

# COATING METHOD



[www.kerone.com](http://www.kerone.com)



In Association with SVCH-Technologii, Moscow (Russia)

## *About KERONE*

KERONE now renowned name in serving specialized need of customers with best quality and economical process Heating /cooling and drying products, manufactured in high quality environment by well trained and qualified workforce(special purpose machineries) .

KERONE is pioneer in application and implementation engineering with its vast experience and team of professionals. KERONE is devoted to serve the industry to optimize their operations both economically and environmentally with its specialized heating and drying solutions.

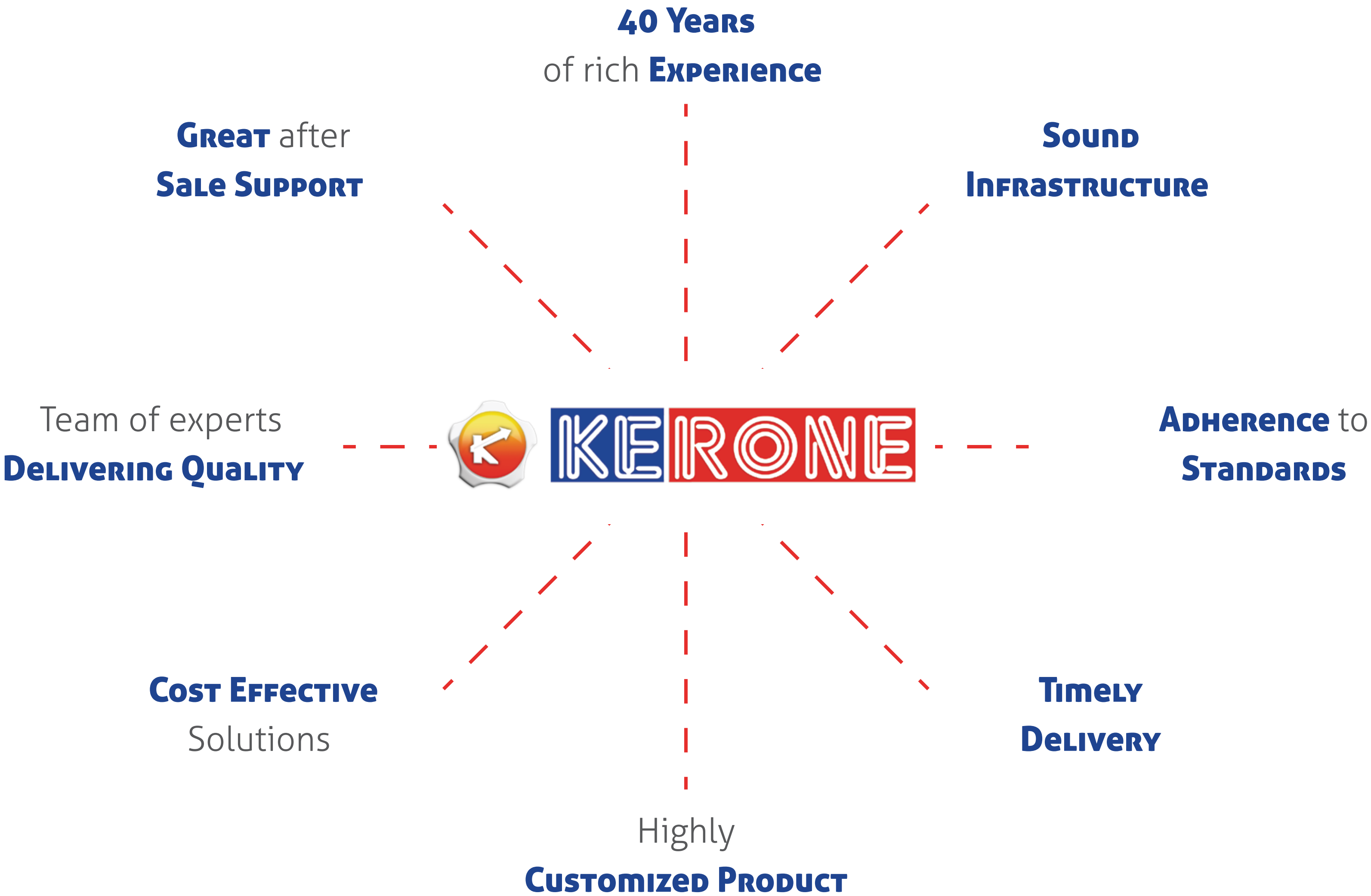
## *Vision*

- Turn into world leader in providing specialized, top-notch quality and ecological industrial heating, cooling and drying solution across the globe.
- To attain global recognition as best of quality and environment friendly engineering solution company.

## *Mission*

- To enhance the value of customer operation through our customer need centric engineering solution.
- We are committed to provide our customers, unique and best in class products in Industrial heating, drying and cooling segment, with strategic tie-up for the technical know-how with renowned leader in the industry specific segment.
- We are company that believes in strong ethics and timely commitment helps to build long term relationship.

Value Propositions



## *Introduction of Coating Systems*

Coating is a very Important process involved in Manufacture of Coated Products

Today we shall review some of these as listed below:-

**GRAVURE COATING**

**COMMA COATING**

**KNIFE OVER ROLL COATING**

**SLOT ORIFICE COATING**

**REVERSE ROLL COATING**

**CURTAIN COATING**

**HOT MELT COATING**

**IMMERSION / DIP COATING**

**METERING ROD  
MAYER BAR COATING**

To understand the process of coating an adhesive on a substrate for the manufacture of Adhesive tape is quite simple.

Let's quote the example spreading butter on bread. The Butter must have good spread ability in order to apply it evenly. Try spreading frozen butter on bread and you will learn the difficulties encountered.

Similarly, the adhesive to be coated must have good spread ability. And let's not forget one must have a correct equipment to spread or coat the adhesive. There are other variable factors also involved, but we shall look into coating methods Exclusively.

The Coating methods

Their Capabilities and Limitations

Coating Method	Viscosity in CPS	Max Speed per Min	Coating Wt. gm per sq.mtr
Gravure	100-200	700 Mtrs	3-20
Comma	1000-6000	300	10-200
Reverse Roll Nip	1000-6000	300	10-200
Reverse Roll Pan	200-6000	100	10-200
Hot Melt	500-20000	300	10-300
Mayer Bar	10-200	200	3-25
Knife over Roll	100-20000	1500	3-15
Slot Orifice	500-20000	200	20-100
Immersion /Dip Coating	1000-10000	50	Heavy
Curtain	500-20000	200	20-100

## *Gravure Coating*

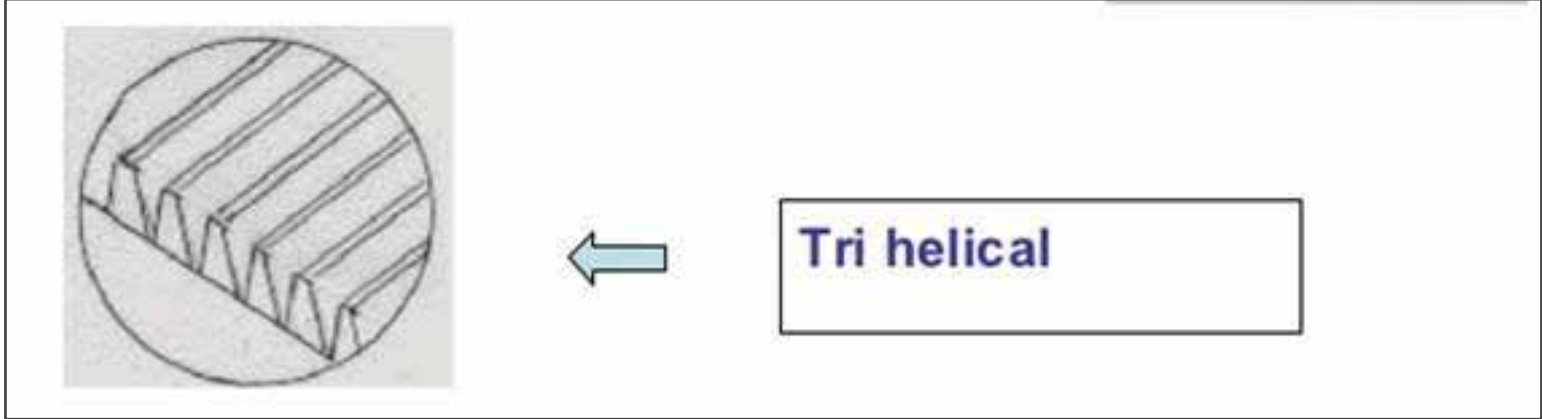
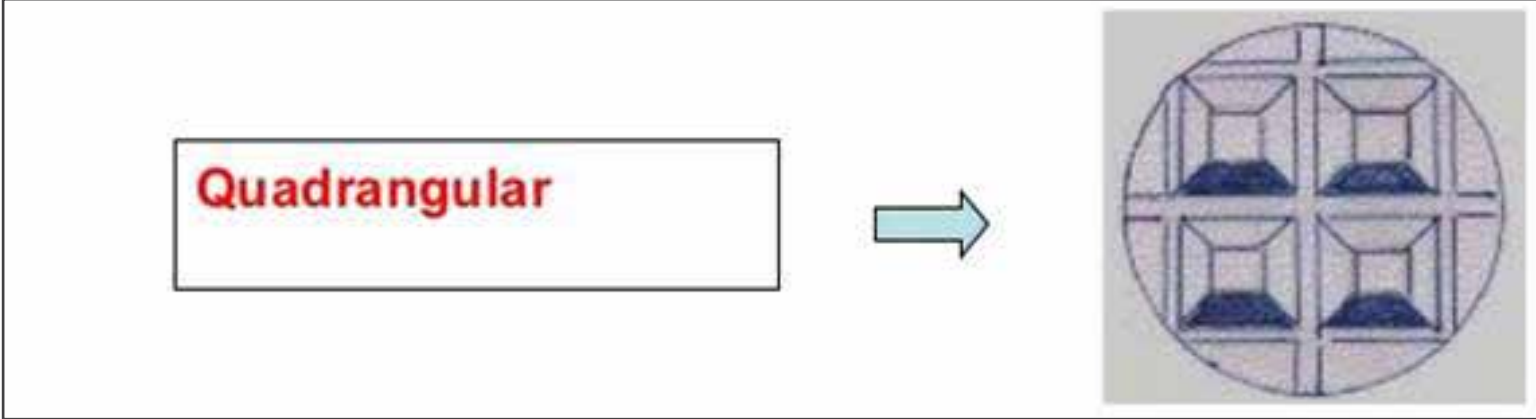
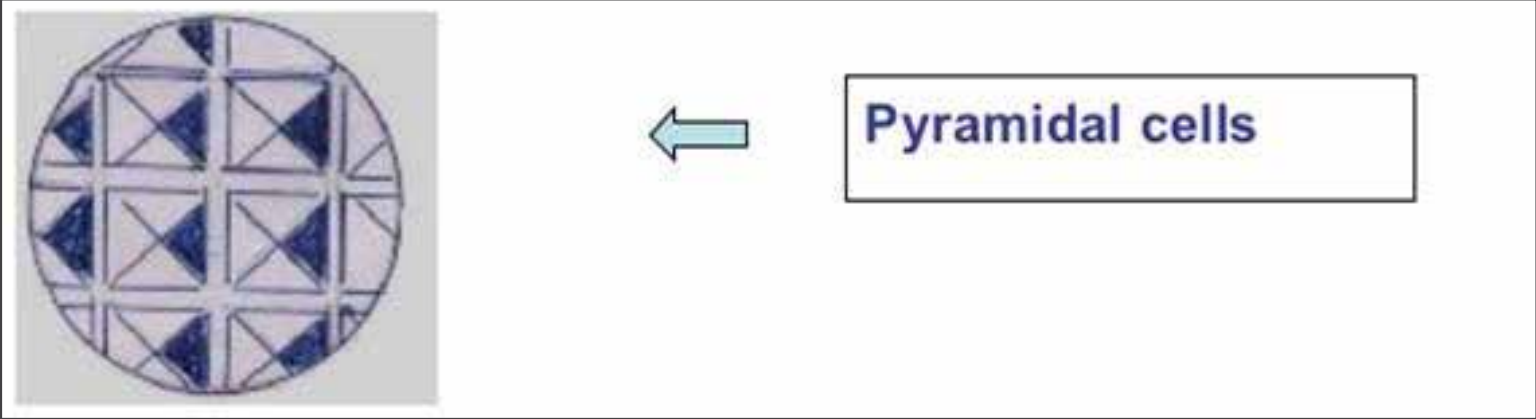
The gravure coating process relies on an engraved roller running in a coating bath, which fills the engraved dots or lines of the roller with the coating material.

The excess coating on the roller is wiped off by the Doctor Blade and the coating is then deposited on to the substrate as it passes between the Engraved roller and a Pressure Roller.

There are three different ways of gravure roll manufacturing. One has to choose a correct type depending upon the required coating gram mage and the material to be coated



Type of Engraving	Screen		Cell Depth mm	Deposit gm/m <sup>2</sup>
	Lines/ in	Lines/ cm		
Pyramidal	200 40	79 16	0.003 0.037	2.4 27.6
Quadrangular	200 16	79 6	0.005 0.065	3.6 49.5
Trihelical	120 14	47 9	0.010 0.055	11.7 63.1

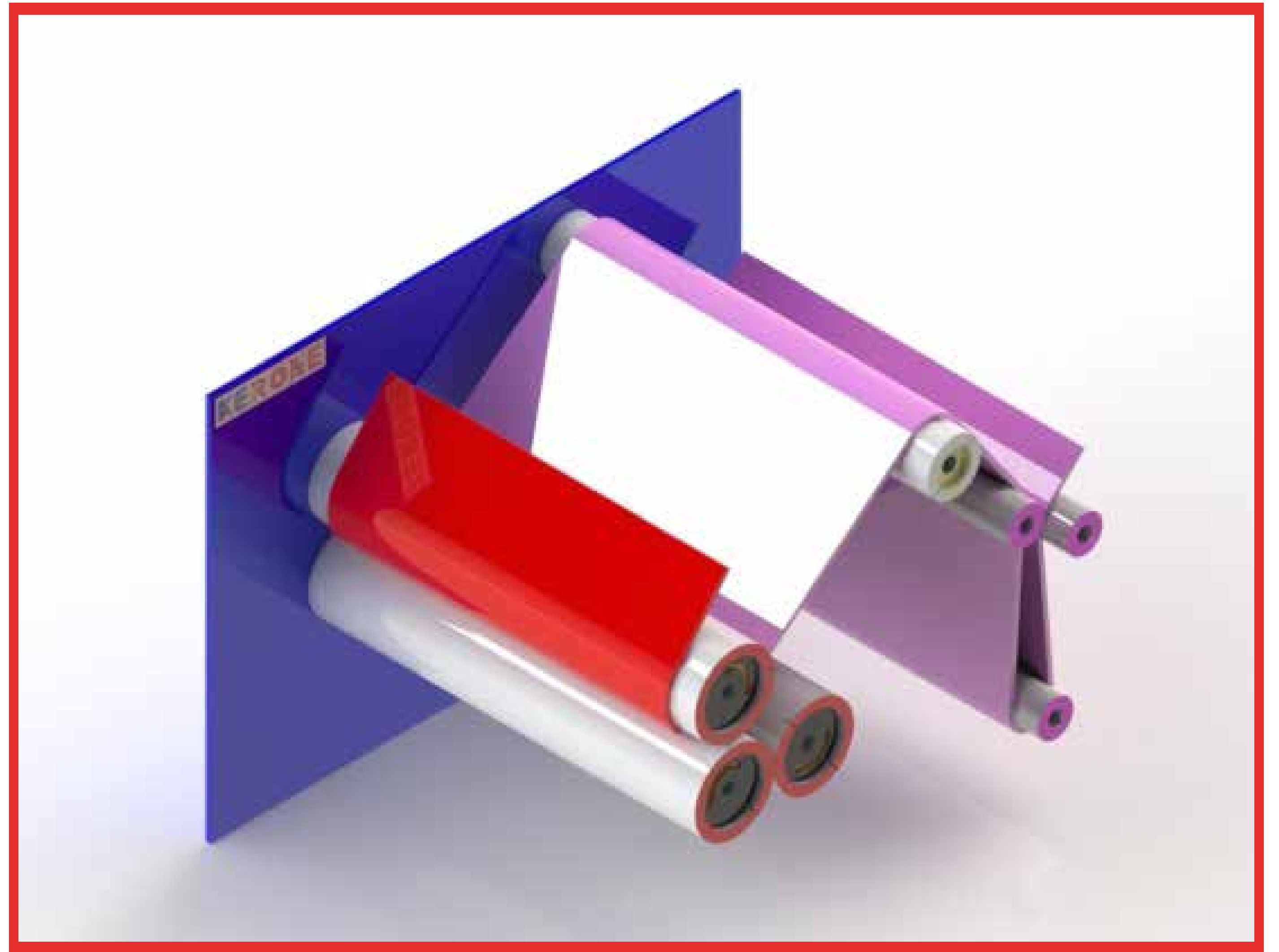


## *Reverse Roll Coating*

In this procedure, the coating material is measured on to the applicator roller by precision setting of the gap between the upper metering roller and the application roller below it.

The coating is “wiped” off the application roller by the substrate as it passes around the support roller at the bottom.

The diagram illustrates a 3-roll reverse roll coating process, although 4-roll versions are common.



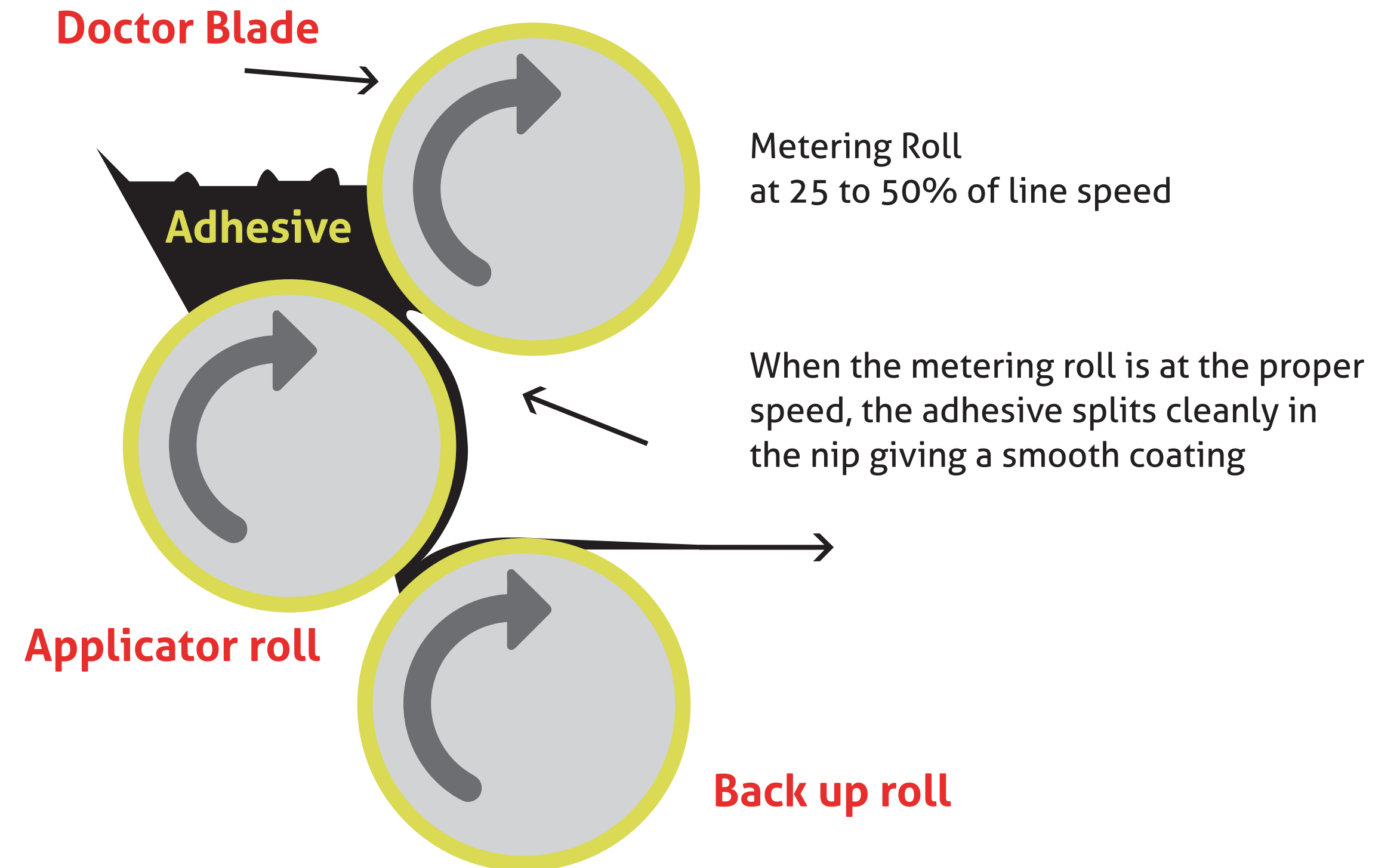
## Reverse Roll Coating

The three roll reverse coater is used for many specially applications. This method is more expensive and generally slower in line speed than the Mayer rod coater.

However, the versatility in terms of coat weight range and coating width, and the good coat quality of the three roll reverse has made it popular with many converters. In this process, the middle roll is coated with a precise thickness of adhesive, is then transferred as the rubber backing roll brings the web into contact.

The adhesive coat weight can also be varied by increasing or decreasing the speed of the applicator roll relative to the web speed. The metering roll speed can be varied to adjust the smoothness of the coating.

Figure 2 : Reverse Roll Coater



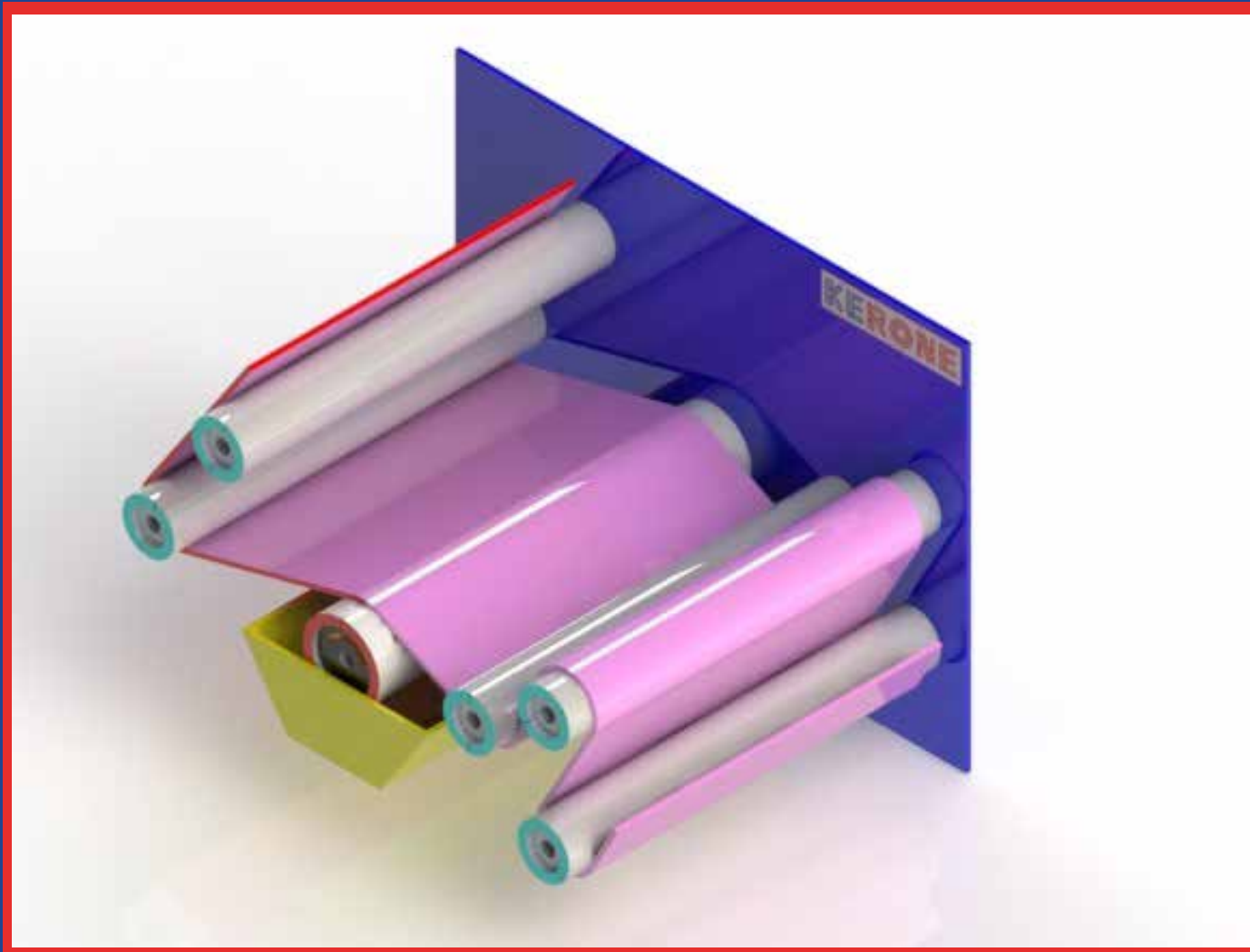
There are several variations of the reverse roll coating method, such as four-roll, nip fed, and pan fed systems. A nip-fed, three roll reverse coater is shown here. Medium to high coat weights are possible with reverse roll.

## Mayer Bar Coating

In this coating process, an excess of the coating is deposited on to the substrate as it passes over the bath roller.

The wire-wound metering rod, sometimes known as a Mayer Rod, allows the desired quantity of the coating to remain on the substrate.

The quantity is determined by the diameter of the wire used on the rod. This process is remarkably tolerant of non-precision engineering of the other components of the coating machine.

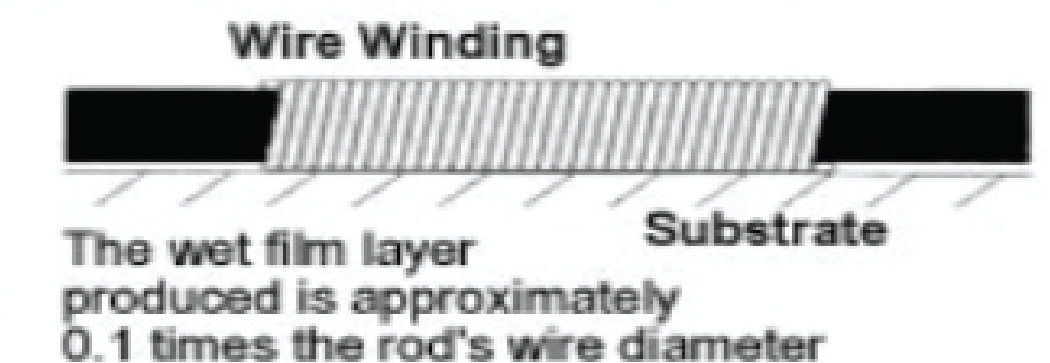


The market for wire-wound rods has grown rapidly during the past few decades, because they provide predictable, accurate coatings time after time, at a minimal cost. Although the technology goes back almost a century, today's high quality materials, multi-wire designs and special wire surfaces have made this system more popular than ever before.

Rods give users the ability to fine-tune coating thickness quickly and easily, without altering the chemistry of their coating material, and without time-consuming and expensive changeovers.

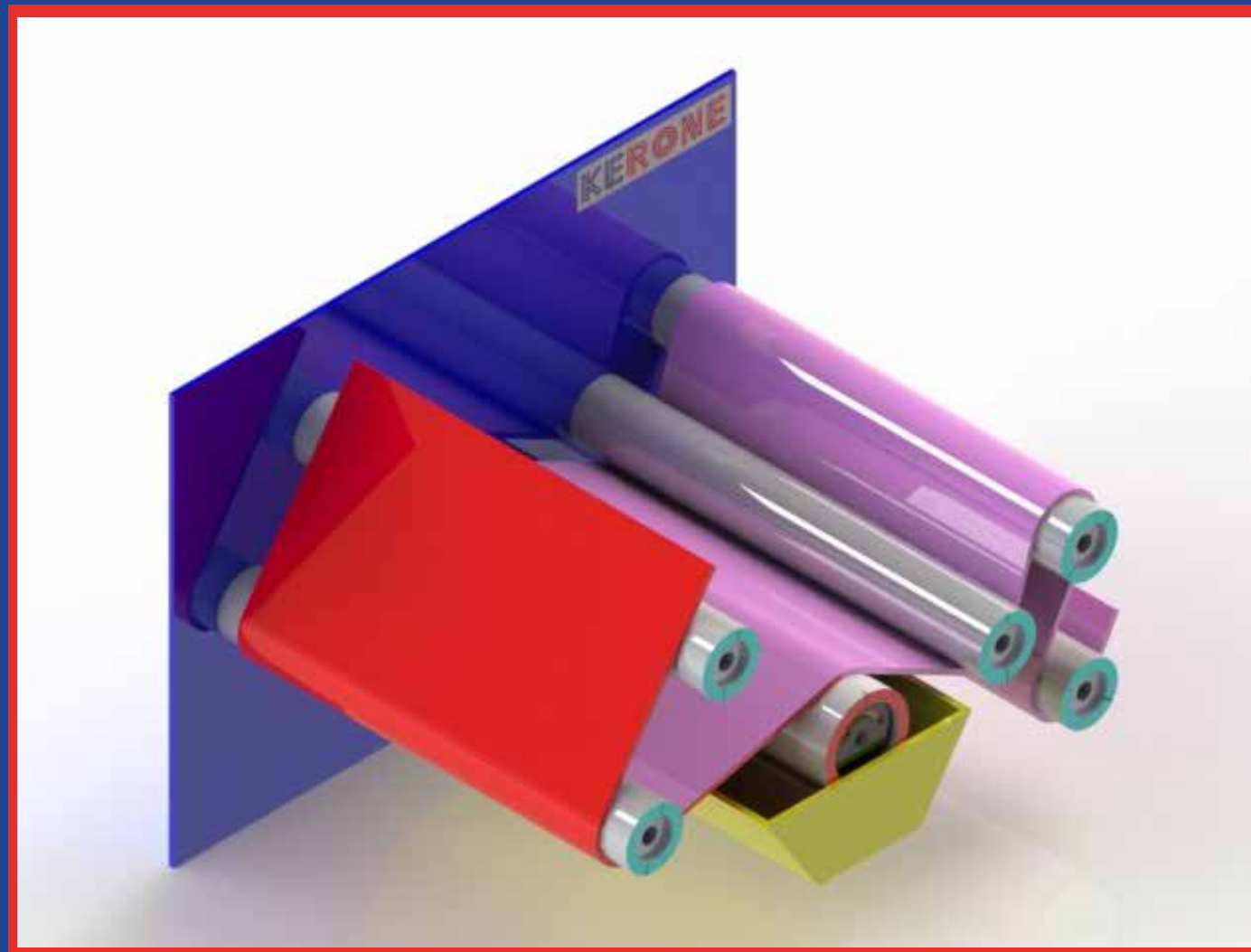
Wire-wound rods were first used in coating machines built by Charles Mayer in the 1900's to manufacture waxed paper and carbon paper. They are still called "Mayer Bars" by many coaters.

Wet coating thickness can be accurately predicted within one tenth of a mil(.0001"). Rod selection tables allow coaters to consider coat weight and percent of solids in choosing the proper rod size for each production run. Bottom-line profits have encouraged many coaters to modify existing machines, in order to take advantage of the flexibility, the ease of use and the dollar saving associated with rod coating.

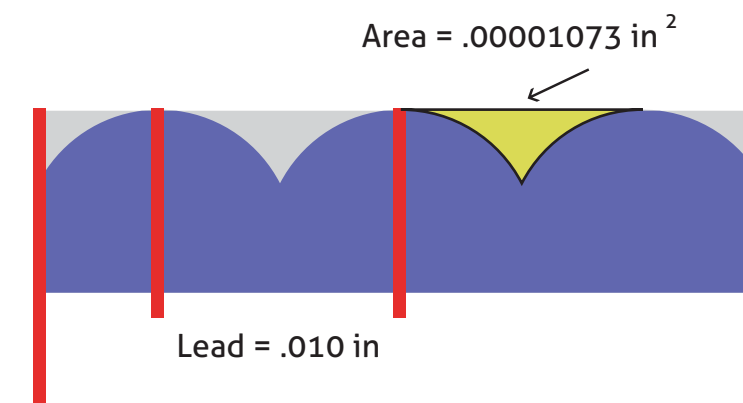


## Mayer Bar Coating

One of the more common method of coating is the Mayer rod coater, sometimes called a metering rod coater. This equipment has advantages such as low capital cost, ease of coat weight adjustment, ease of operation, and a broad range of coat weights are possible.



Single-wrap wire-wound rod size 10  
Total area of 3 openings = .00003219 in



Double-wrapped wire-wound rod size 10  
Total area of 6 openings = .00003219 in

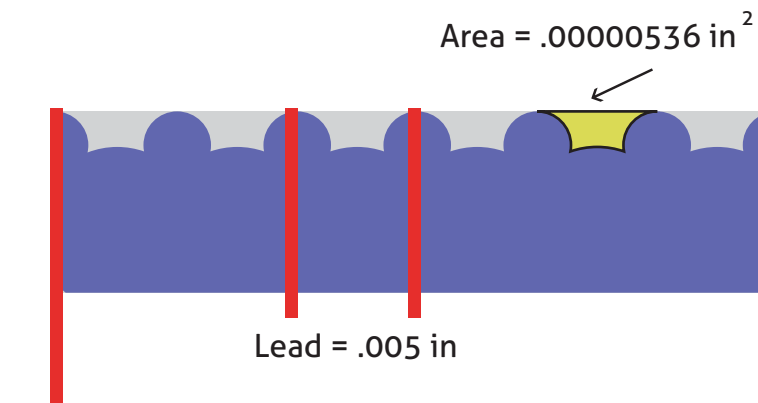
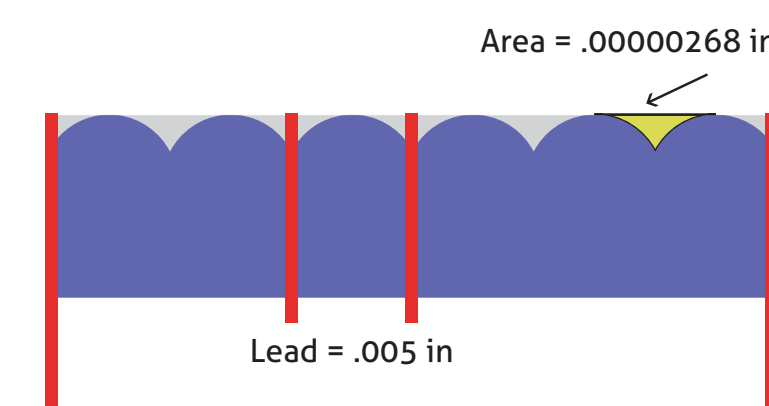


Illustration of the relationship between lead and area on comparable lengths of size 10 double wrap and single wrap wire roads.

Wire-wound rod size 5  
Total area of 6 openings = .00001609 in



Wire-wound rod size 10  
Total area of 3 openings = .00003219 in

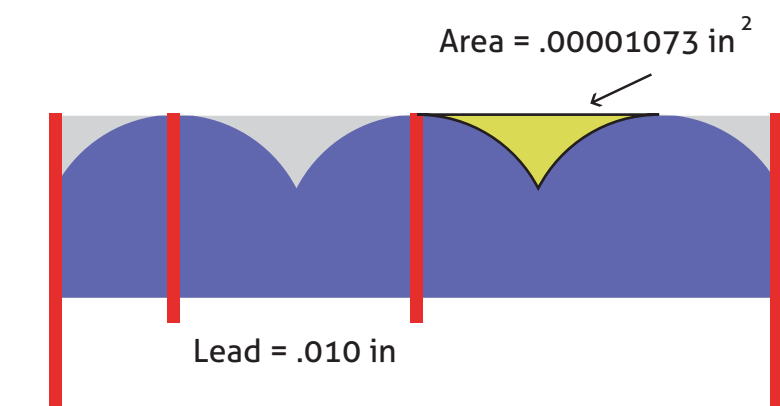


Illustration of the relationship between lead and area on comparable lengths of two different rods : a size 5 and a size 10.

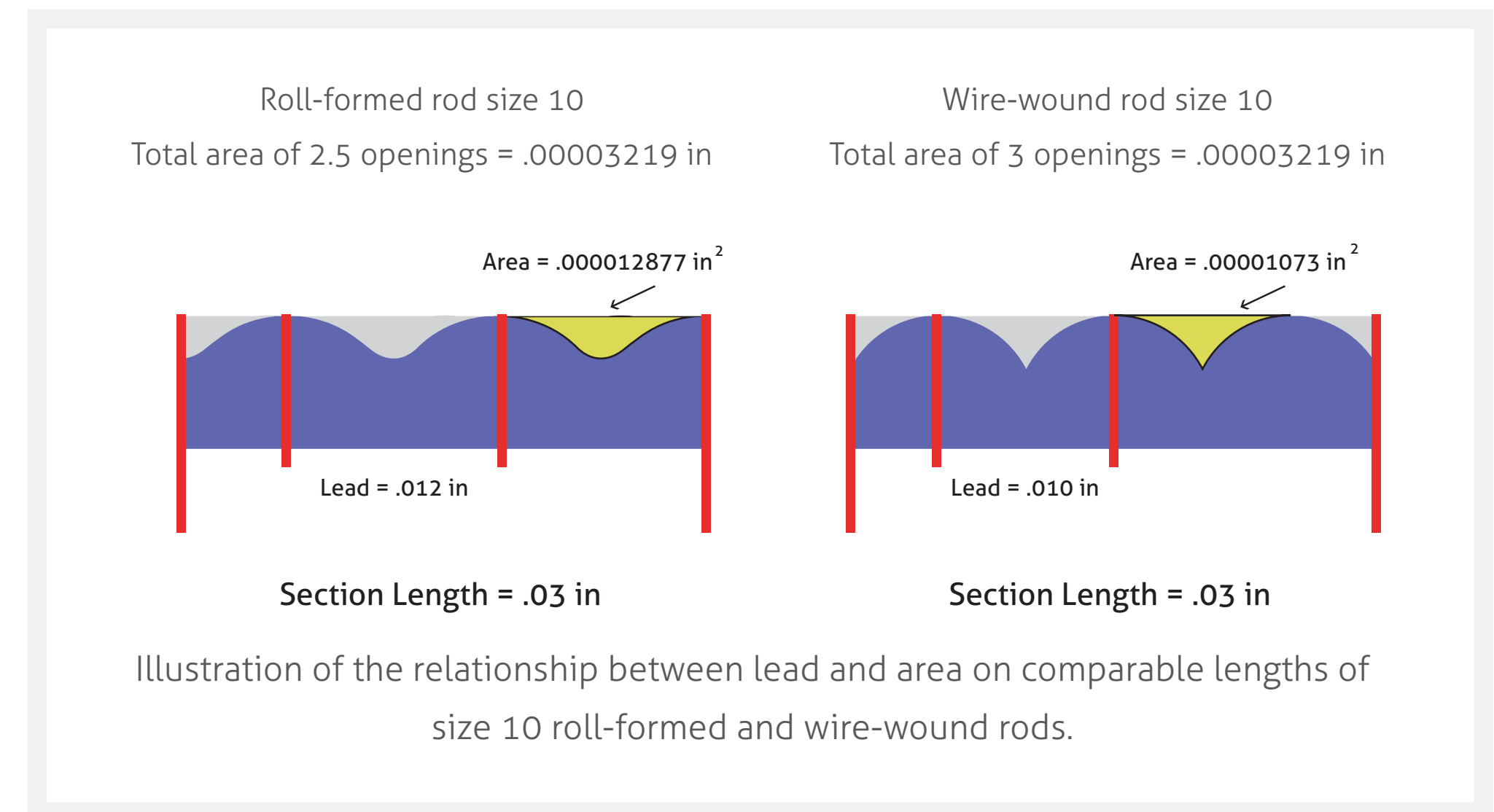
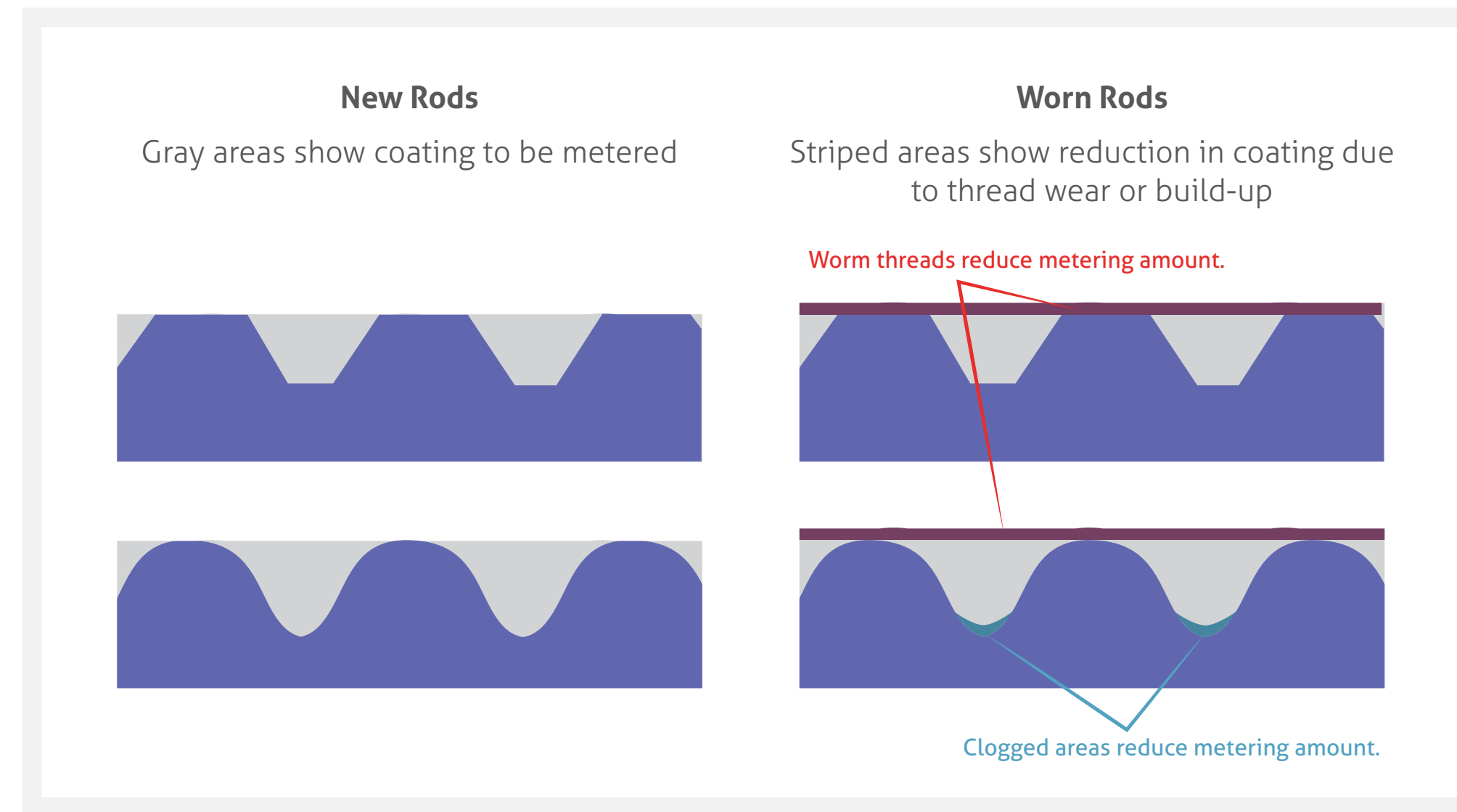
## Mayer Bar Coating

Figure 1 : Mayer Rod Coater

In this coating method, an applicator roll delivers adhesive to the substrate being coated. The applicator roll may turn either with against the primary web, delivering an excess of adhesive. Wire wound rods are then used to remove the excess. The rods may also turn in either direction.

The amount of adhesive removed depends upon the diameter of the wire which is wound around the steel rod. Coat weight is increased by simply switching to a rod wrapped with large diameter wire. Two rods in series often give better coating result than a single rod. The first rod has larger diameter wire and removes most of the excess adhesive. The second rod, with smaller diameter wire, smoothes the coating and produces the final desired coat weight.

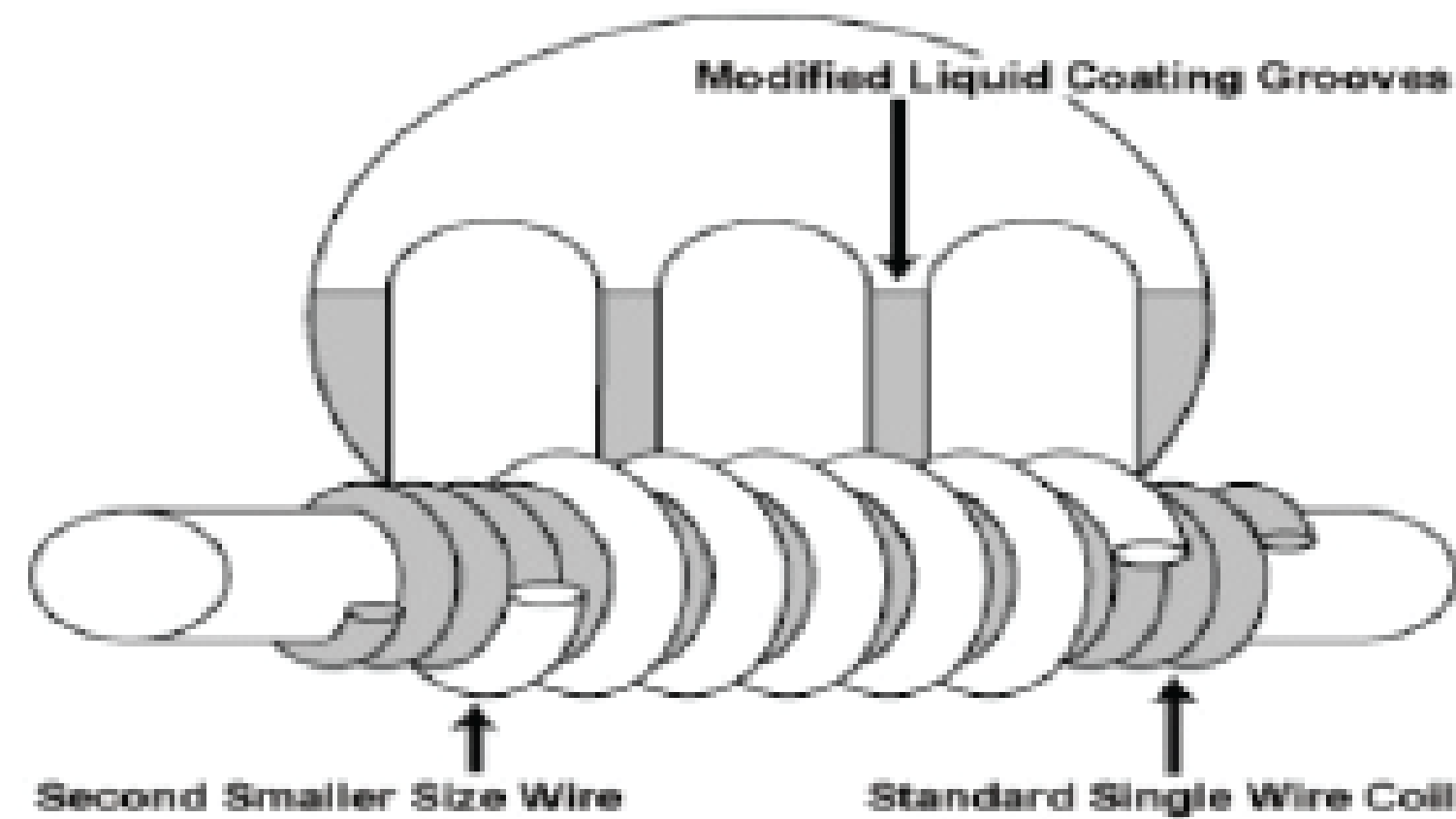
Mayer rod coating can deliver a broad range of coat weights.



## *Mayer Bar Coating*

### **Two-wire Drawdown Rods**

Where heavier coatings are required, manufactures provide special drawdown rods with two wires. A standard single-wire rod is over wound with a smaller wire which follows the spiral of the base wire. The result is a modified groove between the wires that will produce wet coatings up to 19 mils (0.19") thick.

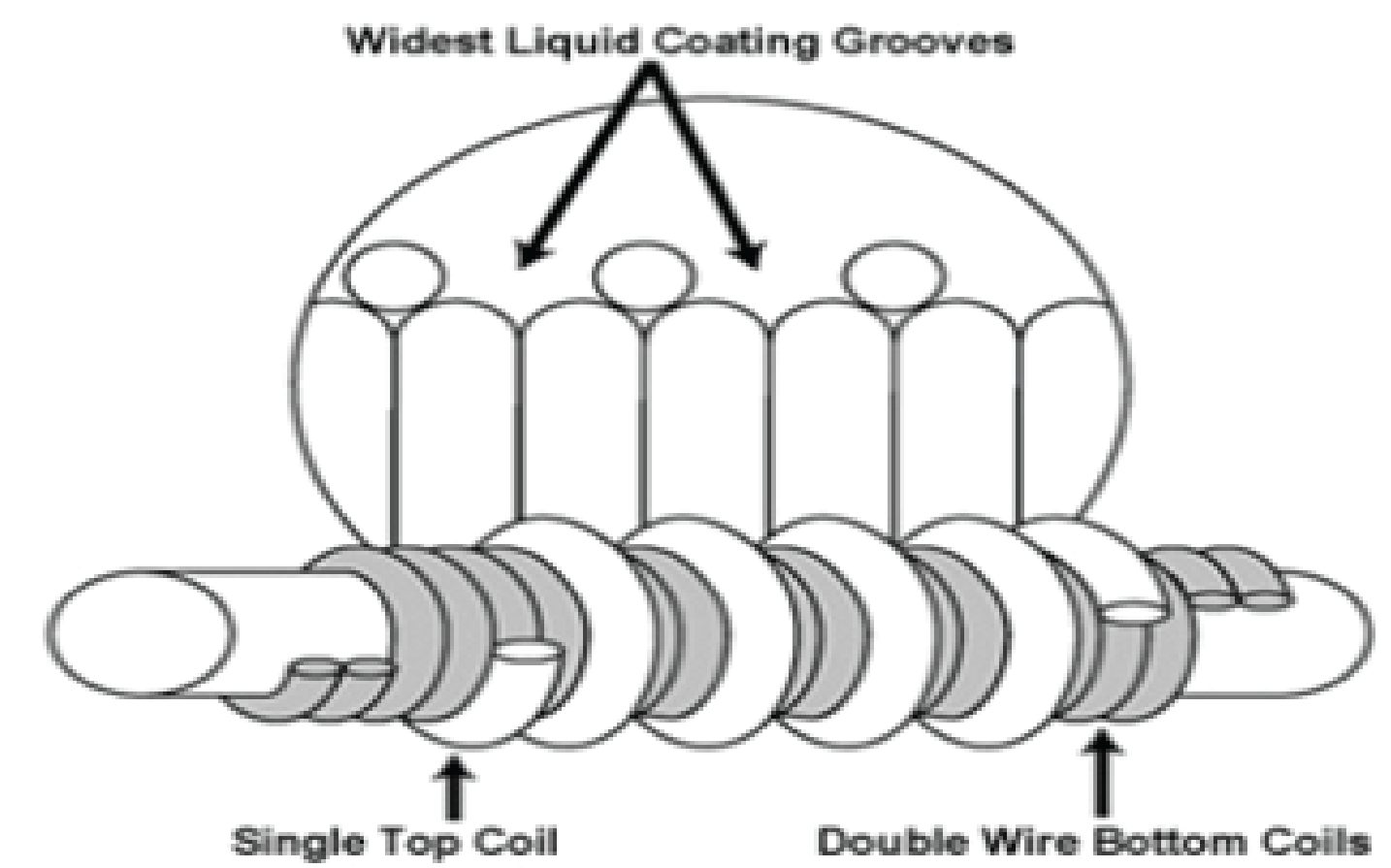


**Two-wire  
Drawdown Rods**

### **Tri-wire Drawdown Rods**

Three Rod technology developed by for Coatings up to 56 mils(0.56") thick can be produced, using three standard wires wound in a unique configuration.

Two wires are wound side by side on a core rod, then a third wire follows one spiral of the base wires. The resulting groove will maximize the area between the wires, producing a coating more than six times the thickness produced by a single-wire rod!



**Tri-wire  
Drawdown Rods**

Metering Rod Application Chart

Rod#	Thickness		Coverage		Wet Film Weight	
	Mils	Microns	Ft2/gal	m2/l	lbs/1000ft2	g/m2
1	0.15	3.8	10,700	263	0.94	3.8
3	0.3	7.6	5,350	131	1.87	7.6
4	0.4	10.2	4,010	98.4	2.49	10.2
5	0.5	12.7	3,210	78.7	3.12	12.7
6	0.6	15.2	2,670	65.6	3.74	15.2
8	0.8	20.3	2,010	49.2	4.99	20.3
10	1.0	25.4	1,600	39.4	6.23	25.4
12	1.2	30.5	1,340	32.8	7.48	30.5
15	1.5	38.1	1,075	26.3	9.39	38.1
18	1.8	45.7	891	21.9	11.2	45.7
22	2.2	55.9	727	17.9	13.7	55.9
24	2.4	60.3	669	16.1	14.9	60.3
30	3.0	76.2	535	13.1	18.7	76.2
42	4.2	107	382	9.2	26.2	107
50	5.0	127	320	7.9	31.2	127
80	8.0	200	201	4.9	50.0	203
100	10.0	254	160	3.9	62.3	254

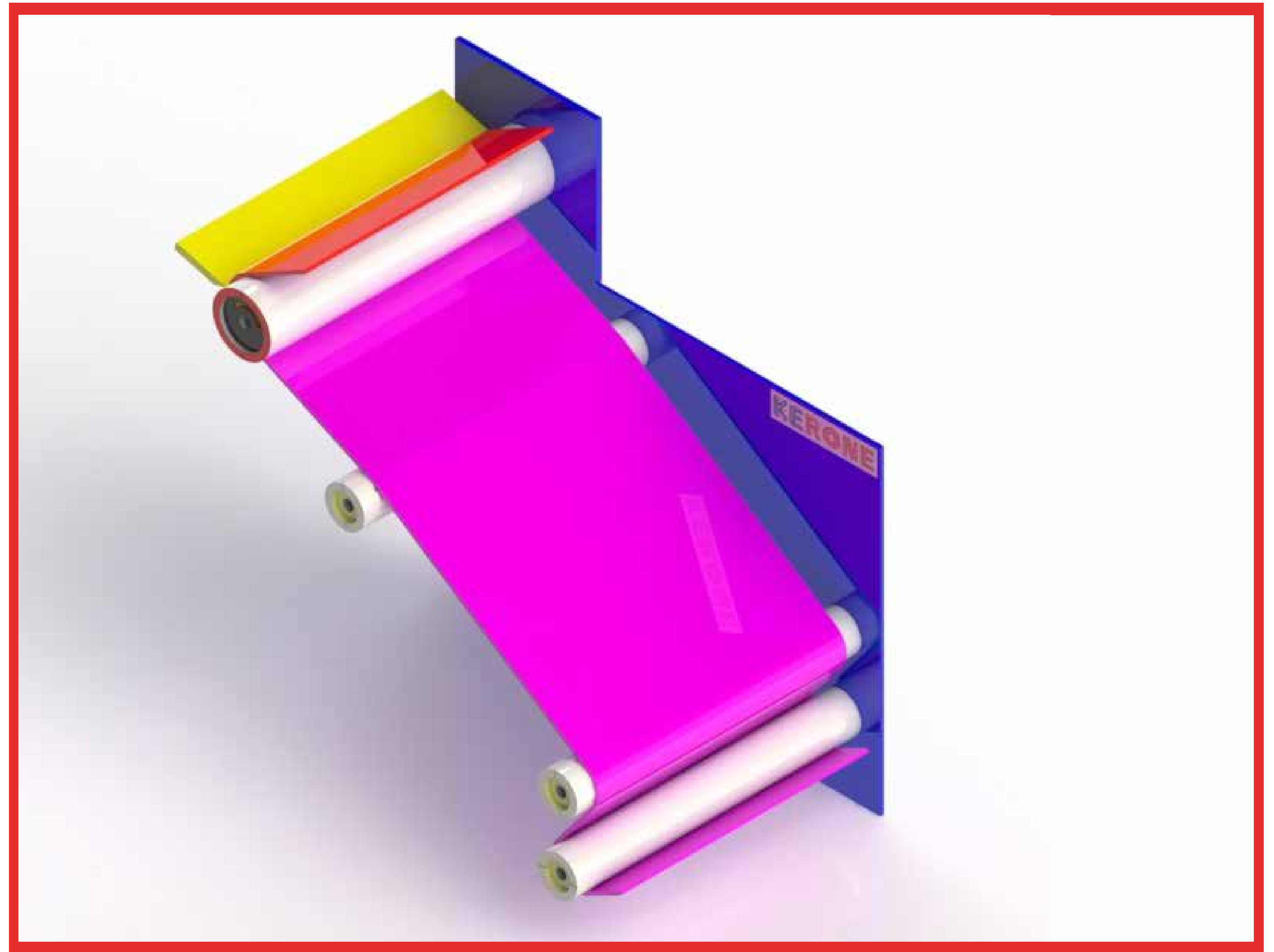
## *Knife over Roll*

This process relies on a coating being applied to the substrate which then passes through a “gap” between a “knife” and a support roller.

As the coating and substrate pass through, the excess is scraped off.

This process can be used for high viscosity coating and very high coat weights, such as plastisols and rubber coatings.

There are innumerable variants of the relatively simple process which is rugged, hard-working and somewhat inaccurate.

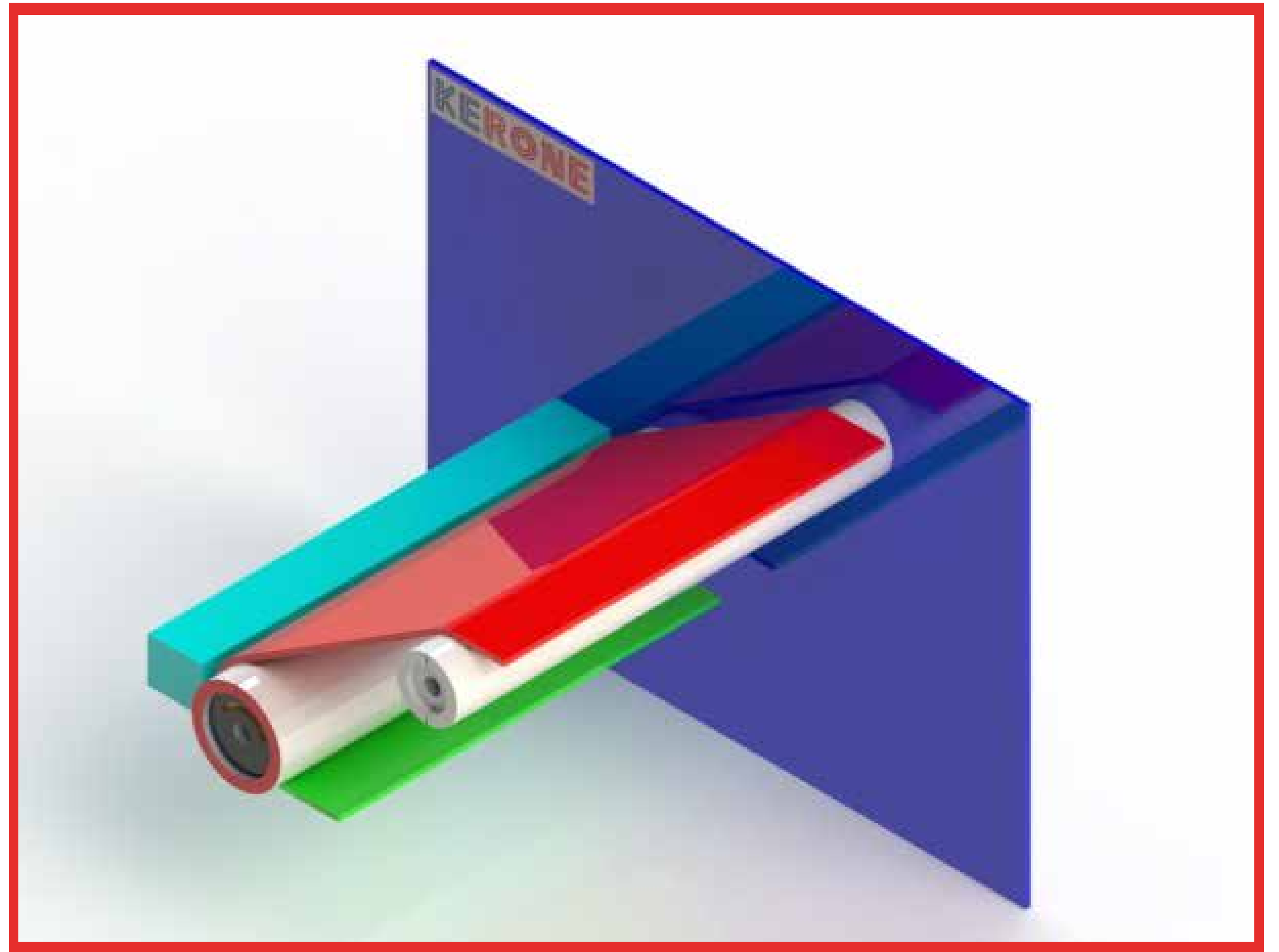


## *Slot Orifice Coating*

In the Slot Die process, the coating is squeezed out by gravity or under pressure through a slot and on to the substrate.

If the coating is 100% solids, the process is termed “Extrusion” and in this case, the line speed is frequently much faster than the speed of the extrusion.

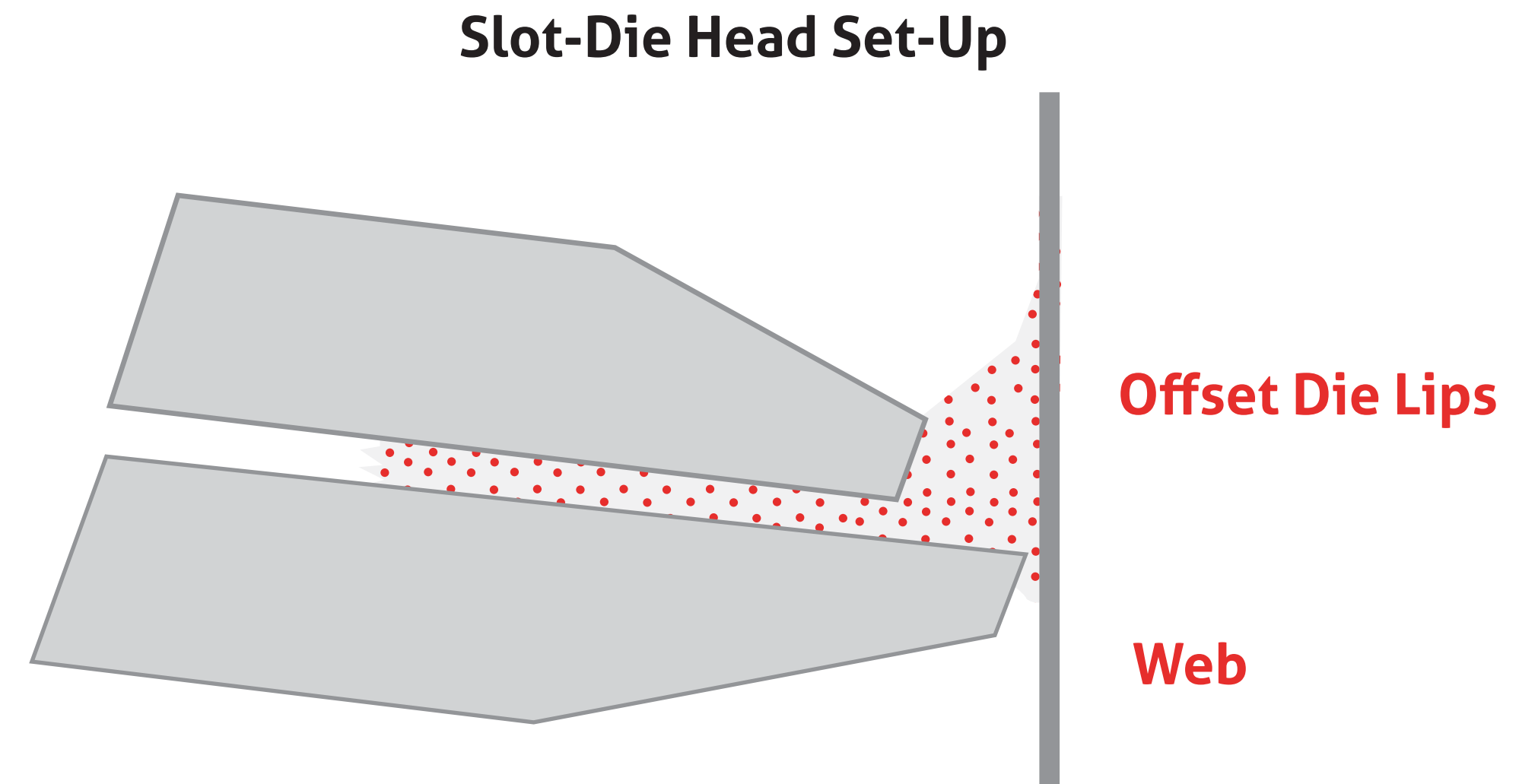
This enables coatings to be considerably thinner than the width of the slot.



## *Slot Die Coater*

The slot die coater does not use rollers to deliver the adhesive to the web. Instead, adhesive is pumped into a chamber, where it exits through a long, narrow slot directly in contact with a moving web. The web is usually supported immediately behind the slot with a rubber or steel backingroll.

Figure 4 : Slot Die Head Set-Up



The slot die coating method is inherently low foaming, and is capable of producing good quality material at high line speeds. However, the equipment is relatively expensive and requires a high level of operator expertise. Moderate to high coat weights are possible with slot die.

## *Die Coating Methods* *a family of coating methods:*

- Slot-Bead ("slot", "die", "on-roll slot")
- Extrusion
- Tensioned-Web Slot ("off-roll slot", "TWSC")
- Slot-On-Rubber Roll
- Slide-Bead ("slide", "cascade")
- Slot-Curtain ("curtain", "hopper", "inverted fountain")
- Slide-Curtain ("multilayer curtain")
- Jet Coating

### **Die Coating CHARACTERISTICS:**

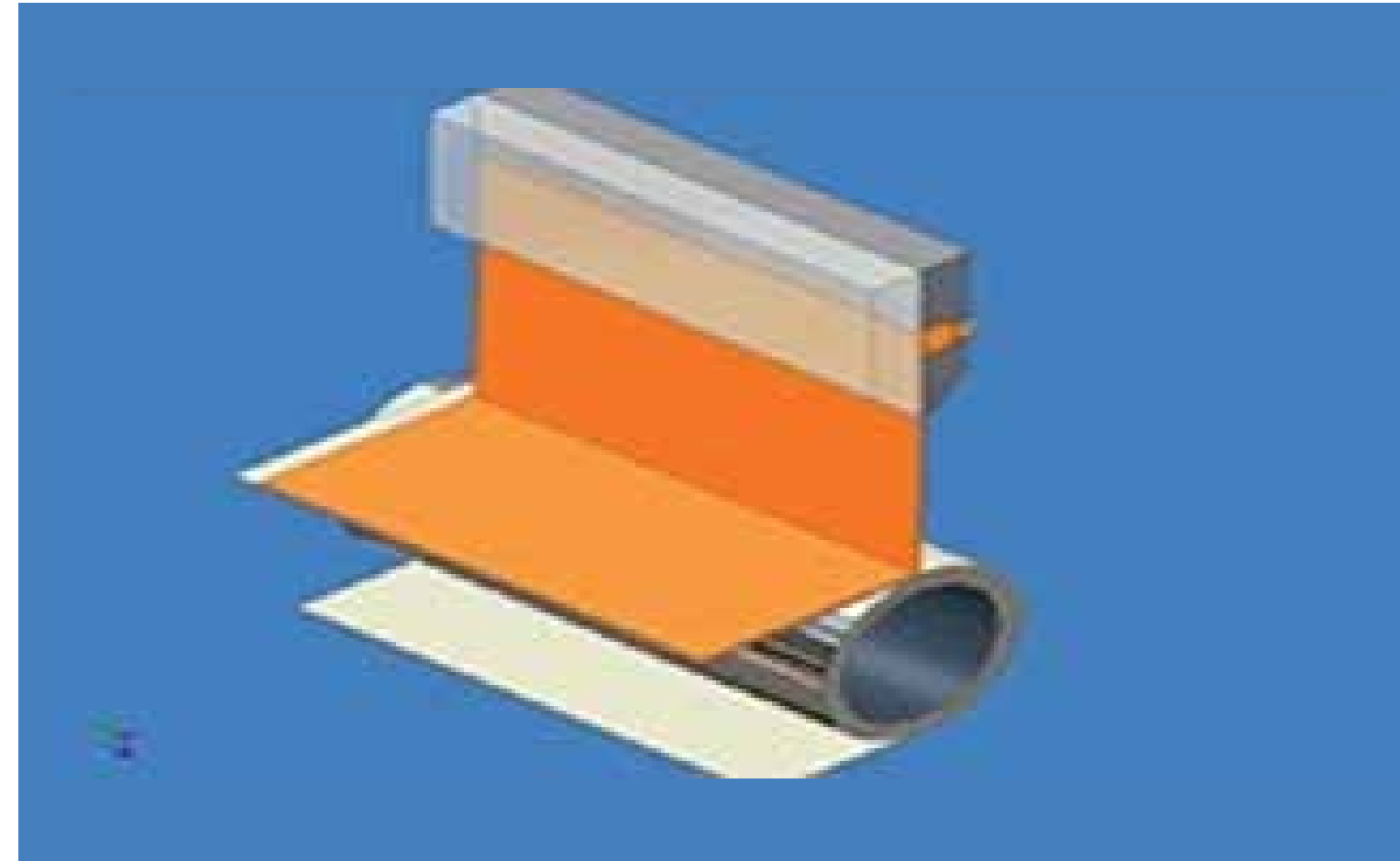
Coating process utilizes a "die" applicator for achieving two sequential flows:

#### **INTERNAL MANIFOLD FLOW -**

Distributes flow across intended coating width internal manifold flow is similar for all die coating methods

#### **EXTERNAL TRANSFER FLOW -**

Transfers the width-distributed flow to the moving substrate different methods are distinguished by their particular transfer flowst



**Slot-Curtain Coating section displaying manifold and transfer flows**



**Slot Die section view displaying internal manifold**

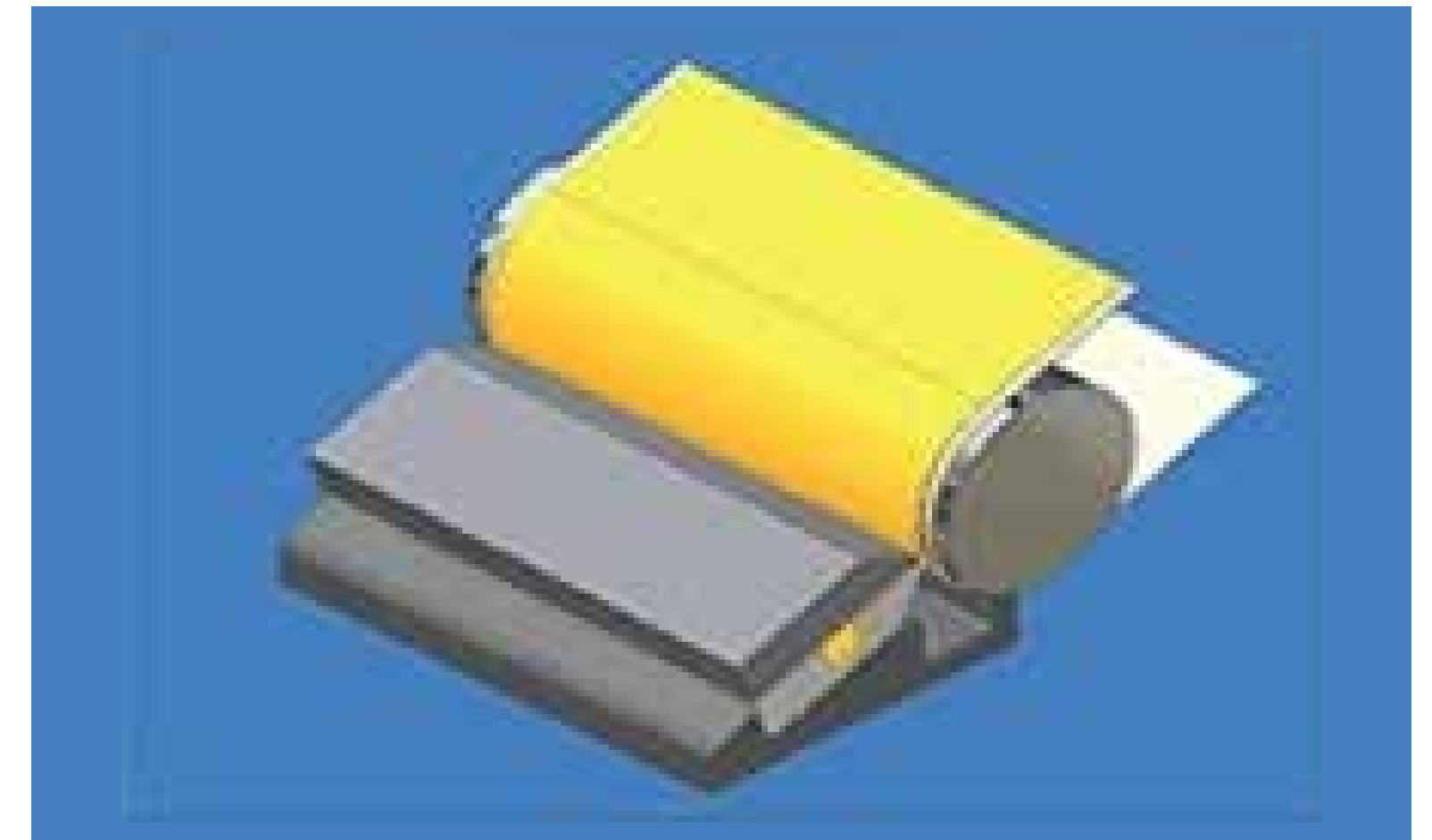
## *Commercial Advantages*

Precision Die Coating allows participation in higher-margin markets exclusive to superior product functionality and more frugal manufacturing (reduce waste, high productivity) when compared with other coatings methods such as roll, blade, gravure, rod, etc.



**Transfer flow of  
slot-bead coating**

**Slot-bead Coating with  
applied vacuum**

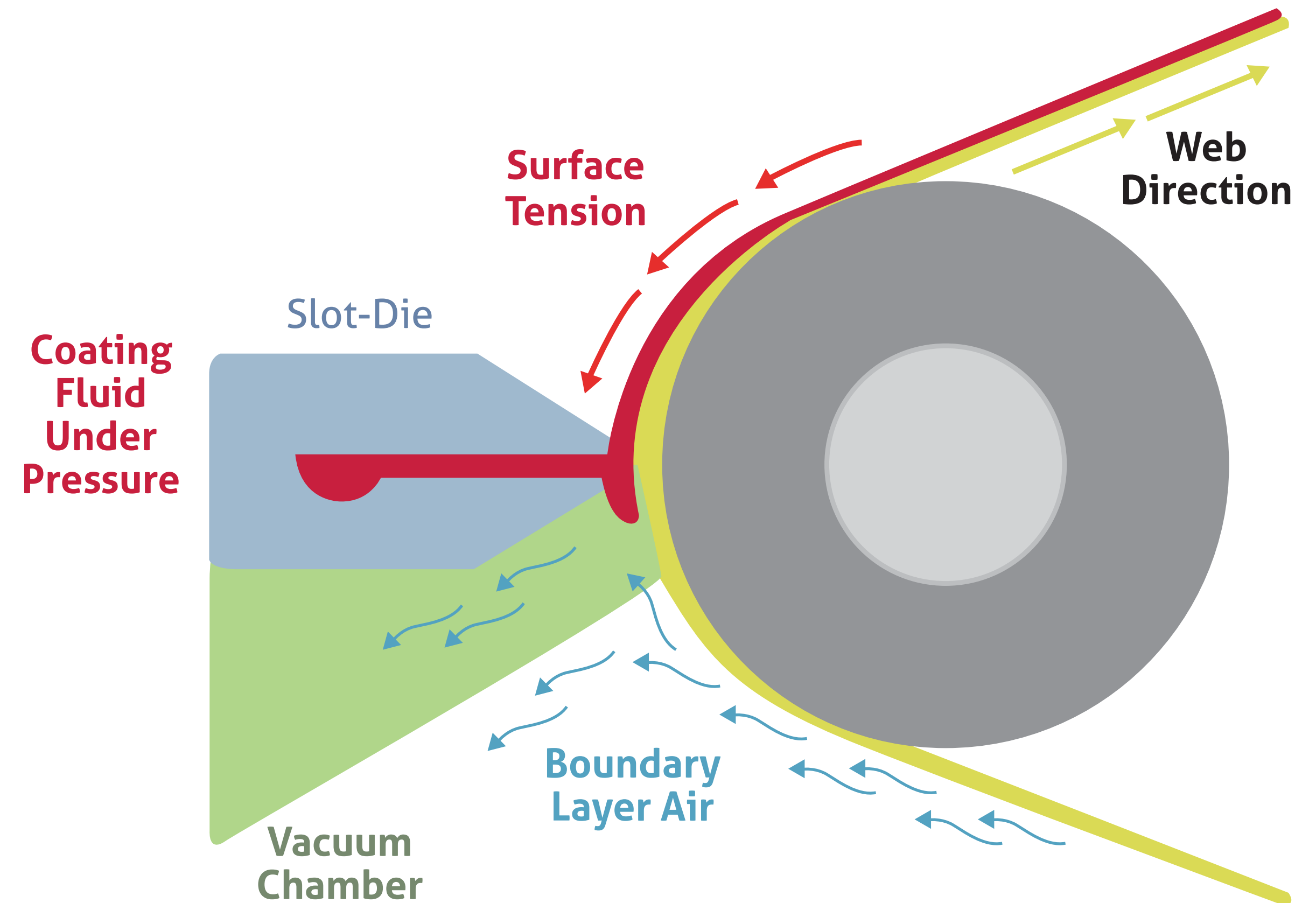


## Contactless Adhesive Coating

WebFlight adhesive coating technology is a contactless method of applying adhesive coating solutions to web materials by modifying the micro-environment in which the adhesive coating solution and web meet.

WebFlight adhesive coating does not employ rollers, knives, blades, or other contact devices to apply or level coating solutions across the web.

Instead, WebFlight adhesive coating uses the following methods to optimize the adhesive coating process:



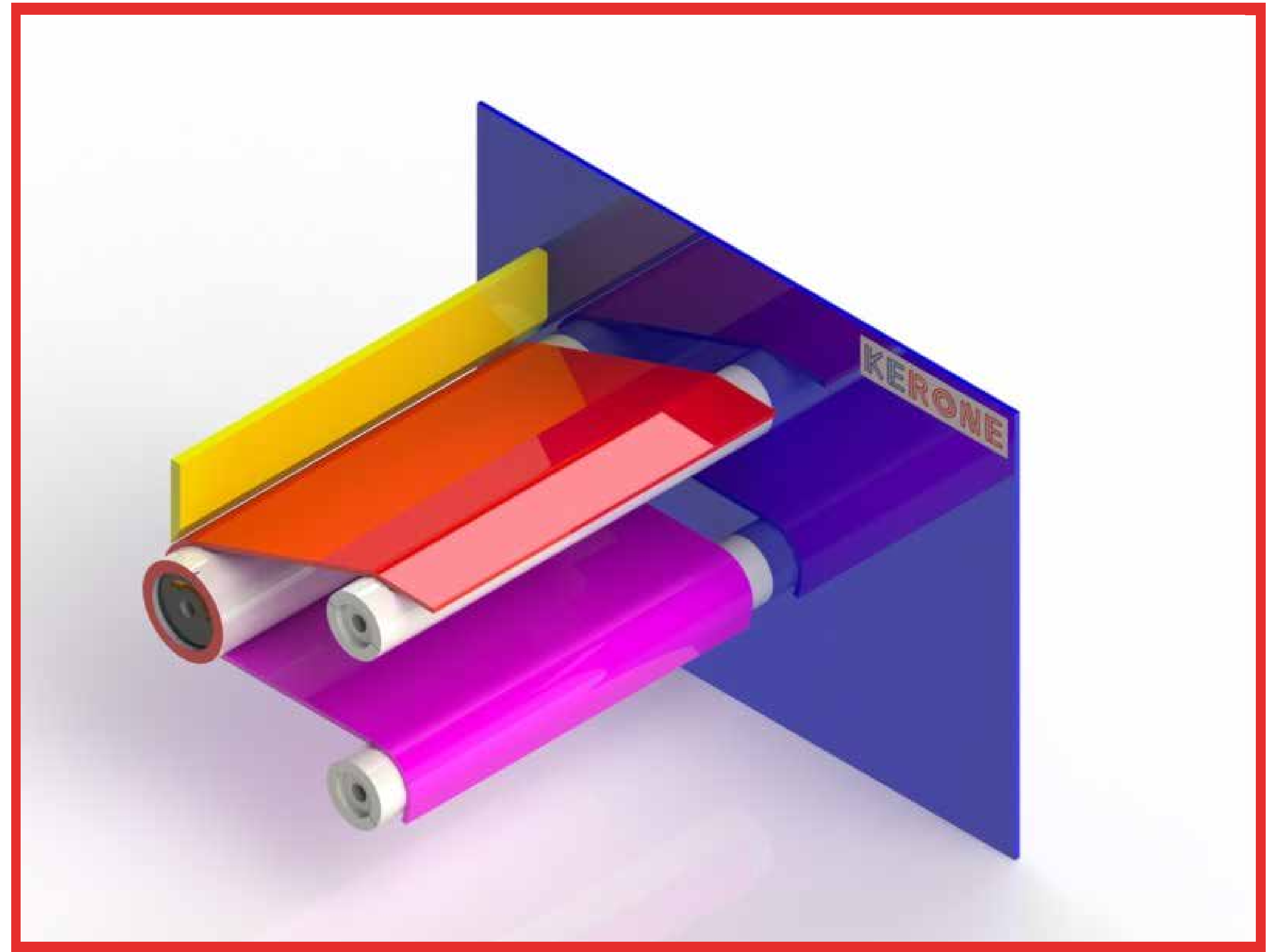
## *Air Knife Coating*

The Air Knife coater, likewise called Air Doctor is a case of an old coating system that is still generally utilized and has a part as a part of the coating process.

It was broadly used to successively cover the different layers required for photographic movies in light of the fact that it could apply thin layers from low thickness arrangements.

Slide and blind coating on account of enhanced quality, higher rates and multilayer ability supplanted it. It is currently generally used to apply pigmented coatings in the paper business and for 100% solids coating, for example, liquid zinc and aluminum in arousing applications. A basic process where the coating is connected to the substrate and the abundance is 'brushed off' by an effective jet from the air knife.

This method is regularly utilized for fluid coatings and is especially boisterous.



## Curtain Coating

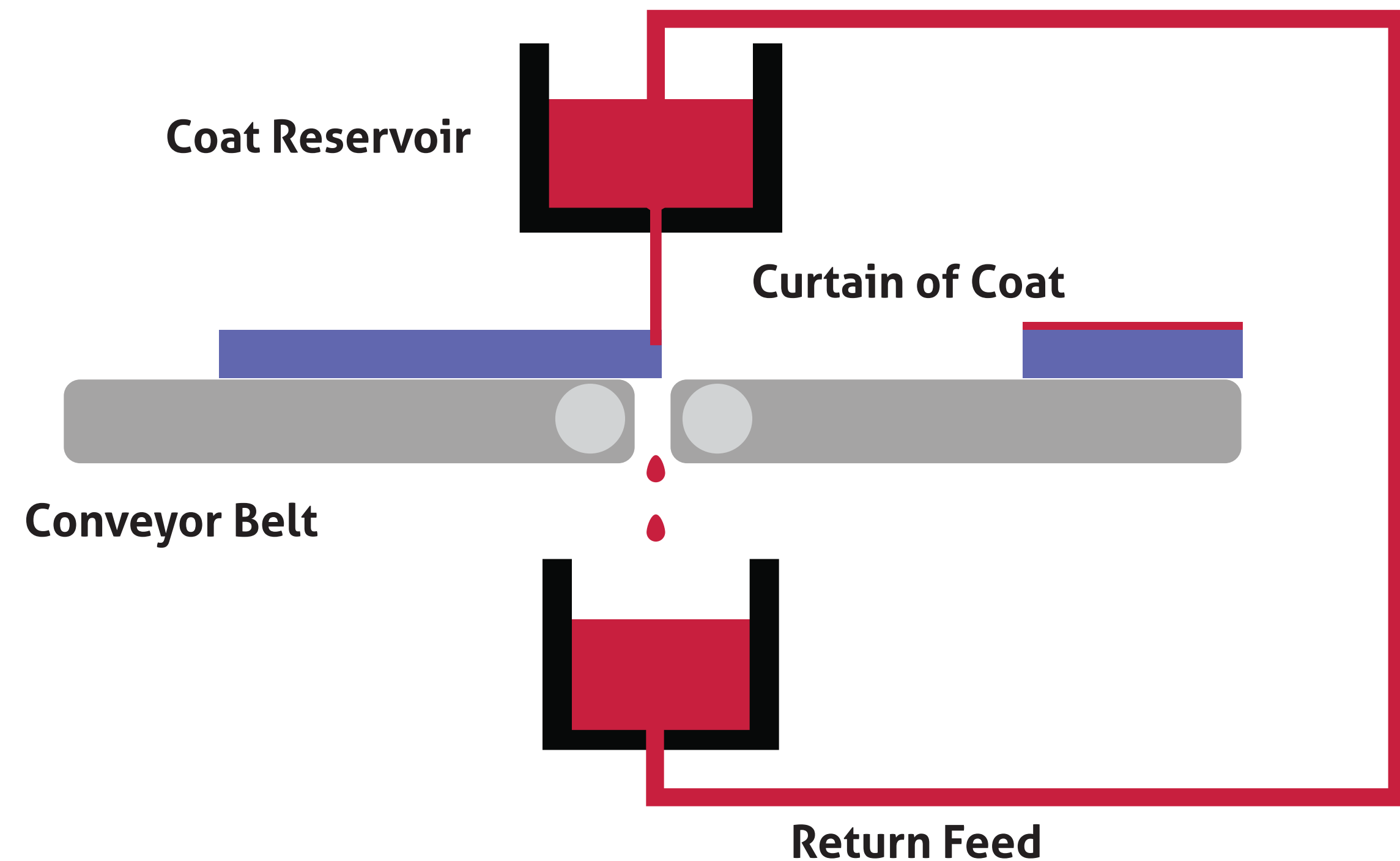
Curtain coating process creates an uninterrupted curtain of fluid that falls onto a substrate. The object to be coated, such as a door, is passed along the conveyor at a controlled speed and so receives even coating on its upper face. The curtain is created by using a slit at the base of the holding tank, allowing the liquid to fall upon the substrate.

### Uses -

- Promotional, opening price-point and moderate market levels
- Cookware: Interiors and exteriors
- Bakeware
- Small electrics

### Advantages -

- **Speed:** This system can coat from 3,000 to 4,000 pieces per hour
- **Minimum personnel required**
- **Virtually no waste:** Since the small amount of unused coating is cycled back into the system, this method wastes less coating than any other
- **Aesthetics:** The only non-spray process that imparts a smooth, glossy finish, with no track marks
- **Flexibility:** Disks can be as thin or as thick as specifications require



## *Immersion / Dip Coating*

This is an industrial coating process; in which the substrate is dipped into a tank of the coating reservoir, which is normally of a low viscosity to enable the coating to run back into the bath as the substrate emerges.

This process is frequently used on porous substrates. Immersion/Dip coating process take after the set method which takes after as parts to be covered ought to be cleaned to evacuate contaminants.

This outcomes in unrivaled groundwork attachment and in addition enhanced consumption resistance.

### **Advantages -**

- Dip coating gives a defensive shield that opposes consumption
- Insulates against warmth, frosty, stress and electrical streams
- Adaptable to high volume requests obliging quick conveyance
- Durable and UV safe
- Alternative hues and completions (reflexive and matt) can be made effortlessly and financially
- An extensive variety of thickness, compositions



## *Hot Melt Coating*

Hot melt coating is widely used industrial coating mechanism, in this the coat to be applied is heated to its melting point then the substrate is put into this melted coating solution and later it allowed to dry at uniform rate forming a smooth coat on the substrate.

### **Advantages -**

- Environmentally friendly due to water and solvent-free adhesives
- Low coating weight needed
- Elimination of dryer / low energy requirements
- No thermal stress of substrate
- High production speed possible
- Permanent or non permanent coating possible



## *Pilot Coating Plant*

Pilot Coating Machine is a small coating machine which allows us to use verity of the coating techniques, the pilot coating machines can later be transformed to large scale machinery for the regular production processing.

The Pilot coating plant is useful in reproducing various type of the coating technology according to the substrate and coating material involved



## *Spray Coating Machine*

At KERONE, we hold the expertise in designing and manufacturing of custom build spray coating systems for the diverse need of customer, every single machines designed by us, is known for its performance, efficiency and economy of scale.

Spray coating is one of the most widely used in industries, because its highly versatile can be utilized for the number of applications

### **Application -**

- Coating protection coats on engines
- Pharmaceutical: antibiotics, medical ingredients, additives
- Industrial: paint pigments, ceramic materials, catalyst supports, microalgae



## *Fabric Coating Machine*

To enhance and strengthen the fabrics, taps, textile products and other flexible substrates, it is mandate that some type of the coating and lamination required, coating helps the industrial products to achieve the desired level of strength, surface tension, look and feel and improve the durability. KERONE since last 40 years, with its engineering excellence helping the industries for their need of coating and laminating machineries for the tape, fabric, textile products, and other flexible substances with deep level of the customization.

Fabric coating systems utilize any from the below coating techniques: Hot melt Coating Systems, Slot Die Coating Machine, Reverse Roll Coating Machine, Knife Over Roll Coating and immersion/dip coating.

### **Application -**

- Perfect uniform coating across the whole width
- Vibration free rigid doctor blade construction
- Special arrangement to set very fine gap across the width
- Quick lifting system
- Micro adjustment individual and together left / right
- Knife on air arrangement
- Dual knife system with option of thin /thick coating



## *Web Coating Systems*

Web coating is the continuous process of applying a coating material – whether its of a solid or liquid substance – onto a particular substrate. Web coating is able to apply, coating over a extensive variety of numerous different kinds of substrates, such as plastic, paper, fabric, metal etc.

Web coaters have become quite useful and preferable choice of industry due to its economical approach, high efficiency, cost effectiveness and high production rate.

Web Coating Dies have many advantages over traditional coating methods such as roll coating. These types of machine also use less material, have better gauge control, and can apply multi-layer and pattern coatings. Exacting tolerances of up to 75 nanometers are available to complement the application and process specifications.



## *Impregnation Plants*

Impregnation process plants are used for applying a coating of decorative & protective layers on the substrate, the impregnation plants are most commonly used for coating of chemically balanced liquids to protect the components and materials from damage of problems by filling the micropores (very narrow space or hole in a material left in material due to various processes) from causing serious issues.

The impregnation process is most commonly used in the increasing capacity/protecting the Film paper, Press Board, Paper, Wood, Asbestos board, Mica, Micanite, Cotton or silk, Rubber, Insulating fabrics, PLASTICS, motor winding, electrical and mechanical machine components and etc.



## Coating Line

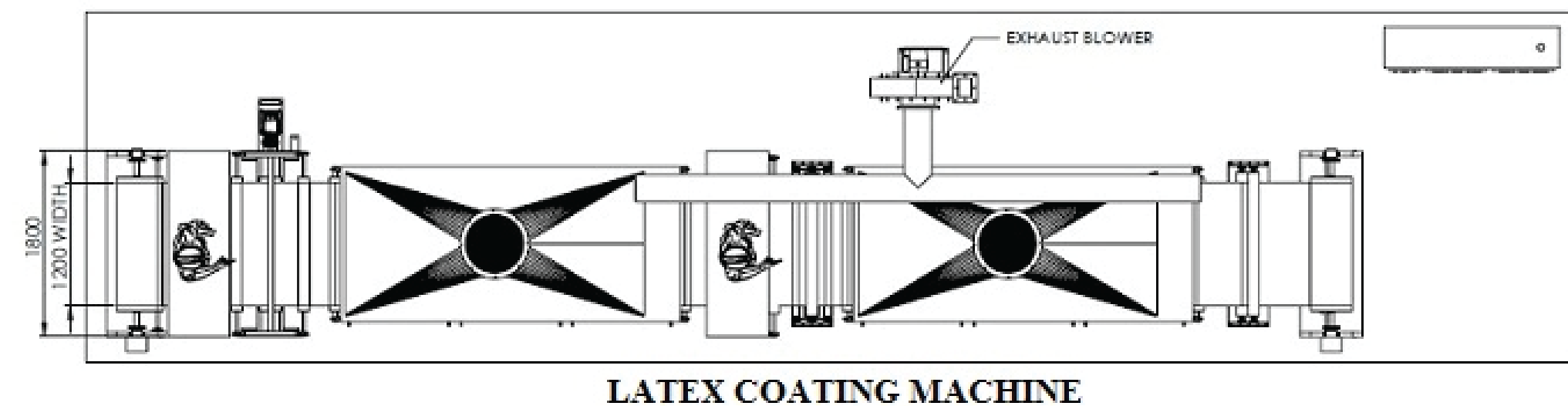
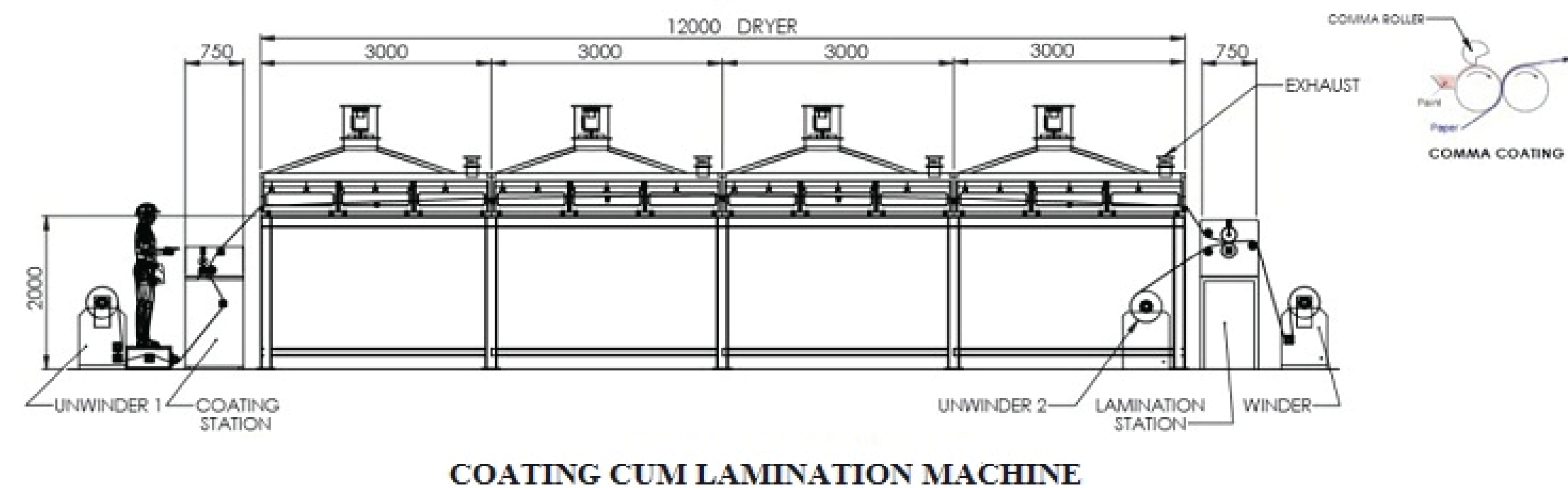
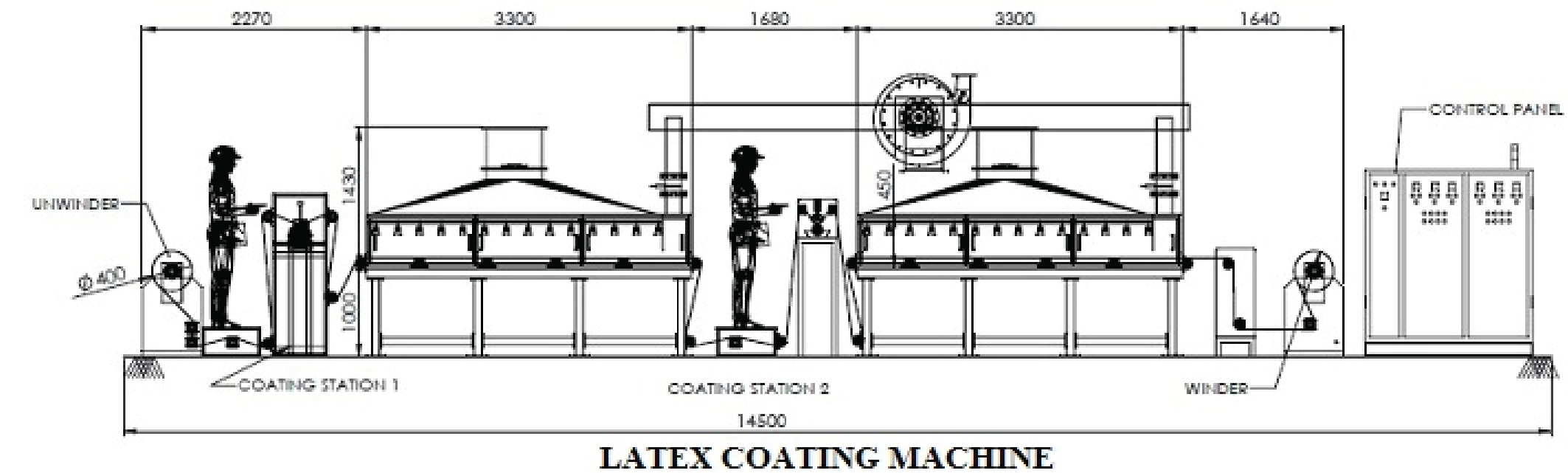
Accuracy, efficiency, machine quality and output quality are not just word but are our commitment towards our profession. We always strive to achieve more than client satisfaction with our quality delivery and commitment towards every machine manufactured by us.

We design and manufacture coating solutions that can cater various needs of converting and coating, technology and methodology selected are as per the demand of substrate and desired output quality.

We provide various lab and Pilot scale or complete industrial scale coating machines of various techniques such as Gravure Coating, Reverse Roll Coating, Knife-Over-Roll Coating, Air Knife coating, Metering Rod (Mayer Rod) Coating, Slot Die Coating, Curtain Coating, Immersion/Dip Coating, Hot melt Coating, Web Coating and ETC.

### Lab scale and Pilot scale coating Lines

### Commercial Scale Coating Lines



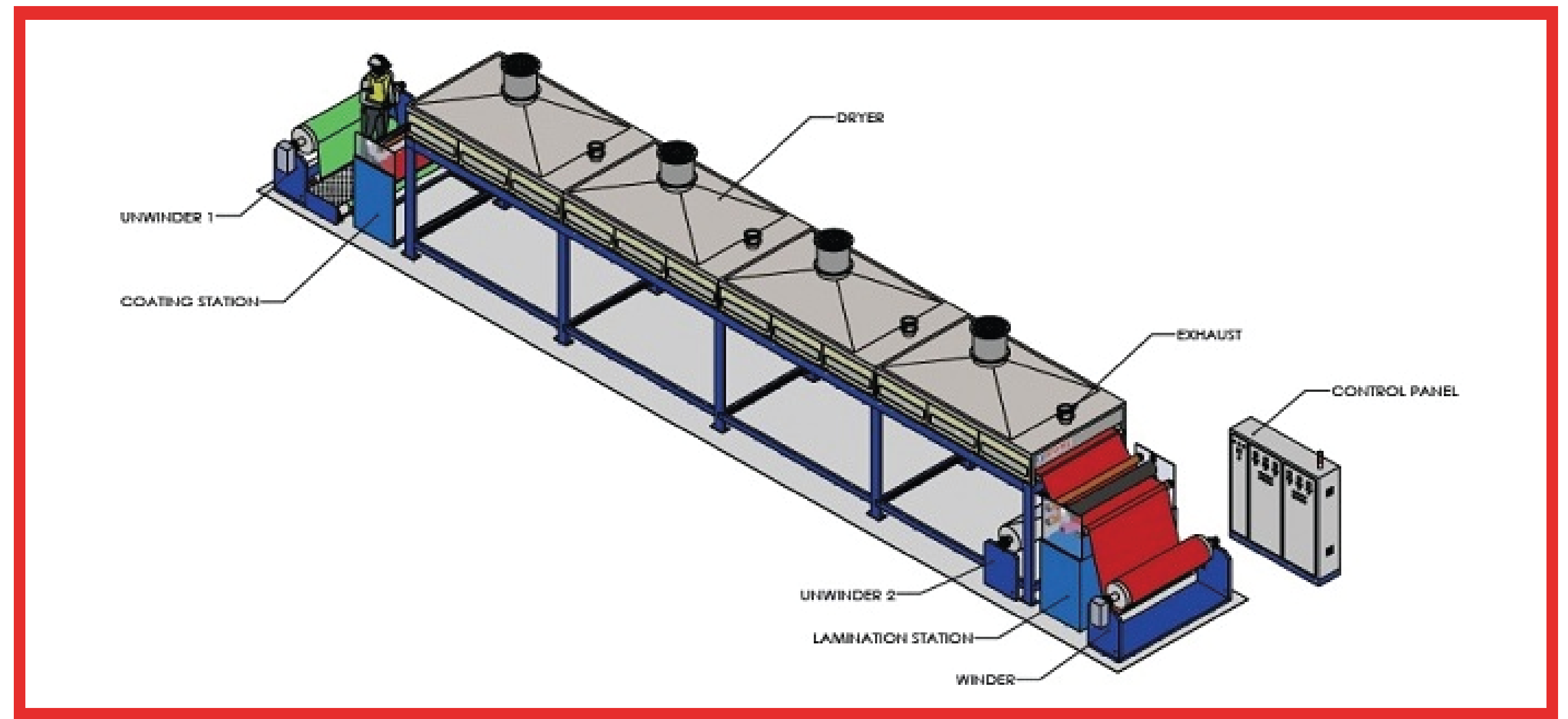
## Lab And Pilot Scale Coating Line

KERONE's Lab and Pilot scale coating systems are of plug and play type, sizing 10 inches to more than 50 inches. We produce lab-scale and pilot-scale coating systems to achieve same level of quality and efficiency as of production scale coating system. We design and manufacture lab and pilot scale coating with of various such as **Gravure Coating, Knife coating, Curtain Coating, Knife-Over-Roll Coating, Web Coating and Mayer Rod Coating.**

Lab scale and Pilot scale coating lines are ideal to get the chemistry of coating rightly in place by trying various coating combination with substrate, suitable for the small scale production, NPD (New product development), science labs.

### Features-

- Big Coating Performance by small size equipment
- Suitable to handle small input and provide better performance
- Technically reliable and efficient
- Flexible, highly efficient coating machine for high quality
- Aesthetically vibrant and Technically advanced



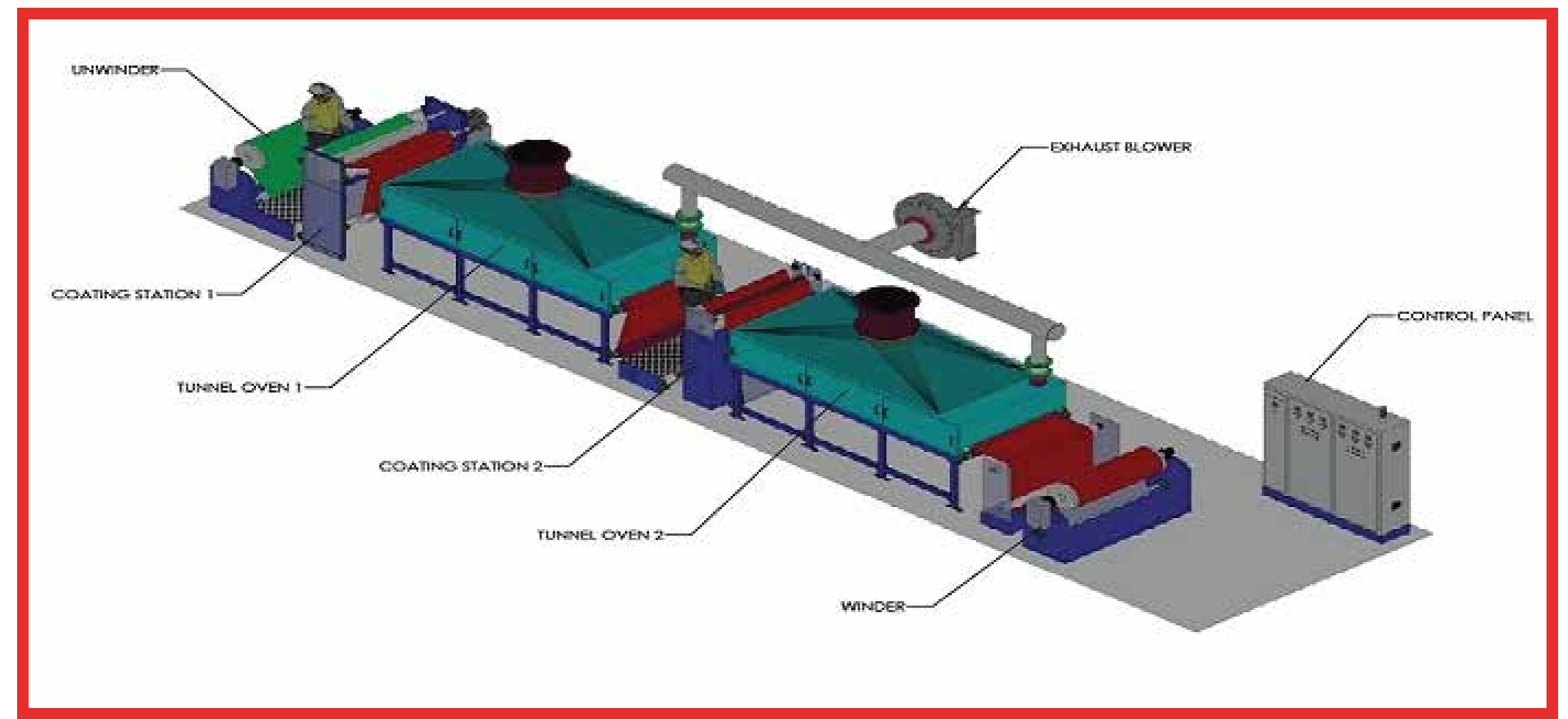
## Commercial Scale Coating Line

Commercial scale coating or complete coating line is highly productive having ability to handle complex coating needs. KERONE's commercial scale (complete) coating line helps in accommodating specialized requirement of customization, each system is design and nurtured by team of experts having more than 40 years of knowledge along with dedicated team to support which make us completely reliable and customer friendly company.

With our coating solution help our client to be step ahead from time for technical advancement.

### Features-

- Simplified and easy to operate but very effective control system .
- Lesser or minimum human interface, automated completely .
- Precisely build machinery after all calculation so that accurate repeatability is achieved.
- Technically advance implementation to offer long term committed performance
- Wastage control mechanism, to avoid wastage of coating chemical or material
- Thickness control with exact level of tolerance



Trusted Partner



## Our Clients

## UNIT I

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road, Bhayander(E), Mumbai-401105

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