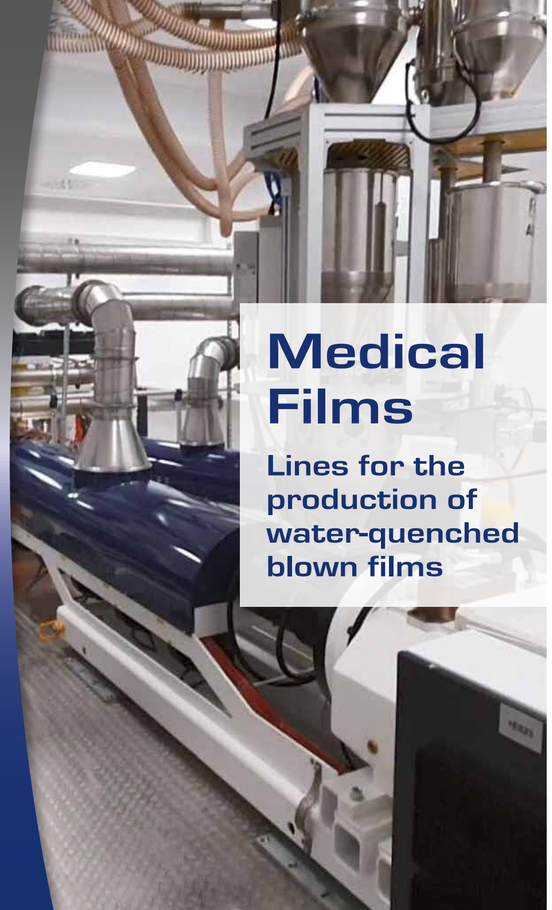
KUHNE GROUP

CREATING VALUES

BLOWN-FILM LINES

Cool Bubble®



Medical Films

Lines for the production of water-quenched blown films

freezing the shape

Line layout

- **number of layers:** 3 / 5 / 7
- **raw materials:** PE, PP, EVOH, PVDC/PVC, EVA, EMA and others
- **film thickness:** 40 µ - 800 µ
- **film width:** 100 mm - 900 mm double layflat
- **output:** 50 kg/h - 500 kg/h
- **line speed:** 20 m/min - 100 m/min
- **suitable for clean room applications**

Film characteristics

- excellent optical properties (clarity and gloss)
- extraordinary suppleness and elasticity
- very low volatiles

Application

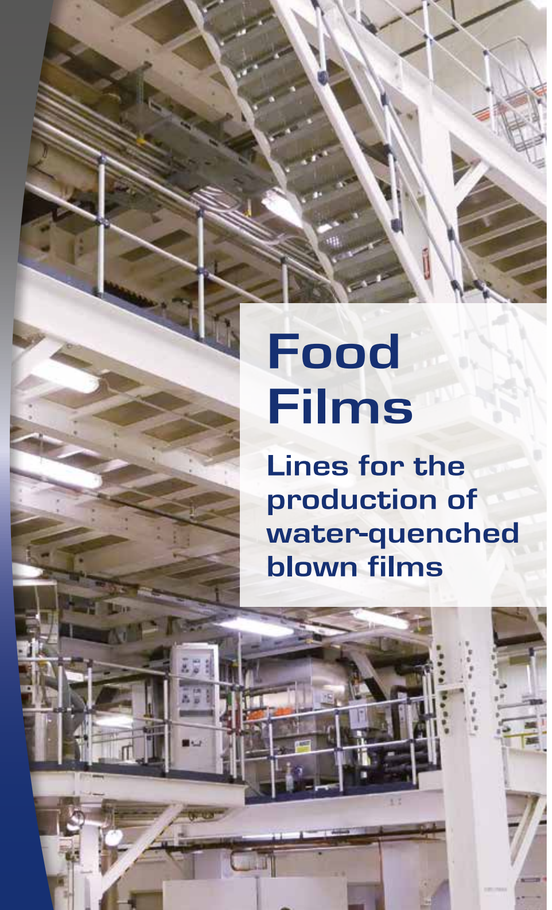
Added values

- by far the highest quenching rate (cooling rate) available
- ability to process a very broad MFI range
- highly amorphous and transparent film
- very low gel count / low organoleptic values
- minimum risk of internal contamination
- multiple options in raw materials and film structures
- turnkey solutions and operator training

Application areas

- medical fluid bags (IV therapy and nutrition / blood bags)
- applications requiring high puncture and tear resistance plus superior optical properties

Cool Bubble®



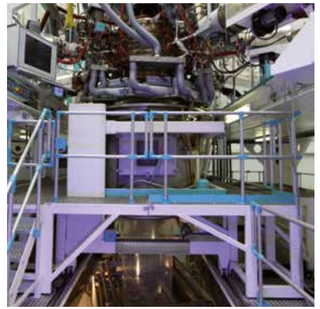
Food Films

Lines for the production of water-quenched blown films

freezing the shape

Line layout

- **number of layers:** 5 / 7 / 9 / 11 / 13
- **raw materials:** PE, PP, PS, PET, PA, EVOH, EVA, EMA, ionomer and others
- **film thickness:** 40 µ - 800 µ
- **film width:** 700 mm – 2.400 mm double layflat
- **output:** 400 kg/h - 2.000 kg/h
- **line speed:** 20 m/min - 100 m/min



Film characteristics

- excellent optical properties (clarity and gloss)
- outstanding mechanical properties (impact strength and puncture resistance)
- excellent deep draw thermo-formability (highly amorphous)

Application

Added values

- extremely high output (up to 2.000 kg/h)
- ability to process very thick films (> 250 µm)
- by far the highest quenching rate (cooling rate) available
- highly amorphous and transparent film
- multiple options in raw materials and film structures
- turnkey solutions and operator training

Application areas

- films for meat and cheese packaging
- high barrier films for vacuum pouches
- thermoforming films
- vacuum-forming films
- vacuum skin packaging (VSP) films

CoolBubble®

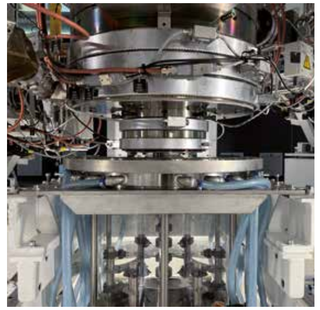
Technical Films

Lines for the production of water-quenched blown films

freezing the shape

Line layout

- **number of layers:** 1 / 3 / 5 / 7 / 9 / 11 / 13
- **raw materials:** PE, PP, PS, PET, PA, EVOH, EVA, EMA, Elastomers, PVDC/PVC, TPU and others
- **film thickness:** up to 2.000 µ
- **film width:** 25 mm - 1.800 mm double layflat
- **output:** 100 kg/h - 1.000 kg/h
- **line speed:** 10 m/min - 100 m/min



Film characteristics

- excellent formability and flexibility (exceptionally amorphous)
- outstanding mechanical properties (impact strength and puncture resistance)
- excellent optical properties (clarity and gloss)

Application

Added values

- high output (up to 1.000 kg/h)
- high performance alternative to traditional tube extrusion
- dimensional stability of the structure / tube
- ability to process very thick films (up to 2.000 µm)
- by far the highest quenching rate (cooling rate) available
- ability to handle low melt strength polymers (MFI > 10)
- multiple options in raw materials and film structures
- turnkey solutions and operator training

Application areas

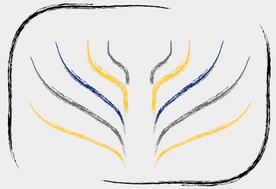
- tube extrusion
- mobility applications
- pipe repair liners and other technical solutions

Cool Bubble®

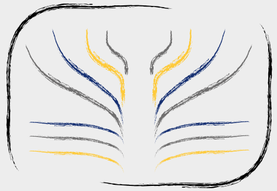
Die-Head Concept

Kuhne Anlagenbau GmbH

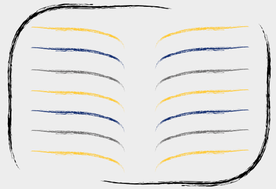
Kuhne Anlagenbau designs and manufactures blown film dies optimized for every application. For top quality and reliable supply, the dies are manufactured in-house in a state-of-the-art facility that guarantees the tightest design tolerances.



Re-Con

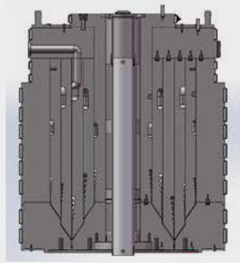


Hy-Con

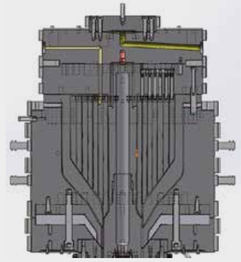


Mo-Con

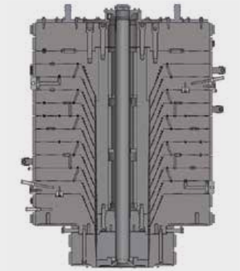
ReCon



HyCon®



MoCon®



Application

Cool Bubble® medical films

Medical films are typically 3, 5 or 7-layer structures, depending on the application. Some of them require thermally sensitive polymers like PVC/PVDC, EVA or EVOH used in combination with polyolefins as the bulk material. It is important to optimize the die design for the structures to be produced.

Our ReCon (regular concept) spiral mandrel design is the proven solution for 3 and 5-layer structures. For more complex 7-layer structures, our MoCon® (modular concept) stackable plate die is ideal since it provides much more flexibility in film structure design.

Additionally, our MoCon® die can be configured with thermal isolation to be able to process very heat sensitive resins like PVDC. Both options, in conjunction with our precise manufacturing technology, delivers tight thickness tolerances for very thin layers.

Cool Bubble® food packaging films

Water quenched blown films used in food packaging are generally bottom forming webs of 9, 11 or 13 layers. These consist of several layers of PA coextruded with PE layers and an EVOH layer for barrier. Due to the most aggressive quenching in the market, Cool Bubble® lines designed for this application deliver very high output, which requires high processing pressure. Our MoCon® (modular concept) stackable plate die can operate with pressures up to 1000 bar and delivers the best combination of high output and excellent thickness control.

Cool Bubble® industrial films

Choosing the right die design for a particular application depends on the film structure and properties of the polymers to be used. Our three die concepts offer all possible options for the best processing solution: (1) the ReCon (regular concept) spiral mandrel die, (2) the HyCon® (hybrid concept) die, a combination of spiral mandrels and stackable plate mandrels, and (3) the MoCon® (modular concept) stackable plate die. In many applications, our Cool Bubble® process, in combination with one of the die concepts above, makes it possible to provide a solution for industrial films or tubing that are difficult, inefficient, or impossible to produce by conventional blown film.

One example is the extrusion of tubing using tacky or sticky resins with low melt strength. Another example is the coextrusion of a high barrier film or tubing with PVDC, a very heat sensitive resin, as the barrier layer. In this case, our MoCon® die can be configured with thermal isolation in the PVDC layer to be able to process it without degradation. If required, this same layer can also be used to process EVOH without any changes. In all cases it is still possible to keep high outputs with great thickness control.

Cool Bubble®

Specialization is our business

Kuhne Anlagenbau GmbH is one of meanwhile 3 companies owned by family Kuhne; besides the mother company Kuhne GmbH and its subsidiary Kuhne Anlagenbau GmbH there is another subsidiary in the US, Kuhne North America Corp.

The origins of company Kuhne date back to the machine building company

Heinrich Koch founded in 1934. This company developed the first extruder in 1949 and in 1957 was taken over by company Werner Battenfeld. In 1959 the leadership of Battenfeld Extruderwerk Siegburg was assigned to Mr. Walter Kuhne. In 1970 Mr. Kuhne took over this company (Battenfeld Kuhne Extruderwerk GmbH) which was renamed as Kuhne GmbH in 1975 when the company moved to its new and today's site in Sankt Augustin.

Kuhne Anlagenbau was created in 1972, at that time as a department of Battenfeld Kuhne Extruderwerk GmbH. In October 1979 Kuhne Anlagenbau GmbH finally was founded as independent 100% subsidiary of Kuhne GmbH. In the 70ies and 80ies Kuhne Anlagenbau GmbH made its mark as general contractor for large-scale turnkey projects in the plastic branch. At that time Kuhne Anlagenbau GmbH also acted as sales department of Kuhne GmbH for the countries of the Middle East and the former USSR.

In the 90ies Kuhne Anlagenbau GmbH built up a production and sales program of their own for the plastic recycling branch in addition to their sales activities for Kuhne GmbH. After an impressively short time, Kuhne Anlagenbau GmbH was successfully offering complete lines for the recycling of plastic waste. However, as this market almost completely collapsed when the public subsidies were suspended, Kuhne Anlagenbau GmbH had to look for a new field of activity. Basing on the decades of film blowing know-how of Kuhne GmbH, Kuhne Anlagenbau GmbH started the development of the first Triple Bubble® line for the production of bi-oriented blown films in 1996. The Triple Bubble® technology allows to produce high-class food packaging films (for meat, sausages, cheese, etc.) which meet special requirements such as high oxygen barrier for the prolongation of shelf life and a corresponding aroma

barrier in combination with an excellent mechanical strength. Since then Kuhne Anlagenbau GmbH continuously developed the Triple Bubble® technology and set up a broad product range.

The production program nowadays ranges from mono-layer high-speed lines for the production of small calibre sausage casings with production speeds up to 300 m/min ("XXS" series); and multi-layer lines for food packaging with up to 17 layers and medium film width ("M" and "L" series); up to the large scale orientation lines especially for widths of up to 3 metres ("XXL" series). Especially the "XXL" series provide extremely high barrier and mechanical properties while at the same time film thickness is reduced by up to 50% compared to films produced by conventional technologies. The large scale Triple Bubble® lines meanwhile allow for output capacities of up to 2 tons, especially for applications such as deep drawn and vacuum packaging.

This wide-ranging production program provides ideal solutions for all types of flexible packaging with or without shrink or for formable packaging respectively.

Highlights

1934
foundation of machine building company Heinrich Koch

1949
development of the first extruder HKS 80/60

1953
supply of the first complete blown film line

1957
company Werner Battenfeld takes over company Heinrich Koch

1959
Dipl- Ing- Walter Kuhne assumes management of Battenfeld Extruderwerk Siegburg

1960
supply of an industrial blown film line with a working width of 2,000 mm

1970
Walter Kuhne takes over company Battenfeld Extruderwerk Siegburg

1974
supply of various 2 to 4-layer coex systems for the production of multicolored carrier bags

1975
relocation of company Kuhne GmbH from Siegburg into the new site in Sankt Augustin

presentation of the complete extruder program with the designation K 25 - K 150 in 24, 30 and 33 D length

1979
foundation of KUHNE Anlagenbau GmbH

1980
presentation of the first IBC blown film line with spiral distributor

1982
presentation of the first pure HDPE blown film line for 6 µm films

1990
presentation of a fully automatic blown film line with automatic thickness control

presentation of the data management system = KEC

1994
presentation of a 5-layer blown film line for the production of barrier film

1996
first Triple Bubble® line

1997
first 5-layer Triple Bubble® line

2000
first "high speed" Triple Bubble® line (>200m/min)

2003
first 7-layer Triple Bubble® line

presentation of the first shrink film system based on Triple Bubble® process

2005
first WQB line (Water Quenched Blown film)

2006
Supply of a new "high speed" generation of Triple Bubble® lines (>300m/min)

2007
50th Triple Bubble® line

2008
first 9-layer Triple Bubble® line

2009
first large 7-layer Triple Bubble® line
(Roller width 1800 mm) XL-Serie

2010
first 11-layer Triple Bubble® line

2011
first large WQB line (roller width 1600 mm)

first large 9-layer Triple Bubble® lid film line (roller width = 1800 mm) XL-Serie

2012
first large sausage casing line (high output > 150kg/h)

2013
first 7-layer conventional blown film line

first supply of a Triple Bubble® line with a "Mo-Con" die

2014
first 9-layer conventional blown film line

2015
first 11-layer conventional blown film line

2016
first delivery of a conventional blown film line with a "Mo-Con" die

2017
first 13-layer Triple Bubble® line

2018
100th Triple Bubble® line

2019
first 5-layer battery film line
(roller width = 2100 mm) XL-Serie

2020
first 13-layer Triple Bubble® line
(roller width = 1800 mm) XL-Serie

2021
first Triple Bubble® shrink film line for PVDC

2022
first Triple Bubble® lamination film line
(3-layer line / roller width = 2100) XL-Serie

2025
first 13-layer Triple Bubble® line
(roller width = 3200 mm) XXL-Serie

KUHNE GROUP

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