

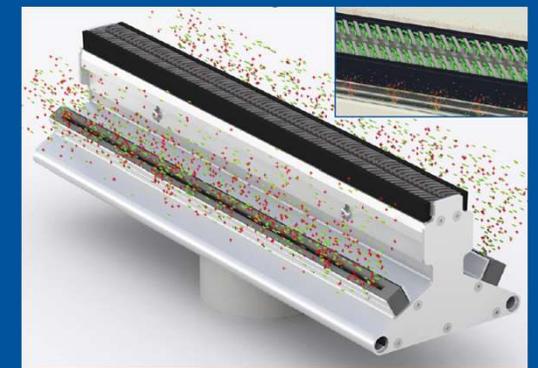
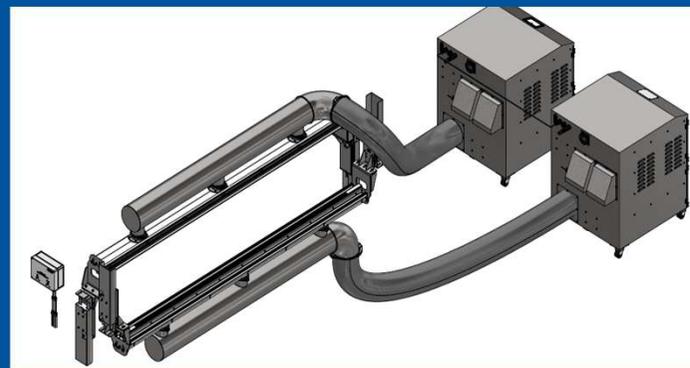


Extending production uptime on HDPE blown film lines with MDO

(removal of white powder before MDO system)

Introducing:

Bespoke Meech cleaning solution



Introduction & Background– PPWR & MDO



- Increase in demand for HDPE film is due to **new European environmental recycling laws** (this policy will likely be adopted in more regions around the world).
- **PPWR** – is a challenging goal to make **70% of packaging recyclable or reusable by 2030** (no single-use PET or BOPP materials and layers).
- Adoption is already started in industry.. So, need to look at this now.
- **Preference is for MONO-Material Packaging:** polyethylene (PE) but crucially “modified” to provide enhanced: stiffness, mechanical properties, gloss, transparency and heat resistance. This is achieved by combination of polyethylene resins, combined with **special manufacturing method called “MDO”** (Machine Direction Orientation).



Useful terms:

(PPWR) - Packaging and Packaging Waste Regulation (EU 2030)

(MDO) - Machine Directional Orientation

(HDPE) - High-Density Polyethylene

(PE) - Polyethylene

(PET) - Polyethylene terephthalate

(BOPP) - Biaxially oriented polypropylene

Why is mono material easier to recycle?



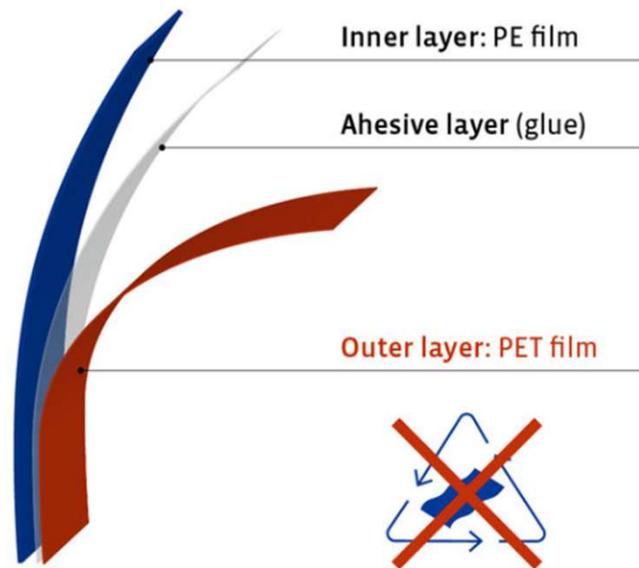
Replace PET and achieve full recyclability

'Mono-materials' make recycling easier and more efficient

Quite simply, the material does not need to be separated!

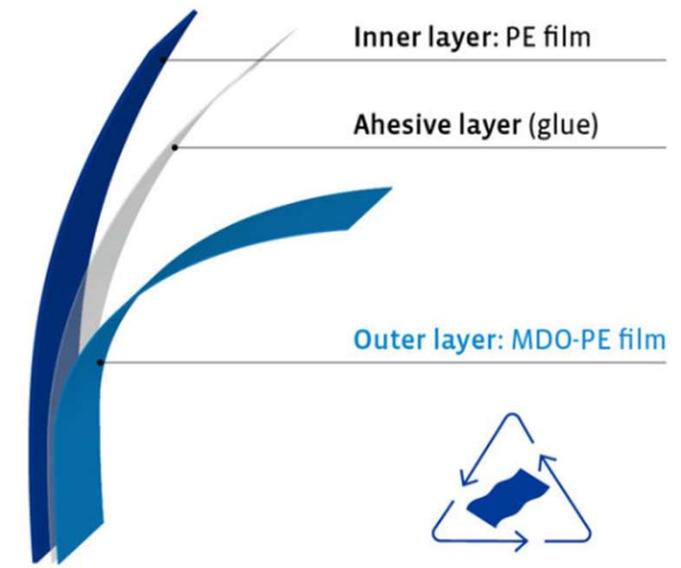
Classic Laminate

Low recyclability due to multi material mix



All-PE Laminate

Full recyclability due to PE material mix



What is MDO process?



The MDO film orientation process is divided into four phases:

1. Heating
2. Stretching
3. Annealing (heating/curing)
4. Cooling

Depending on application - MDO is based on an 8, 10 or 12 roller concept (a lot of friction)

The film is conveyed on heated rollers to obtain the required temperature.

MDO can be in different positions including at the 'take-off' position of blown film.

(MDO) - Machine Directional Orientation



What is MDO and where is it used?



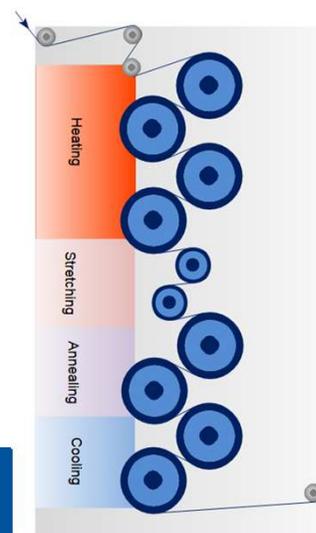
- The 'machine directional orientation' process improves the PE material performance.
- Due to resultant film's high stiffness, **packaging 'downgauging'** is possible (thinner film).
- Raw materials are therefore saved, and transport, logistics, and other costs are also reduced.

MDO is used to:

- Increase the mechanical resistance;
- Enhance gas barrier properties (moisture and oxygen);
- Improve the gloss and wettability qualities

MDO film is likely to be used widely:

- Diaper film
- Paper substitute
- Stand-up pouches
- Graphic arts and packaging
- Self-adhesive labels
- And more

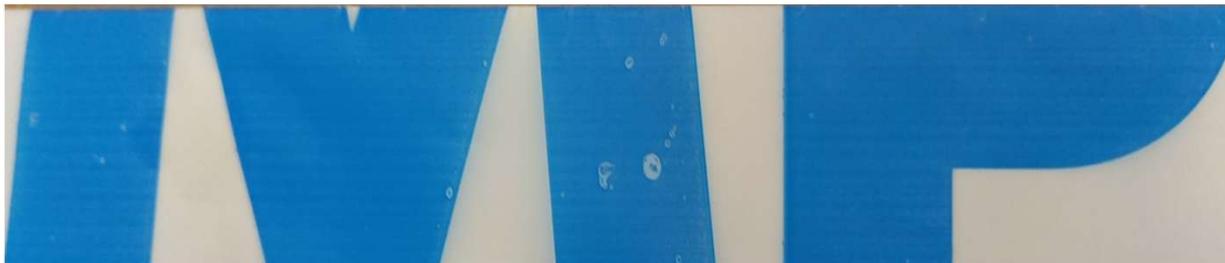


Contamination problems (production of HDPE)



Meech has had requests from international producers to help remove white flakes & powder build-up on HDPE film lines:

- White powder observed on film surfaces and production equipment.
- Particulates then reach 130 degree MDO rollers and melt, build up and start to “imprint” on to film
- **Regular closures are then required to clean the line – in particular the MDO rollers (as low as every 12-24 hours)**



Industry Maintenance Feedback – “Unacceptable levels of downtime”



Meech has been consulting with a range of end producers and machinery manufacturers – producing HDPE films with and blown film lines with MDO systems

Range of different customer feedback (research scope is 30 MDO lines):

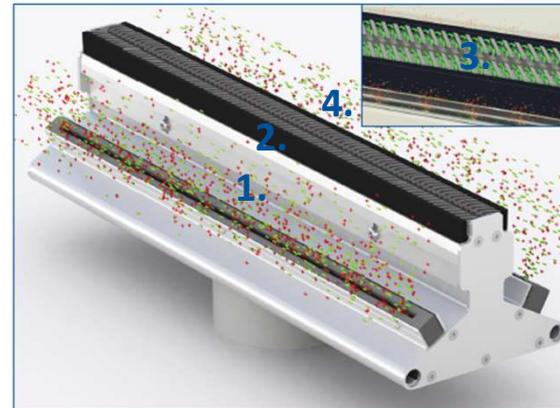
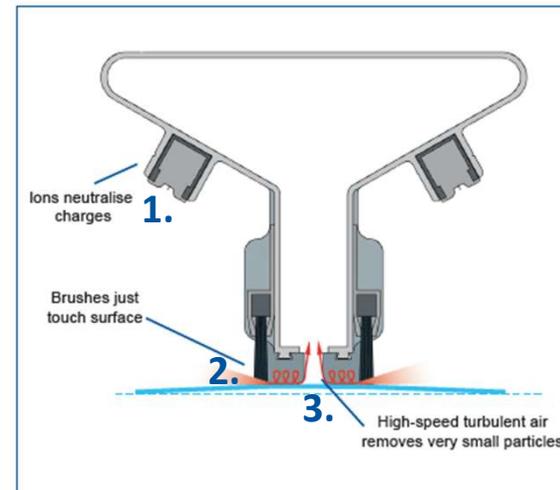
1. Cleaning intervals of MDO rollers = **every 12-36 hours (depending on speeds, web widths and chemistry)**
2. Duration time to clean MDO unit = **2-4 hours (depending on rollers)**
3. Total downtime of line during MDO cleaning = **5-6 hours**
4. No. of people needed to clean MDO unit = **2-3 people**
5. Direct Cost per hour for downtime due to additional maintenance/cleaning = **USD / EURO 1,200 per hour**
6. Productivity and capacity impacts = **20% reduction in available production capacity !**
7. By installing in-line contamination removal time between cleaning intervals is extended by more that 50% (depending on installation)



Meech VacClean – basic product principles



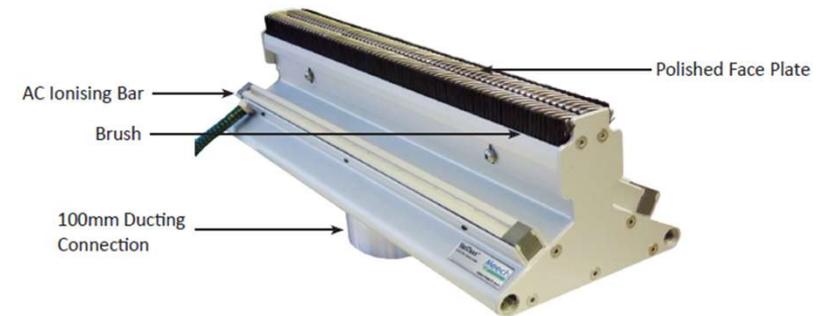
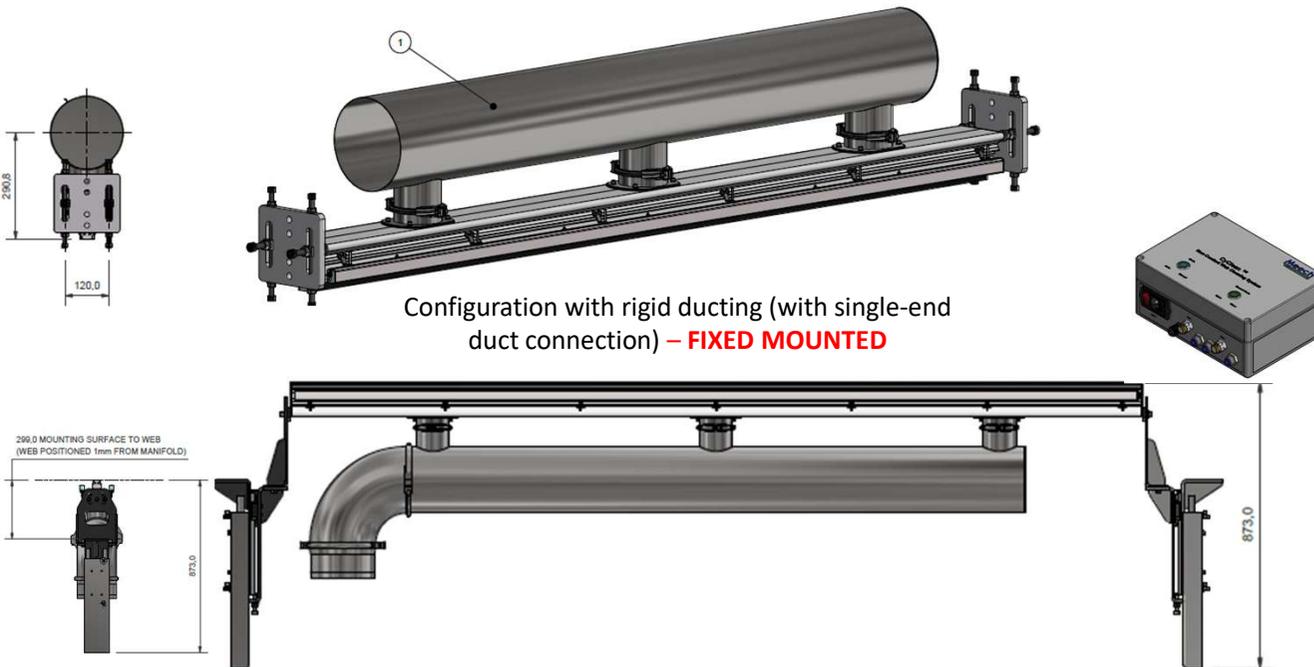
- **1. PE film passes through cloud of ionisation** (neutralises static charges present)
- **2. Brushes are just below surface** (to break boundary layer of air, enabling effective removal of the smallest particles).
- **3. Powerful vacuum with web in full contact with two highly polished low friction vacuum faceplates** (creates highly turbulent airflows on material surface to remove contaminants with very high efficiency).
- **4. PE film passes through second cloud of ionisation** (neutralises any remaining static charges present).
- **NB. While VacClean is a contact cleaning system due to the highly polished SS cleaning plates it is very low friction and vacuum air pressure can be adjusted**



Bespoke VacClean – specialized MDO line cleaning solutions (2.6m web sample)



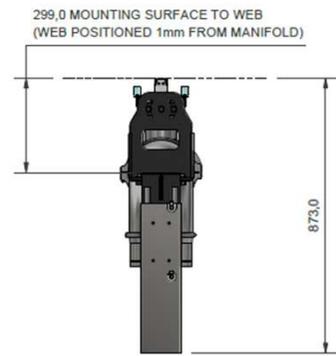
- While flexible ducting available, a **RIGID DUCT with single end-duct connection is recommended for wide webs** (with optional pressure sensor to show pressure is good inside ducting at cleaning head)



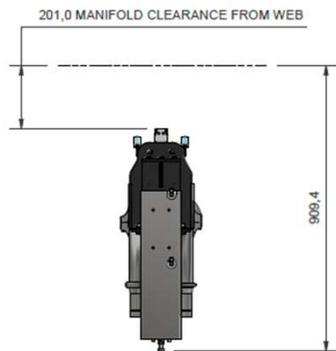
Standard fixed configuration with **multiple FLEXIBLE DUCT connections** (to cleaning head)

Configuration with rigid ducting (with single-end duct connection) – **PNEUMATIC OPENING**
NB. – recommended for pulling through initial blown film when webbing up) - Meech solution offers **200 mm stroke**

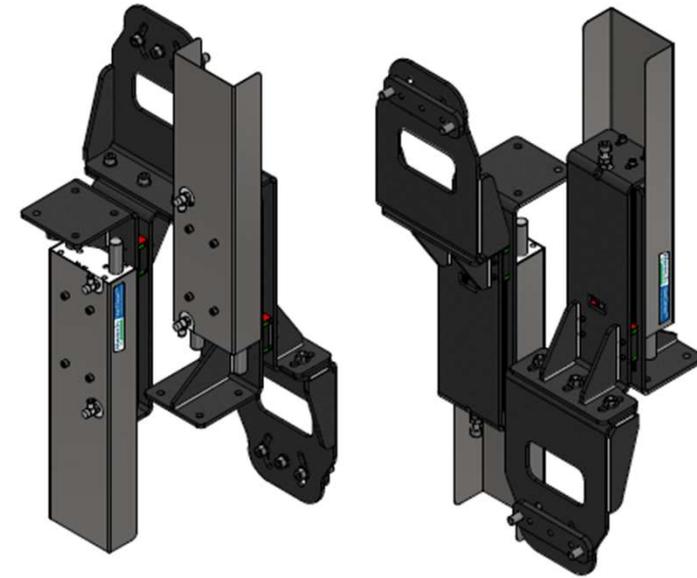
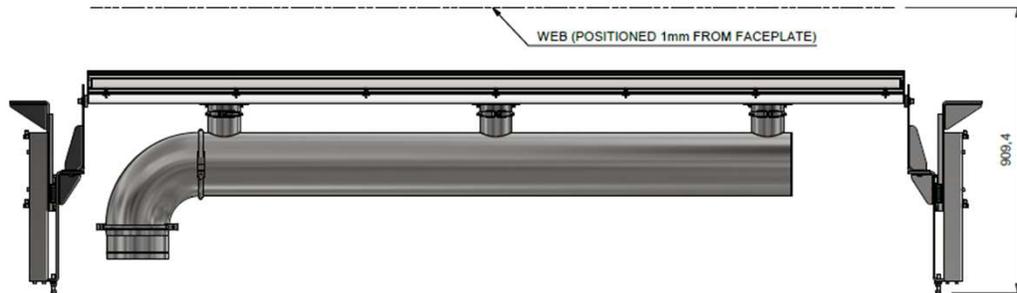
Bespoke VacClean – specialized MDO line cleaning solutions (2.6m web sample) – pneumatic lift



EXAMPLE A - CYLINDER RETRACTED



EXAMPLE A - CYLINDER EXTENDED

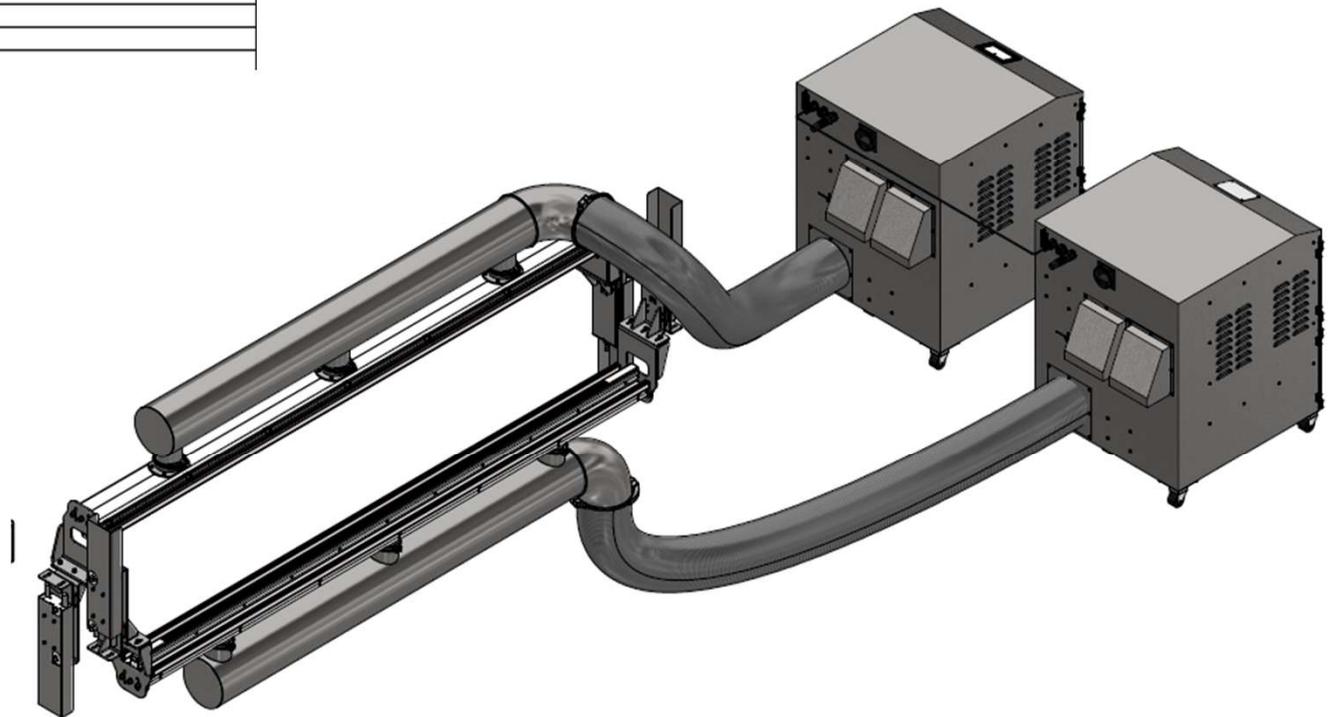


Meech VacClean – specialised MDO line cleaning solutions (2.6m web sample) – pneumatic lift



PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	BVC-MANJ2600-924IPS	VacClean Manifold Only - 2620mm Eff/2600mm Web
2	2	BVC-RIGDUCT-2600-90H	90 Deg Hose Connection Rigid Ducting for 2600mm VacClean
3	2	A-AHUV3-6PUMP-01	Air Handling Unit - 6 Pump, 200-440V 3ph 50/60Hz
4	2	A-AHUV3-SPIGBAF-200	AHUV3 6 Pump - Conversion Kit
5	1	BVC-BRKT-200-04	VacClean Double Sided Lifting Bracket
6	8m	ASYS-FLEXDUCT200	Flexible Ducting 200mm Diameter
7	4	ASYS-JUBCLIP200	Jubilee Clip 200mm Diameter



Recommended VacClean location – BEFORE Corona Treatment



By cleaning web **before Corona treatment** and **before MDO** these important processes are optimized on a clean film surface - leading to better film properties, improved quality, and reduced line stoppages.

A. BEFORE Corona Treatment (advantages)

1. **Contaminant removal:** web cleaner removes dust, debris, and other contaminants from the film surface before corona treatment = ensures cleaner surface for more effective corona treatment
2. **Improved treatment effectiveness:** clean film surface allows for better contact between corona discharge and film = leading to more uniform and effective surface treatment
3. **Protection of corona equipment:** removing contaminants helps protect corona treater electrodes from accumulating debris = maintaining treatment efficiency and potential reducing maintenance
4. **Enhanced film quality:** prevents contaminants from becoming embedded in film surface during corona process = resulting in higher overall film quality



Typical Machine installations

(NB. images are for illustration purposes only)

