

## **Cosmo Films R&D Capabilities**

Our state-of-the-art Analytical facilities, staffed with skilled technicians and PhDs, support quality analysis and product development.

# Cosmo Films R&D Instrument Capabilities

We created state-of-the-art Analytical & Instrument facilities. Our Analytical lab have diverse skills/capabilities to analyse material for customer quality complaints & new product developments. The facility is equipped with highly trained professional lab technicians & PhD holders from different branch of chemistry & material sciences (Organic, Analytical, and Polymer). Below are our department wise analytical & instruments capabilities.

## Analytical Lab Instruments

S. No.	Name of the Instruments	Application/ Objective
1.	<b>FTIR- Spectrum Two</b>	Functional group analysis & Chemical identification of material. Quantification of additives in the polymer film and maser batch.
2.	<b>FTIR - Microscope</b>	<b>Simultaneous identification of type &amp; chemical nature of spot/impurity/defect on the film. For example, printing defect analysis, foreign spots on the film by automated mapping and small area imaging application Investigating particles, Films spot and coating for quality failure analysis.</b>
3.	<b>Thermogravimetric Analysis</b>	<b>To determine the change in the sample mass as a function of temperature or time under different gas atmosphere conditions. Polymer/additive thermal stability</b>
4.	<b>TGA Hyphenation (TL 8500 Module TGA 8000/SQ8)</b>	<b>This is added on facility to TGA where we can analyse the evolved gases liberated after decomposition of material in TGA in combination with GC &amp; Mass spectrometer</b>
5.	<b>Differential Scanning Colorimetry</b>	To determine polymer phase transition temperature (Melting & cooling, Glass transition temperature, Crystallinity). Oxidative Thermal Stability of polymer/ Master batch. Melting & cooling temperature in additives used for MB
6.	<b>Dynamic Mechanical Analyzer</b>	<b>DMA is a basic tool for the characterization of viscoelastic properties of material (Polymer/elastomer/adhesive/coating). By using different geometry, we can find the storage &amp; loss modulus of the material at different temperature &amp; frequencies</b>
7.	<b>Gas Chromatography – Clarus 690 (with Headspace)</b>	Identification and quantification of material (additives, organic molecule, Solvent, Monomer, residuals. estimation % purity, However, it always required the known standard material for material identification & quantification.
8.	<b>Gas Chromatography – Shimadzu 2014 Pro</b>	<b>Identification and quantification of material</b>
9.	<b>Mass Spectrophotometer (CLARUS SQ8C MS)</b>	<b>This instrument is used for identification, estimation % purity, and quantification of material (additives, organic molecule, Solvent, Monomer, residuals. Does not required the known standard material for material identification.</b>
10.	<b>Scanning Electron Microscope (SEM-EDX)</b>	SEM is used to analyse the surface morphology of film & Masterbatch & other material 1) Cross section analysis can give information about number of layers in coextruded film 2) Normal surface analysis give information about topographical and morphological evaluation, a (e.g. fracture, examine surface contamination, dispersion of filler in MB & Film) 3) EDX detector with SEM provides a quick non-destructive determination of the elemental/compositional analysis of the sample readily identify the filler & inorganic material
11.	<b>Optical Microscope</b>	Film surface morphology to identify the printing issue. Number layers in multilayer laminates. Bigger Surface defects on the film

S. No.	Name of the Instruments	Application/ Objective
12.	Laser Particle Size Analyzer	To determines the size (mean size D50) of powder/additives in Master Batch, coating/adhesive emulsion. To characterize the sediment particles based on diffraction of a laser light source by the sample under analysis- The analyser is used to determine the size distribution of a powder a suspension or an emulsion based on light diffraction.
13.	Solution Viscosity (IV) Measurement	To measure the kinematic viscosity of Newtonian liquid that are sufficiently transparent to enable the meniscus of the liquid to be observed during measurement. Solution IV of PET & PBT can be measured
14.	Visible UV spectrophotometer	Absorption and transmittance of properties of material. Quantitative/ qualitative analysis of UV active material.
15.	Spectrophotometer	Quantifies colour on three axis to present colour difference uniformly (I,a,b value & Whiteness & Yellowness Index of granules of PET and Master batches)
16.	Karl-Fisher	Titration method that uses colorimetric & volumetric titration to determine the quantity of water present in each sample (Polymer granules, liquid monomers like PTA, EG)
17.	Auto Titrator	Titration method to measure acid value/ base value/amine value of substance (analyte) in a sample solution by determining the amount of reagent required to react completely with the substance (analyte). Acid value of PTA & EG. Ened group analysis of PET and PET-G
18.	PH Meter	To measure the hydrogen ion activity in a sample - other words this instrument measures acidity/alkalinity of a sample
19.	Conductivity Meter	To measure the amount of nutrients, salts or impurities in the water
20.	Resistivity Meter	To measure the surface & volume resistivity of polymer films
21.	Melting & Boiling Point apparatus	To find out the melting & boiling point of polymer & other material
22.	Swiss Halogen Moisture Meter	To be use for the moisture content of a sample (PET and other granules)
23.	High Purity Water Generator	Type A & B water for analytical solution preparations
24.	Rotary Evaporator	To Concentration, Crystallization drying separation and solvent recovery in addition to the continues distillation of volatiles solvent
25.	Ultrasonic Cleaner	Particle distribution - homogeneous solution preparation
26.	Manual Hydraulic Press with Die	TO make tablet of powder to measure the colour value
27.	Vacuum Oven	It used for drying heat sensitive materials such as powder to extract moisture
28.	Muffle Furnace	To find the Ash material qualitative & quantitative
29.	Bending Stiffness Tester (Model-41715)	Bending & Stiffness Measurement of polymer films
30.	Tear Tester (Model -TT/MO)	Tear Strength measurement
31	Scuff Resistance Tester	To measure the Scuff resistance properties of film surface

# ANALYTICAL INSTRUMENTS

## THERMAL & MECHANICAL ANALYSIS



### Differential Scanning Calorimetry

Used to determine polymer phase transition temperature (Melting & cooling, Glass transition temperature, Crystallinity). Oxidative Thermal Stability of polymer/ Master batch. Melting & cooling temperature in additives used for MB

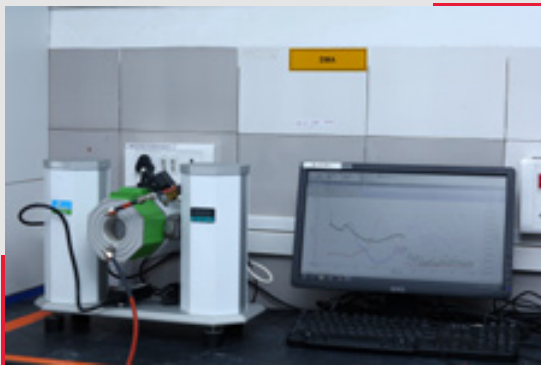
### Thermogravimetric Analyzer

Used to determine the thermal and/or oxidative stabilities of materials as well as their compositional properties. This technique can analyse materials that exhibit either mass loss or gain due to decomposition, oxidation or loss of volatiles (such as moisture)



### Dynamic Mechanical Analysis

DMA is a basic tool for the characterization of viscoelastic properties of material (Polymer/elastomer/adhesive/coating). By using different geometry, we can find the storage & loss modulus of the material at different temperature & frequencies



## STRUCTURAL & CHROMATOGRAPHIC ANALYSIS

**FTIR** is a technique used to analyse the structure of material. FTIR is equipped with ATR (Attenuated Total Reflectance) accessory which simplifies the analysis of solid, powder, pastes, gels and liquids. FTIR is equipped with microscopes. FTIR microscope is used to observe, record & identify the contaminants in film & textile material. GC is used for testing the material for its purity & to resolve the quality issues.



## Gas Chromatography with MS.

We have two GC instruments (Clarus 690 by Perkin Elmer & GC-2014 Pro Shimadzu). GC is used for separating and analyzing compounds that can be vaporized without decomposition. This instrument is used for identification, estimation % purity, and quantification of material (additives, organic molecules, Solvent, Monomer, residuals). GC is equipped with Mass Spectrophotometer, Headspace, and TGA-Hyphenation.

1. **Head Space:** Applications involving the solvent-free extraction of volatile compounds from interested analyte. It's an unsurpassed technique, eliminating the time-consuming steps and risk of human error associated with other GC sample-preparation methods. Engineered to deliver unparalleled precision, sensitivity, and productivity in a broad range of specialized applications—including forensics, food and beverage, pharmaceuticals and environmental, Packaging (e.g., residual solvent in packaging film).
2. **TGA-Hyphenation:** TG-GC/MS hyphenated module is used to obtain accurate thermal decomposition data with subsequent identification of the evolved breakdown products. Particularly, GC can help to identify and quantify the evolved gas, solvents, and breakdown products in the decomposition process. This technique can be used to identify the volatile compounds in the film.



## MICROSCOPIC ANALYSIS

**Scanning Electron Microscope (Phenom Model PROX by Thermo-Fisher)** is technique used for microscopic analysis of surface of the material. SEM is equipped with BSD and EDX (for elemental analysis) detectors with resolution up to nanometre level. We use SEM & EDX to analyse the bulk structure of film material, the surface properties of material such as size, shape and their chemical identity by elemental analysis

**Optical Microscope (by Leica)** is used to analyse the surface pattern of film Film surface morphology to identify the printing issue. Number layers in multilayer laminates. Optical microscope is used to analyse the surface of film & defects.



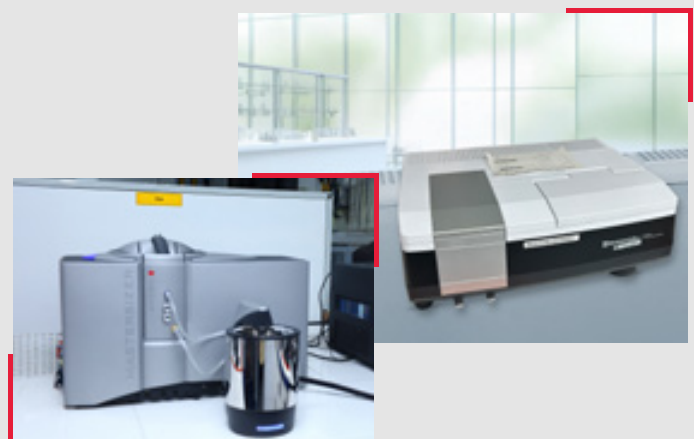
## PHYSICAL PROPERTIES

### Particle Size Analyzer (Mastersizer 3000)

is laser diffraction technique used for measuring the size of solid powder & liquid emulsions. We use this technique to analyse the particle size of polymer in emulsion, raw material used in the formulation & in the film.

### UV-Vis Spectrophotometer (UV-1900i)

Find transmittance & absorption properties of films & liquid. Quantitative/ qualitative analysis of UV active material.



## Introduction and Specification "Advanced KARO IV Laboratory Stretching Machine

Cosmo First Ltd. has installed the KARO IV, a state-of-the-art laboratory stretching machine from Brückner Maschinenbau, designed to revolutionize film development and testing. The KARO IV sets a new standard in precision, flexibility, and efficiency for the film industry. It is ideal for a variety of applications, including developing new packaging film recipes, optimizing skin layers, and creating specialty films such as capacitor films, battery separator films, and optical films. The machine supports both monoaxial and biaxial film orientation, making it versatile for testing various material properties.

The KARO IV boasts advanced specifications, including the capability for both sequential and simultaneous stretching, precise temperature control for accurate testing conditions, and an intuitive visualization system for enhanced process control. Additionally, it features an oven and clip cooling system for faster trial sequences and is designed to consume less energy and operate quietly.



### Highlights of the Machine:

- High stretching ratios starting from 1.01 x 1.01 up to 10 x 10.
- Heating capability up to 400 °C.
- Up to 3 independent heating modules.
- MD retardation for optical films (MDX < 1, while TDX > 1).
- Sample loading station outside the hot oven area.
- Exchangeable clip tables.

### Features of the Machine:

- Easy and comfortable operation by advanced EPC control panel.
- Free programmable test sequences, parameters for each direction:
- Stretching ratio.
- Stretching speed profile (constant speed, constant rate, user-defined).
- Relaxation ratio.
- Pneumatic sample support.
- Heating by air circulation, with independent and separated oven zones for accurate and close-to-production conditions.
- State-of-the-art measurement equipment for:
- Stretching forces.
- Displacement.
- Sample surface temperature.
- Clip temperature.
- Oven temperatures.



## Introduction and Specification "Advanced KARO IV Laboratory Stretching Machine

The machine's exceptional properties include its flexibility to handle a wide range of film types, such as BOPP, BOPET, and BOPA. It provides consistent and accurate control over the test film processes, is ergonomically designed for comfortable and convenient operation, and offers enhanced process control for superior film quality and performance. The KARO IV include the installation of a new programmable logic controller (PLC) and extensive electrical modifications, ensuring continued safe and efficient operation. These enhancements improve safety, reliability, and overall functionality.

# About Us

Cosmo Films is a global leader in specialty films for packaging, lamination, labelling and synthetic paper. With engineering of innovative products and sustainability solutions, Cosmo Films over the years has been partnering with worlds' leading F&B and personal care brands and packaging & printing converters to enhance the end consumer experience. With state-of-the-art manufacturing facilities in India and distribution, warehousing & sales offices in different parts of the world, the company has been at the forefront of developing customer-centric solutions to deliver the finest product and service experience, backed by innovation, people, and processes.



## Installed Production Capacity

BOPP Films: 2,74,000 TPA  
CSP : 7,200 TPA  
CPP Films: 27,000 TPA  
BOPET Films: 30,000 TPA  
PET G Films: 14,000 TPA  
Thermal Films: 40,000 TPA  
Coating Films: 30,000 TPA  
Metalized Films: 65,000 TPA

## Infrastructure

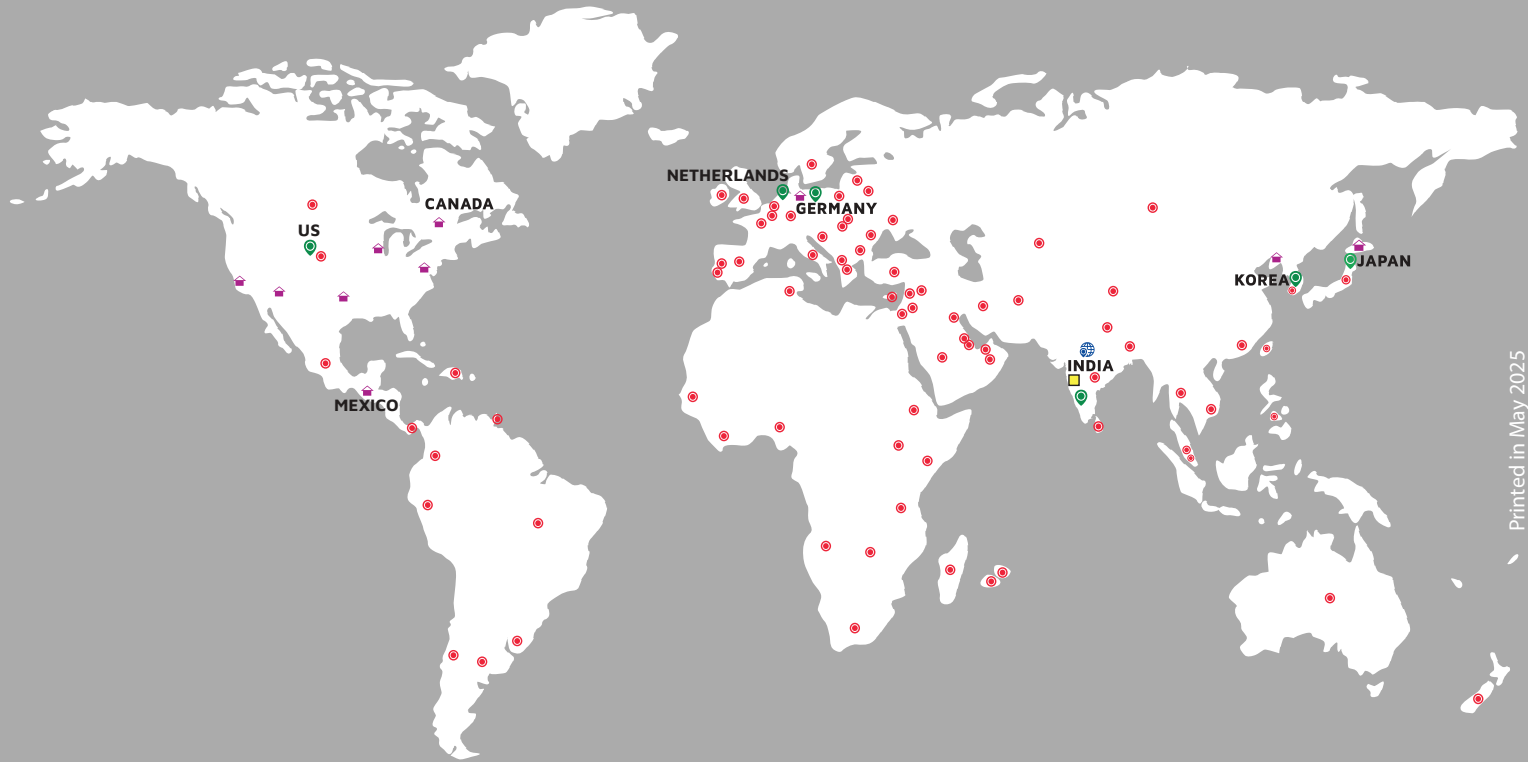
10 BOPP Production Lines  
2 CSP Line  
3 CPP Lines  
1 BOPET Line  
6 Thermal Lamination Lines  
8 Gravure Coating Lines  
10 Metalizers

## Certifications

**ISO 9001: 2015** - Quality Management System  
**BRCGS** - Global Standard For Packaging Material System  
**ISO 14001: 2015** - Environment Management System  
**FSSC 22000** - Food Safety System Certification  
**ISCC PLUS** - International Sustainability and Carbon Certification.



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