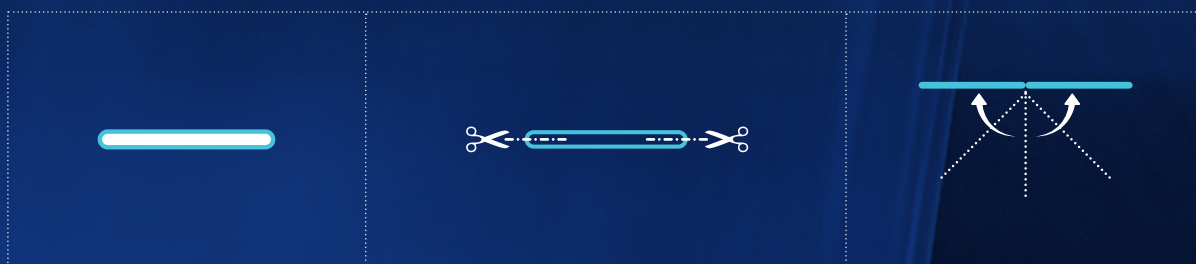
- » Significantly improved flatness
- » Hanging edges and bagginess are eliminated
- » Perfectly prepared for lamination or printing
- » Neck-in reduction by up to 70%



* For certain applications a smooth roller is mandatory.

» 3 SOLUTIONS FOR INLINE PRODUCTION

Hosokawa Alpine offers three alternatives to run MDO films. The process mode is flexible and can be adapted to meet the film production requirements.



BLOCKED

- high film thickness
- good flatness
- only symmetric film structures
- very high machine speed with thin films

DOUBLE FLAT

- layflat width up to 3.000 mm
- multiple lanes possible
- production of asymmetric structures
- output up to 800 kg/h in production (for lamination film)

OPENED

- thin film thickness
- good flatness
- multiple lanes
- low economics

**EASY PROCESSING WITH
VACUUM TECHNOLOGY!**

OPTIMUM FILM PROPERTIES FOR YOUR APPLICATION.

SUSTAINABLE FULL PE SOLUTIONS

Recyclability is becoming one of the most important requirements for food packaging. Many current products use non-recyclable multi-material solutions. On the other hand mono-material PE-based packaging meets recyclability requirements and contributes to global sustainability goals.

In the future, full PE solutions will be a substitute for multi-material films. The recycle from Full PE laminate pouches can be used for valuable end products without any loss of efficiency. Hosokawa Alpine's MDO orientation lines are a key technology for the production of mono-material structures.

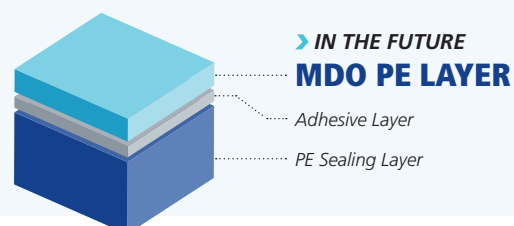
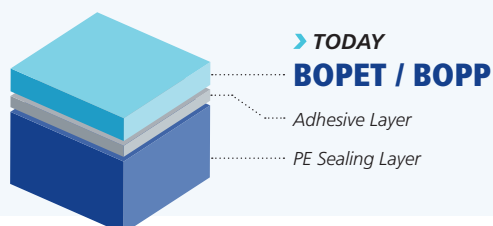
Depending on the required barrier level, different film structures can be designed.

TYPICAL CONFIGURATION

- blown film line: 5/7 Layer
- thickness: 20–25 µm
- layflat: up to 3m with 2–3 lanes

FILM STRUCTURE

From multi-material to recyclable mono-material solutions.





BREATHABLE FILM

Breathable film is used e.g. for baby diapers in the hygiene industry. Breathability can be achieved through the use of plastic concentrates containing fine CaCO_3 particles. The film becomes breathable as a result of pores which are created during the film orientation process. In the past, such films were produced on cast lines. With the use of the MDO technology significant material savings can be realized.

TYPICAL CONFIGURATION

- blown film line: 3 layer
- layer distribution: 25%–50%–25%
- WVTR 6.600 g/m²/24h
- MDO orientation rate: 4–5



TWIST WRAP

Twist wrap film is used mainly for wrapping candy. To achieve excellent twist retention and superior folding performance for twist wrap films, the PE film must be oriented. The twist film can be metallized and offers smooth run ability on packaging machines.

With the MDO opening frame, which is available only from Hosokawa Alpine, mechanical film properties such as rigidity, stiffness and processability can be further improved.

TYPICAL CONFIGURATION

- blown film line: 5 layer
- thickness: 25 µm
- MDO with opening frame



HIGH BARRIER

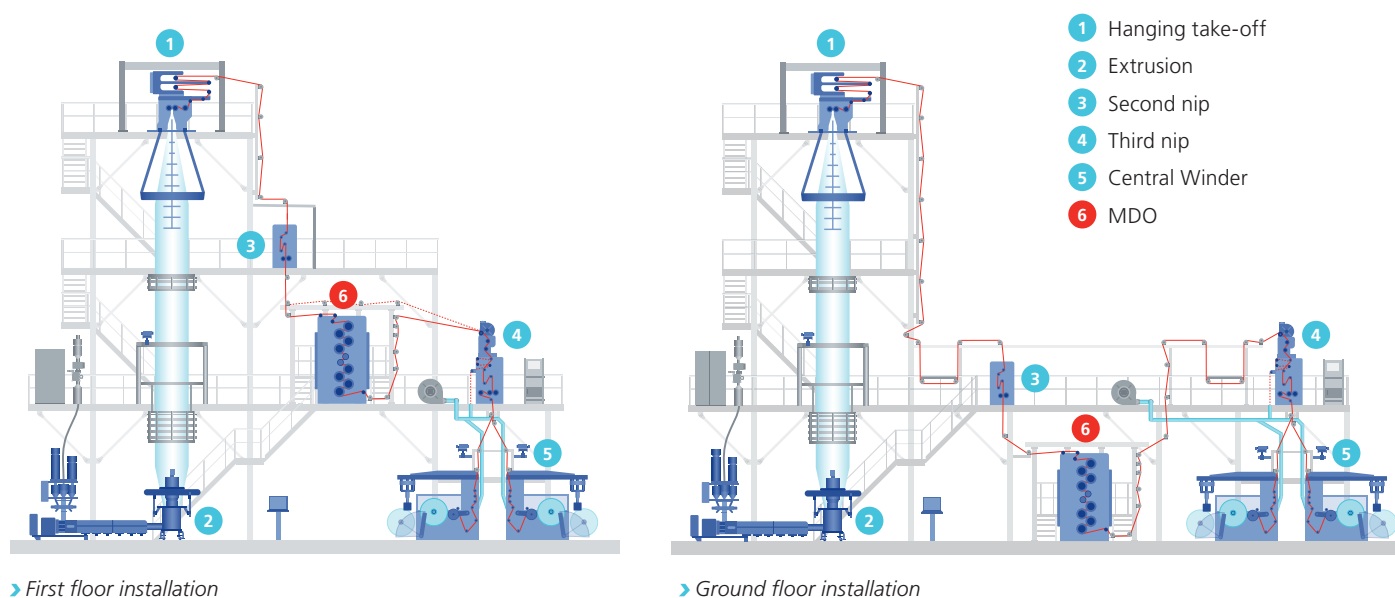
High barrier films are used for food packaging to extend the shelf life of products. Hosokawa Alpine's blown film lines offer maximum flexibility for the production of high-barrier films with effective oxygen and aroma barriers.

TYPICAL CONFIGURATION

- blown film line: 7 or 9 layer
- thickness: 60 µm laminated against 15 µm PET

INSTALLATION OF MDO LINES

Installation on the ground floor allows for easier handling, as the operator does not have to climb to the first floor to check the film and to adjust the settings of the machine. Installation on the first floor saves space and requires less floor space for the entire line.



TECHNICAL DETAILS

Available layflats	1.600 / 2.000 / 2.600 / 3.000 mm
Film speed inlet	up to 130 m/min
Film speed outlet	300 m/min
Stepless orientation ratio	up to 1:10
Individual heating of the rollers with ...	Water tempering unit: > easy handling, safety, better heat transfer > max. processing temperature 130°C Oil tempering unit: > when higher temperatures are required > max. processing temperature 150°C

» WE ARE THE EXPERTS

TECHNOLOGY LEADER FOR FILM OPTIMIZATION WITH MDO

- *Unique TRIO system*
- *New vacuum technology for superior MDO film quality*

EXPERIENCE WITH MDO TECHNOLOGY FOR MORE THAN 25 YEARS

- *Large number of lines installed worldwide*
- *Highest level of knowledge*
- *Strong ability to support customers*

SUPERIOR MDO FILM QUALITY

- *Outstanding processability*
- *Optimized flatness*
- *No hanging edges and bagginess*

FULL SERVICE – FROM ONE SINGLE SOURCE

Get in touch with the blown film experts! Perfect support right from the start – that's what we are known for. Our goal is to advise you individually and optimally. Your personal contact person will support you right from the beginning.





HOSOKAWA ALPINE

Process technologies for tomorrow.

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