



## TECHNOLOGY

Where continual efforts are taken by highly skilled scientists & technocrats to develop and improve products & services.

Continual research for quality products

Gloves

Striving for Customer Centricity

Automotive

Footwear

Provide insights for production capacity

Carpet

Process innovation and development

Paper

Experiments to meet customer demands

Tyre Cord

Cost reduction to meet competitive edge

Construction

## Another Success Story to share with...

### Apcotex Glove Team @ 10<sup>th</sup> IRGCE held at Malaysia

The 10th IRGCE - International Rubber Glove Conference & Exhibition was held during 6th September to 8th September 2022 at Kaulalumpur, Malaysia. It was a premier event which provided a global platform to share the vision of Rubber Glove Industry and its supporting ecosystem.

The team members of Apcotex Glove Segment; were participated with all enthusiasm in the said grand event and witnessed the latest innovations and technology sharing initiatives. The Team also explained the value adding and revolutionary *Apcotex Latex Products* to participants; exhibitors, consultants and patrons, was turned into a big hit. Sharing herewith those golden moments...



Discussions on Apcotex products and their features with CEO of Top Gloves; during his visit to our stall.



Discussions on technical & commercial aspects of Apcotex products, with the Chairman of YTY company

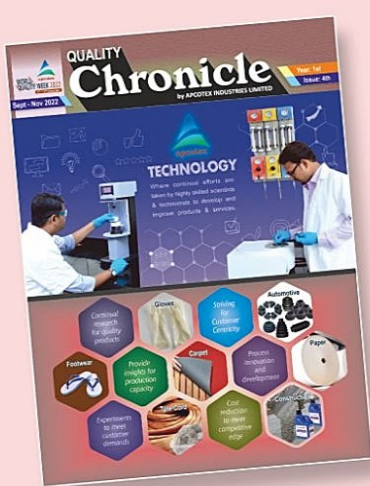


A Selfie-moment after successful business meet with Ms. Michelle of Top Gloves



Another Selfie moment after successful closure of business deal with Ms Sirirat, Manager of Sritrang.





## Quality Chronicle

Quarterly In-house magazine

by Apcotex Industries Limited

on Performance; Achievements & Aptitude  
in Quality; Products and Customer Services

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## Technology: The Strength of New Era

To be successful and sustain position in domestic and international markets; most of the business houses have to develop many value additions in their products; in different ways than their competitors do. Providing technologically rich products is one of them. For this, continual experiments, innovations, and researches should be carried out through R&D and state-of-the-art equipment.

At Apcotex, we are always ready to evaluate all possibilities in refining our processes and products with our most modern in-house technical laboratories, expertise, technocrats and advanced research equipment and this helps us to make our products and services more appealing than our competitors.

Apcotex R&D and Technology Functions are proven most powerful tools for our customers, to bring innovations and reduce production cost of which ultimately gaining customer confidence and acclamation. This also assures them to gain future business.

We strongly believe that, in this persistently challenging business aura & era; to achieve business goals in most efficient way along with quality, safety and productivity needs, *Technology* can offer a plethora of benefits.

Apcotex is always ready to be well-equipped with its R&D and technological dynamics.



--- Atul Choksey

Chairman- Apcotex Industries Ltd.

# CONTENTS

• Message by Shri. Atul Choksey .....	1
• Editorial: Dr. S. V. Govindaraju .....	2
• Message by Shri Abhiraj Choksey - MD .....	3
• Message by Shri Ravishankar Sharma - COO .....	4
• World Quality Week - 2022: Kashim M. Khan .....	5
• Protect Human Being with Apcotex: Dr Asish Sharma .....	6
• Birthday Celebrations @ Apcotex, Taloja .....	8
• Dussehra Poojan: Glimpses .....	9
• Healthy Biocides: Subhadip Sikdar .....	10
• Binders for paper and paper board coating: Dr Renji Reghu .....	12
• Commonly used names for Latex Emulsion Polymer .....	14
• Paper Coating Technique: Rupesh Gharat .....	15
• Thank You: Dr Ajay Kumar Pandey .....	16

# Editorial



Dear Readers,

Quest for quality improvement is of phenomenal importance for all performance chemicals. Emulsion polymers that we make are categorized as performance chemicals due to their high demand of performance in walks of our lives, from aero tyres to life protecting gloves. This year marks the first anniversary of "World Quality Week" celebrations at Apcotex Industries Limited at both locations namely Taloja, Mumbai and Valia, Gujarat. Our collective initiative to bring enhanced awareness about quality amongst all employees through "Annual Quality Week" celebrations with various cultural events, presentations, discussions, mural messages and dedicated quality bulletin resulted in substantial improvements. We are now gearing up to conduct the festival of quality for the second time with lots of innovations. One of our team members composed an inspiring song on quality and even got it recorded in studio with his own voice. As the theme of this year speaks, "Quality conscience: Doing the right thing" our purpose is to instill the indispensability of quality of our products and services in ensuring total customer delight and achieving the targeted growth. Zero product defects and zero accidents, which speak of the quality and safety conscience of people, lead to cent per cent customer delight, thus resulting in a win-win situation for all stakeholders. "Bonds beyond chemistry", the new tagline of Apcotex Industries Limited, speaks loudly about our commitment towards creating the strongest bonds with the customers with "Quality Conscience".

We wish to express our sincere gratitude to all our customers for their continued support through this quality bulletin. All the best!

A handwritten signature in blue ink, appearing to be 'S. S. S.', is written on a white background.

## R&D and Technology: Indeed a need of advanced business era!

The chemical industry is among the most diversified industrial sectors. It covers thousands of products and byproducts. It touches each and every turf such as petrochemicals, fertilizers, pharmaceuticals, dyes, decorative paints, oils, gases, synthetic rubbers, plastics, cosmetics, toiletries and many more.



Over the years the industry has been evolving with an alteration in product innovation and brand building. Besides consumer centricity is gaining significance. Also there are many hidden challenges which affect productivity and processes; results in becoming hurdle to the growth of the organization. Here up to some extent, R&D and technology functions are playing vital role to find the solutions for above aspects. Research and Development are closely related processes which help in innovating new products and revolutionizing new forms of old products through advanced technological functions.

The lower budgets of technology and R&D investments obstruct the way for new product and technology development, leading to lower margin of profitability. However, it is imperative to every industry to devise new processes and technologies, develop new products is the need of advanced industrial era.

Timely up-gradation in R&D and technology is necessary to achieve efficient and quality products and effective processes. Higher access to technological initiatives, implementing them into production processes and adequate trained and skilled manpower helps the organization to improve the utilization rate and achieve efficient production levels.

Thus the R&D and Technological innovations are having importance as it enables to focus on core competence and to lead in specialty products

As a lead player, to be in line with the domestic and global market trends, we are focusing on specializing in the areas of R&D and technological expertise where the competitive advantage exist.

We are achieving continual improvisations in our products and production processes by investing in technology development and building R&D capabilities; this also leads in cutting down the production costs.

Adherence to environmental and safety norms and promotion of safe management of substances are also pivotal areas that need focus right from the design, end use, to its final disposal (hazardous waste) of products. To improve them also, the R&D and Technological function are proved to be helpful.

Thus technology up-gradation along with access to skilled manpower and funds at a reasonable cost, adequate infrastructure support and economical input costs is very much essential for the sustained growth and development of any industry. In near future, with advanced R&D capabilities and technology functions, tomorrow's industry will have a very different look from how it does today.

As per government data, the Indian chemical industry is expected to grow to USD 304 billion by 2025 at a compound annual growth rate (CAGR) of 9.3 percent. This is the most significant of all, for the sustainable growth!

--- **Abhiraj Choksey**

MD - Apcotex Industries Limited

## Importance of R&D and Technology Functions



R&D is important to business because it provides powerful knowledge and insights, leads to improvements to existing processes where efficiency can be increased and costs reduced. It allows businesses to develop new products and

services to allow it to survive and thrive in competitive markets.

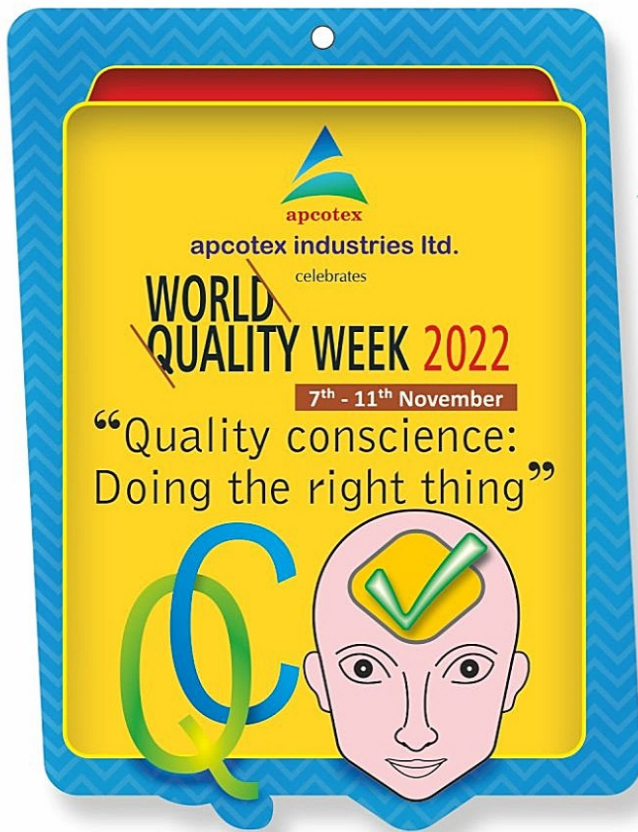
At Apcotex, at both our sites, we have a strong R&D team in place to support our businesses. They help in strengthening our current products offering to the markets by continuous improvements. The technical cell ensures that customer's requirements are well understood to suit our products by interacting and suggesting technical changes. We are in the process of implementing Digital Initiatives even in R&D functions as Artificial Intelligence can be used at discovery phase to identify emerging market needs or new uses of existing technology.

Bringing innovative products through R&D and advanced technology to the market; could give the business a competitive advantage. Businesses of all sizes need to invest in research and development and newer technology; if they want to achieve future growth, stay abreast of developments in their industry and control production costs. Selecting a specific type of R&D and technology should be the main object; through which the business goals can be achieved in the most efficient way possible.

*We have world class equipment, expertise and facilities to conduct research projects. This improves our brand reputation and profile and potentially attracts future business.*

— Ravishankar Sharma  
COO - Apcotex Industries Limited





WORLD QUALITY WEEK 2022  
proud supporter

## The CQI 2022 World Quality Week Theme "Quality conscience: Doing the right thing".

The term "Quality consciousness" was first used, from what I can find, in 1947 by C. R. Sheaffer to the first convention of the American Society for Quality Control (ASQC), the predecessor to ASQ, to answer the question "What does top management expect from quality control(people and organizations)?" He noted that a change in quality consciousness is expected. Attitudes must shift from an acceptance of what's good enough to the constant pursuit of making things better. People must be able to take pride in their high-quality work.

There are certain benefits of "Quality conscience-Doing the right thing":-

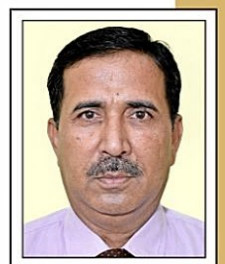
1. Encourages quality consciousness
2. Satisfaction of consumers.
3. Reduction in production cost.
4. Most effective utilization of resources.
5. Reduction in inspection costs.
6. Increased goodwill.
7. Higher morale of employees.
8. Improved employer - employee relations.
9. Improved techniques and methods of production.
10. Effective advertisement.
11. Facilitates price fixation.
12. Increased sales.

This year's World Quality Week theme provides an opportunity to reflect on how corporate culture and conscience can help or hinder an organization to make decisions and 'do the right thing' for all stakeholders.

The key aim of the week is to fly the flag for quality and raise awareness of the quality profession globally.

The focus will be on quality's role to expand its scope of responsibility and to do the right thing, not only for the Stakeholders, Customers, Employees; but Environment and society at large. This demands our business to use conscience in our day-to-day decision making at all level.

*Let us strive to convert the 'Quality Week 2022 Celebrations' at Apcotex Taloja and Apcotex Valia plants; as usual a grand success, to enjoy the reap out of it.*



**Kashim M. Khan**

Head, Plant Initiative, Apcotex Valia

World Quality Week is an annual campaign celebrated by the Apcotex, which raises awareness for the quality among our employees, vendors and customers.

This year, at Apcotex, we are going to celebrate "World Quality Week - 2022" from 7th November to 11th November 2022 at both the locations; Taloja and Valia.

In these celebrations we will have lot many initiatives to participate wholeheartedly such as slogan competition, posters drawing and rangoli preparation on current year's quality theme "Quality conscience: doing the right thing", exhibition of product models, QHSE quiz etc.

The focus will be on quality's role to expand its scope of responsibility and to do the right thing, not only for the our shareholder/taxpayer, customers and staff, but for the environment and society at large. This demand for businesses to use conscience in their decision making at every level creates more difficult ethical dilemmas. But, it is the right opportunity for everyone to participate and show the integrity, enthusiasm by supporting quality culture in our organization. Definitely our focus will be on quality conscience.

Quality is not only about designing and improving the quality of product and service, but also about the methods organisations employ to deliver them to customers and stakeholders across their value stream.

*As usual, we have decided to celebrate "World Quality Week - 2022" this year for all the five days in a very unique manner to make this grand event successful and memorable in every manner.*

— Team Taloja, #WQW22 Celebrations

## Protect Human Being with Apcotex

Protection is key theme of Human being to protect oneself either known or unknown either living or non-living things if it suspects or proven dangerous to human life in this era. To protect oneself from any hazardous or dangerous, suspect to enter in our body through any senses is critical and need to pay attention. That's reason since civilization is growing unknown dangerous species also growing and even having advance facilities and well-equipped devices still nature can defeat us in any ways and best example, we all have faced in pandemic, Covid 19 paralysed every human being life in this world in many ways direct or indirect. We victimised or witnessed to our loving dears around the world affected by Covid 19. Most critical role played by protective devices in either form which can stand by as a strong barrier to protect oneself through touch and one of the sources to get it through unhealthy or healthy touch is hand. Essential requirement is to make a barrier in between connection occurs through hand to things in such an easy way so functionality of hand not affect much. That's need of gloves evolved in last decades and reach at stage where gloves specially disposal glove made by very advanced technology eventually a soft easy donning glove. Well said Protection is better than cure. So most critical part has been paid off that was gloves either examination or surgical in any way of made polymers.

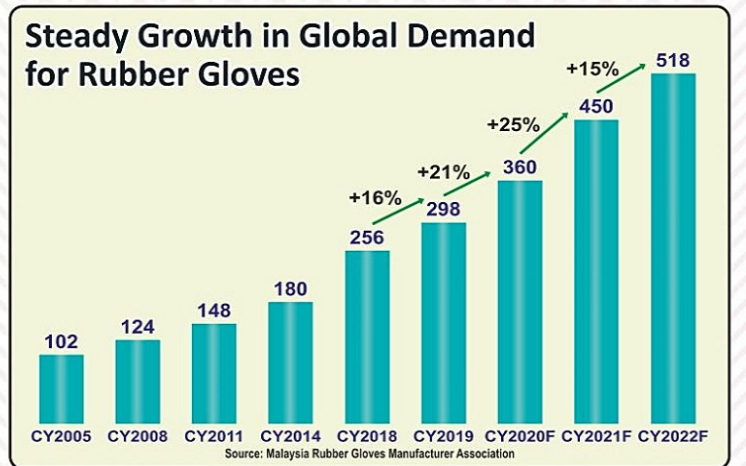
There is a well-known story how glove was invented in 1894 when William Stewart Halsted, the first chief of surgery at Johns Hopkins Hospital, worries for wife Caroline Hampton when noticed her hands were badly affected on the daily surgeries she had performed and to prevent medical staff from developing dermatitis from surgical chemicals. Rest is the history how natural latex come in picture and then natural latex -short coming of susceptibility of human being skin towards the protein, required more controlled and protective

Up until the 1990s, disposable gloves were made of rubber. However, when it was discovered that some chemicals could penetrate the protective barrier of rubber latex, this material was replaced by other types of synthetic materials.

Starting in the 1990s, nitrile disposable gloves became available to the public. These gloves, made from long-chain monomers derived from acrylonitrile and butadiene, provide more chemical resistance than latex gloves. Their chemical resistance makes them a good choice for medical settings where patients could have allergies.

In March 1992, the Occupational Health and Safety Administration's Bloodborne Pathogens Standard was published. This requirement was implemented to protect workers from exposure to HIV, which had increased public awareness around that time. That was the year of Establishment of Disposable Glove As PPE

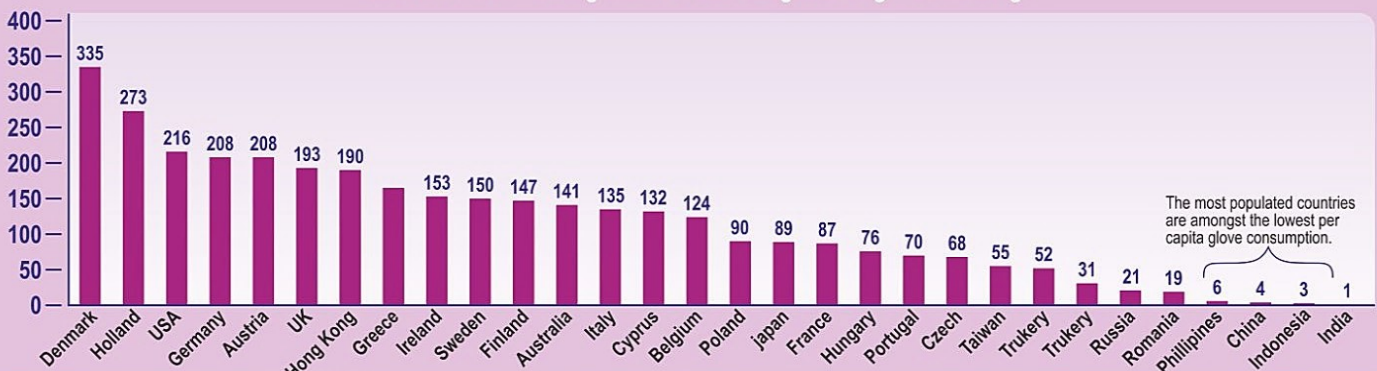
Margma president Dr Supramaniam Shanmugam said based on the forecast revision by the association on Dec 4, 2021, Malaysia is expected to supply 65 per cent of the



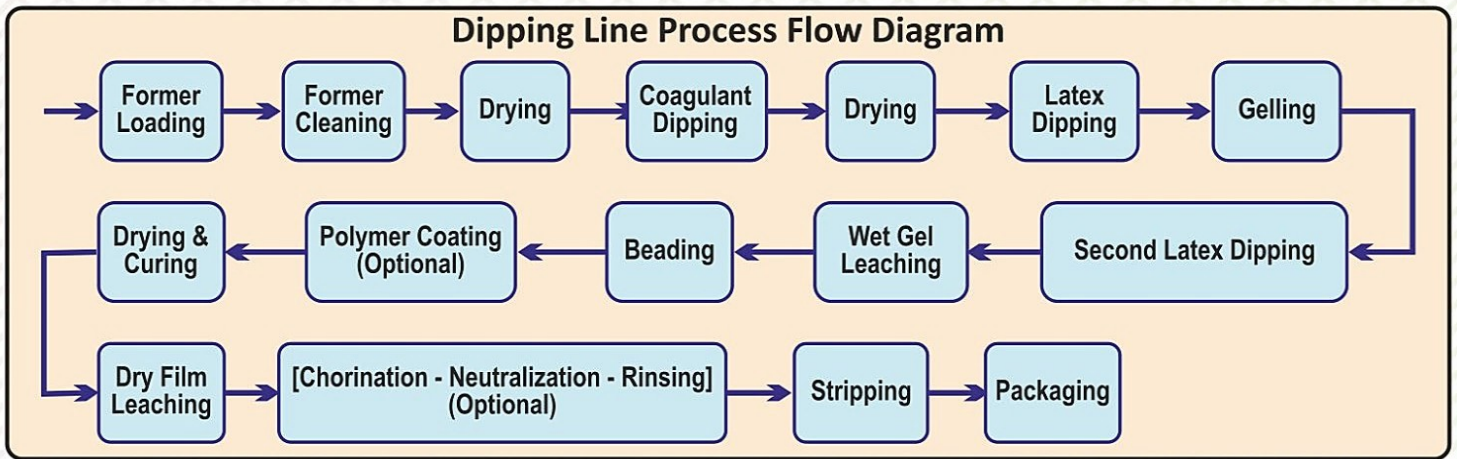
global supply, or 294 billion gloves, this year, followed by China (20 per cent), Thailand (10 per cent) and Indonesia (three per cent). It anticipated global demand for rubber gloves for the year to be at 452 billion units, or 14,333 gloves used every second.

Apcotex comprehend the demand as the awareness on hygiene, cleanliness and safety increases globally, we are optimistic that demand will continue to grow as the industry innovates new types of gloves for the use of the food and beverages industry in handling food items, and the semiconductor sector to better protect electrical and electronic components from contamination.

### Glove Consumption Per Capita by Country







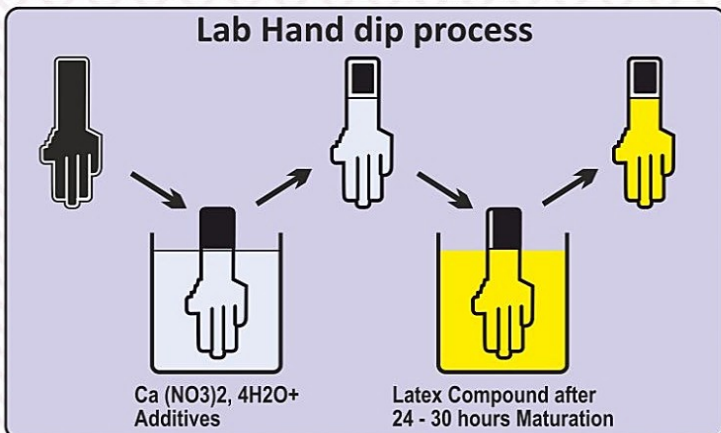
Various marketing analysis expected that global production of NBR is likely to reach around 1,562 thousand tons by the end of 2023, expanding at a CAGR of about 5% per year. In addition, some of the main players on the NBR market are planning to open additional production capacities in different regions and Apcotex is also one of them.

We have been the part of journey to protect the Human being and ensure to supply the key ingredient i.e XNBR latex through advanced continuous monomers addition technology. Apcotex has developed unique, high quality i.e Not only produce the less non-volatile matters further precisely control over latex particle size, cost-effective grades of nitrile latex for synthetic rubber gloves and has been manufacturing and selling nitrile latex from its current plants for the last couple of years.

Apcotex has recently announced a nitrile latex capacity expansion of 60,000 metric tons per year at its existing plant locations in India. These projects are scheduled to be completed by the third quarter of 2022. The plants will be designed for flexibility to manufacture a few existing products as required.

Nitrile latex is used in the production of nitrile gloves used in the healthcare and industrial segments. This capacity will be further expanded to 90,000 metric tons per year in the next phase as the global demand for nitrile gloves is expected to grow rapidly over the next few years.

To support our latex customer user, Apcotex technical team dedicate to develop the dipping lab process and so far



established the hand dip coagulant dipping with generally used coagulant Ca(NO<sub>3</sub>)<sub>2</sub> and with variable dwell time and after drying it in oven say 100 degree till coagulant layer get



dry and then dip in pre designed latex compounding with various dwell time to get various gloves weight, and understand the synergy of film formation which help customers to understand our product technical more and finally do the latex film current after leaching to remove residual. We compliance ASTM/ En455-2 with our design formulation in hand dip process for 3.5 gram or 0.07 mm palm thickness.

**Dr Asish Kumar Sharma**, Manager, Technical Services at Apcotex, Taloja plant is having more than 17 years professional experience in R&D, Manufacturing, technical trouble shooting and technical support to customers. During his career journey, he worked more than 12 years in reputed MNC in South Korea and Indonesia to develop elastomers product and process improvements.



He deep drive in Synthetic and Natural latex glove either examination or surgical – dipping process and product development. He earned his Master of Science and Doctor of philosophy form chemistry department of Indian Institute of Technology, Roorkee (IITR), India. He has published the scientific articles in peer review Journals and filled US patent for Disposal Glove made with advanced cross-linker technology.



## Birthday Celebration @ Taloja

Celebrating birthdays is an easy way to spread positivity. Also it helps in upbringing self-esteem and identity of celebrant, encourage development, strengthen family hood amongst employees and create memories for lifetime. Here are the few memorable moments of birthday celebration at Apcotex, Taloja.



## Dussehra Pooja: Glimpses

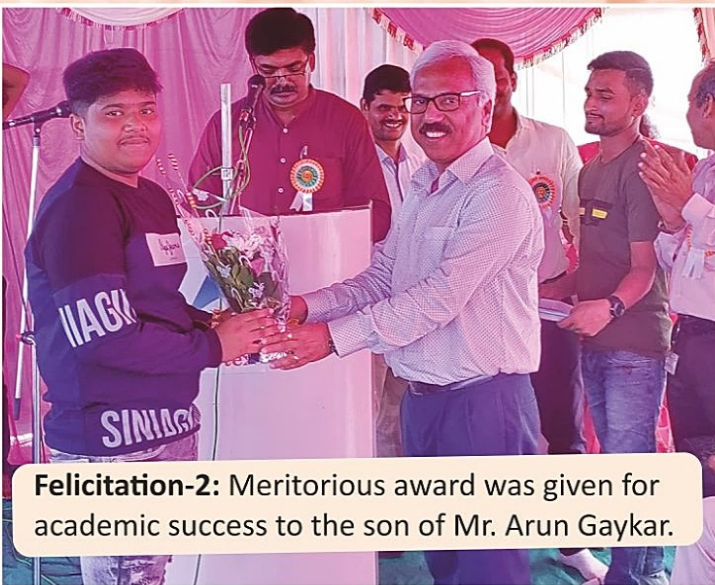
On 4th October 2022; on the occasion of “Dussehra”, Satyanarayan pooja, felicitation of employees and success appreciations were organized at Apcotex, Taloja Plant. Presenting herewith the few memorable moments....



**Satyanarayan Pooja:** Initiated by Host selected Mrs. and Mr. Baban Bhoir for the year 2022.



**Felicitations-1:** Mr. Ramesh Kapre being felicitated at the hands of Shri. C K More, Head-Purchase.



**Felicitations-2:** Meritorious award was given for academic success to the son of Mr. Arun Gaykar.



**Felicitations-3:** Mr. Raghunath Bhoir felicitated with Long Service Award for his dedication and commitment towards Apcotex.



**Appreciation:** Admiration of Employee's Committee for making the Dussehra event a grand success.



**Enthusiastic Audience:** Employees & their family members wholeheartedly attended the function.

## Introduction:

Bio-degradation is major problem in industries like textiles, automotive, medical, home appliances, paint and coatings, construction, packaging etc. Bio-cides have been in use to prevent microbial attack and hence to prevent damage of products. Though usage of bio-cides is essential in many industries, but it is well known that they have negative impact on environment as well as on human health especially pregnant women, unborn life, small children, or people with serious chronic illness.

According to Central Insecticides Board & Registration Committee (CIBRC), common preservatives which are used in waterborne coating (example - diuron, carbendazim etc.) are causing harm to living beings and environment. Thus now a days, scientists are facing a new challenge to balance environmental obligations and product's performance. In this review, three approaches will be discussed which have explored in textile, paper, food, biomedical, cosmetics etc. fields and can be alternates for sustainable antimicrobial products. Exploring metallic nano-particles / nano-composites, antimicrobial polymers, incorporation of material based on natural resources are focused in this article.

## Nano-particles/ nano-composite polymers:

From ancient time, silver (Ag) and copper (Cu) are renowned for their anti-microbial efficiency. Ag and Cu nano-particles have attracted attentions for their applications in numerous fields. In past few years, copper being heavy metal, having known its side effects on human being and other living organisms, copper's direct use as preservative has been controlled in many industries. However, silver nano-particles have unparalleled advantages due to its broad antimicrobial spectrum, high stability, low human toxicity. Mechanism of anti-microbial effect of silver is not completely understood. Three mechanisms are proposed for silver nano-particles are, (i) gradual release of silver ions, followed by disruption of ATP

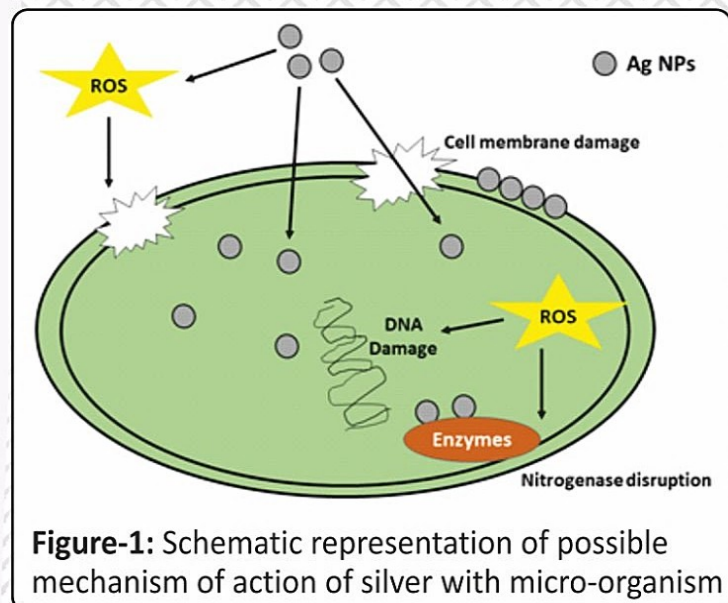
production and DNA replication, (ii) direct damage to cell membrane by silver nano-particles and (iii) silver nano-particles and silver ion generation of reactive oxygen species.

Figure 1 explains possible mechanisms of silver to kill microbes.

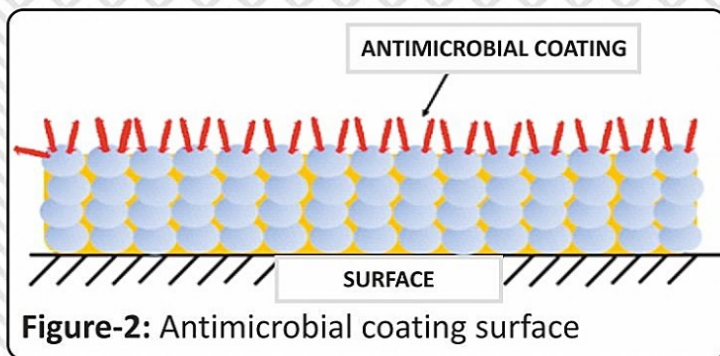
These mechanism involves interaction of silver with thiols or disulfide groups of enzymes (4,6,9,13). Various routes are studied by scientists to use Ag NPs in textile, biomedical, dentistry, food packaging industries but rarely work has been done in paint industry. Though AG NPs are popular due to their unique properties, some detrimental effects of them are release of free silver ions, easy agglomeration, difficulty to be immobilized on surfaces, lack of controllability in synthesis etc. It leads to reduction in their efficiency (4,13,14,15). The release of free silver ions is strictly controlled by many national law and control agencies worldwide (5,9). Polymerization is one of the best routes to control many of the above factors and enhance.

## Antimicrobial polymers:

Another approach to achieve antimicrobial activity is antimicrobial polymers. Such polymers are designed with low surface energy and are engineered to release active agents from their surfaces. Antimicrobial polymers can be produced by synthesis of monomers having bio-cidal moiety and their polymerization or it can be co-polymerized with another monomer also.



**Figure-1:** Schematic representation of possible mechanism of action of silver with micro-organism



**Figure-2:** Antimicrobial coating surface

Figure 2 explains the low surface energy of antimicrobial coating which reduces the microbial attachment and bio-cidal moiety kills the attached microbes subsequently.

Examples of antimicrobial polymers are N-halamine based polymers, quaternary amino functional polymers. These polymers can be used as binder or in an additive form. Research work in this area is receiving more attention for their application in textile, food, biomedical industries. Sun *et al.* synthesized polymers using N-halamine monomers, silver sulfadiazine which can be used as polymeric biocidal agents. N-halamine is a compound which contains one or more halogen-nitrogen bonds. This bond formation can be done by halogenation like bromination or chlorination of imide, amide or amine groups. Reaction for Halogen transfer from halamine in microbial cells results in disruption of cell and finally cell death. This patent invented the novel

method of polymerization to incorporate halogenated monomer for textile application. B. Qian and coworkers studied micro/nanocapsules based on Pickering emulsions showing dual self-healing and antibacterial properties. Polysulfone/silica hybrid Pickering microcapsules have prepared using linseed oil. Silica particle modification have done with quaternary ammonium salts to make their surface active against bacteria. Modified silica surface can be adsorbed on negatively charged bacterial cell wall, resulting in cell death. Polymers containing reactive groups like trimethylsilyl (TMOS), (dimethylamino) ethyl methacrylate etc. have modified with silica particles. Resulting polymer showed superhydrophilicity and antimicrobial performance against *E.coli* due to presence of quaternary ammonium group. Modified glass surfaces prepared using composite polymer showed high stability, antifogging property, easy cleaning and antibacterial efficiency. "Green" antimicrobial agent has synthesized by S. B. Aidarova and coworkers. SiO<sub>2</sub> nanoparticles as a shell and (trimethoxysilyl) propyl methacrylate (TMSPMA) loaded with 5-Dichloro-2-n-octyl-4-isothiazolin-3-one (DCOIT) as a core were synthesized as "submicrocontainers" and studied their antimicrobial activity. Pickering emulsion prepared using silica aqueous solution and oil phase added along with emulsifier for stabilization. In second stage photoinitiator used to carry out polymerization. Submicrocontainers with DCOIT showed 72% growth inhibition for *A. niger*, *A. awamori* and *B. cereus*, whereas free DCOIT showed 52% in 5 days duration.

#### Essential oils:

Essential oils are plant originated compounds that have antioxidant, antimicrobial, antiradical properties and hence are widely getting used in fields like paper, food, medical, cosmetics from centuries. Essential oils are basically complex mixture of volatile & non-volatile constituents which are produced by plants as secondary metabolites. They consists of terpene and terpenoids, aldehydes and phenols as a major functional groups.

Mechanism of antimicrobial action of essential oils is not fully understood yet, but few possible theories have explained the interaction of their different constituents with microorganism cells. For example, cinnamaldehyde,

Carvacrol, Eugenol interact with intracellular protein and enzymes to disrupt protein synthesis and ATP production resulting in cell death. Whereas, Thymol, p-Cymene disturb cell membrane.

*Figure 3 illustrates possible antimicrobial action of essential oils as per constituents.*

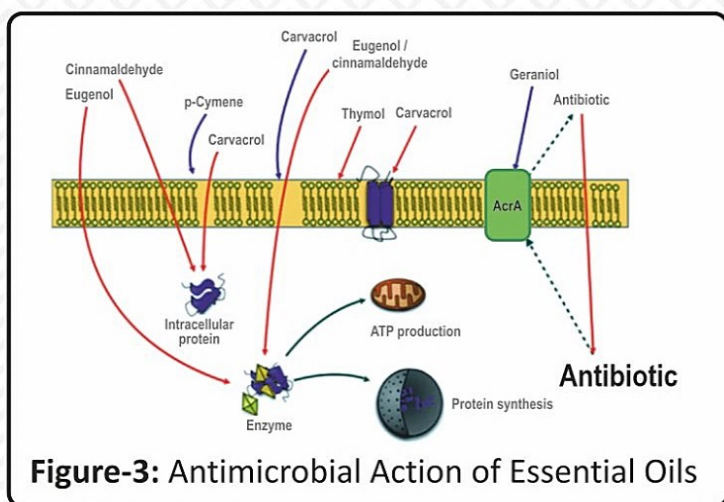
Some of the essential oils (EOs) have antibacterial and antifungal activity and can be used in combination with other essential oils. Hydrophobic nature of EOs is the main constraint for their incorporation & stability in water-based products. Emulsion polymerization is one of the best methods, adopted in food, textile, cosmetics industries, through which EOs can be stabilized in water-based systems.

To stabilize most of the essential oils, oil-in-water emulsion technique used with stabilizers like triglycerol, triglycerides, Tween 80, Span 80, Tween 20. Chitosan is second most abundant polysaccharide and non-toxic, antibacterial, chelating biopolymer obtained by deacetylation of chitin (37). Property improvement have observed in chitosan film when it infused with Eucalyptus oil nanoemulsion, Tween 80 surfactant was used to stabilize the oil in emulsion form using ultrasonication method. In agar diffusion method, EO modified chitosan film (for 5% concentration, ZOI = 15±0.1 mm) showed better inhibition than chitosan film (ZOI = 7±0.1 mm) against clinical pathogen *Staphylococcus aureus* (37). Similarly mint oil, parsley extract, cinnamon oil, clove oil can be stabilized using these surfactants or triglycerol. Their composite with biopolymers like chitosan, alginate improved antimicrobial efficiency than chitosan and alginate individually.

#### Conclusion:

Demand of sustainable products is increasing tremendously in all industries due to worldwide stringent laws and legislation for betterment of environment and all living beings. The use of natural alternatives for preservation is not as simple as an ingredient substitution; there are many practical issues to consider in maintaining safe, effective, and stable consumer products that are free from microbial contamination. Conventional preservatives cannot be completely replaced by nano-composite, essential oils, or halogenated/quaternary amino functional polymers. The problematic organisms of concern studied in food, health, textiles, biomedical industries are common to those encountered to be causing problems in paints and coatings. Hence these methodologies can be explored as eco-friendly and safe alternatives in niche product segments.

**By: Subhadip Sikdar**



**Figure-3: Antimicrobial Action of Essential Oils**

**Subhadip Sikdar**, Manager - R&D, Apcotex, Taloja have had completed his M.Sc. degree in Chemistry from IIT Kharagpur and MBA in Marketing from Welingkar College. He has total 10.5 years of experience in polymer industries. Earlier he has worked with Asian Paints Ltd. and Huntsman India Pvt. Ltd.



## Binders for paper and paper board coating

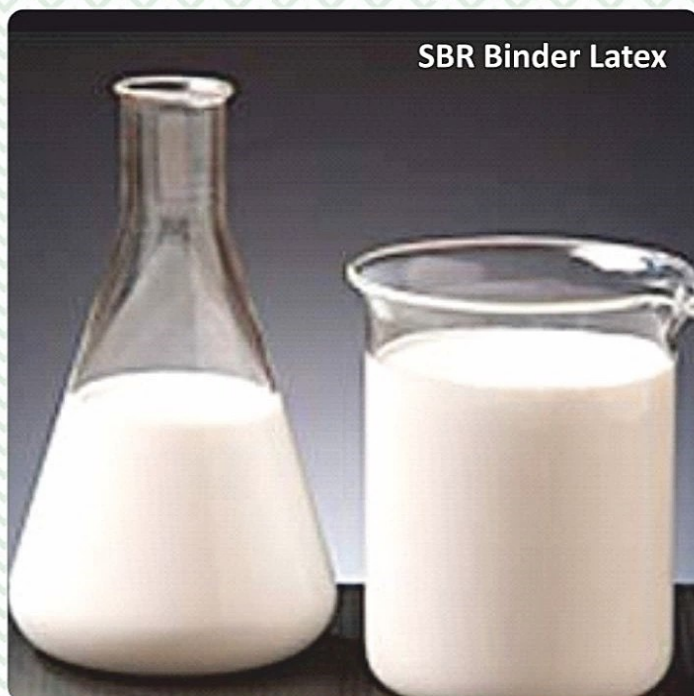
Pigment-coated papers deliver a smooth and white ground for ink illustrations. Coated papers generally consist of a base paper covered by a mixture containing at least a binder and inorganic pigments. The binder in a coating colour formulation should be capable not only of binding the pigment particles together, but also of providing strength to coating surface and of anchoring them to the base paper. The pigment particles at the coating surface must be held adequately tight so that the coated paper can be calendared well and subsequently printed. The amount of binder added to the coating colour formulation must be chosen appropriately to withstand the mechanical stress experienced by the surface of the paper during the printing process and the tack of the printing ink.

Historically, both natural and synthetic binders are used for the paper coating. When the coating of paper started more than a century ago, animal glues and gelatin were used as binders. Successively, natural products such as starch (derived from potatoes, corn, and rice), casein (from milk) and soy proteins were used as binders. Synthetic binders were first used for coating applications in late 1940s. These were water-based polymers known as polymer latexes initially developed as an alternative for natural rubber latex. Latexes for paper coating are produced by emulsion polymerization technology. Out of different latexes employed for paper coating, major part is contributed by carboxylated styrene/butadiene (SBR) type latexes. Other latex type for paper coating include copolymers

of styrene-acrylic (SA) esters. These synthetic binders are usually modified with functional monomers such as vinyl acids, amides, acrylonitrile, etc. to improve the colloidal and rheological properties of coating colour and the printing performance of the coated papers and paperboards.

Synthetic latexes exhibit its own particular characteristics and advantages for its use as binder for paper coating over the natural binders; which are listed below:

1. Ease of addition to the coating mixture.
2. Good compatibility with wide variety of cobinders, pigments and other coating ingredients.
3. Synthetic latex has little effect on coating colour viscosity when compared with natural binders such as starches or casein and this enables the formulation of high solids content and low viscosity.
4. Higher pigment binding power than natural binders like starch or casein.
5. Ease of storage and very low susceptibility to bacterial or fungal attack.
6. Availability of a range of products, types and grades.



The selection of a particular latex depends on the coating method, the co-binder to be used, the printing process for which the coated paper or board is intended, and the end-use of the printed paper or board. It is necessary to understand some of the basic principles, and the variables need to be considered, when selecting a latex for coating purpose with the intention of good machine runnability and printability.

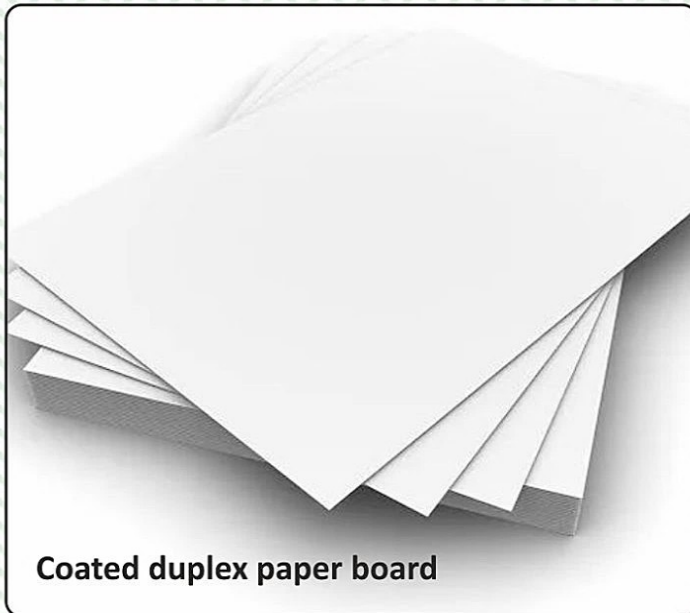
These parameters include: types and ratios of monomers, Glass transition temperature, latex particle size, viscosity, solid content, tolerance towards free calcium ions within the coating colour etc.

The latex binders using in coating colour formulations are based on combinations of different monomers. The most common combinations are styrene with butadiene or acrylic esters. Each monomer imparts particular characteristics like hardness, flexibility, temperature of film formation, resistance to aging etc. The glass transition temperature of a copolymer is determined by the amounts of its different monomer constituents. Papers or boards used in offset printing comprises binders with a glass transition temperature generally between 0°C and 25°C. Coated board properties such as dry and wet pick strength, stiffness, gloss, porosity, and evenness of offset printing are highly depended on glass transition temperature.

The particle size of polymer latex and its distribution (ratio of quantities of particles of different sizes) are also important factors affecting the performance of latexes for coating application. Typically, binders used in the paper coating process have particle sizes of between 100 and 200nm. Particle size directly influence the rheology of latex and coating colour, binding strength, print gloss and porosity of coated board.

Apcotex is supporting paper and paper board industries in India and abroad by offering varieties of carboxylated styrene butadiene and styrene acrylate binder latexes. Our latex products are designed and tailored to cater the specific needs of the paper industry, which results in optimal performance in paper coating, printing and finishing processes.

Our SBR latex portfolio include Apcotex PT800, PT600, PT663, PT515 and PC 200 with the glass



**Coated duplex paper board**

transition temperatures ranging from 6°C to 15°C. Apcotex PT800 is a lower particle size latex specially designed for high speed machine runnability. Apcotex PT515 is a specialty binder dedicated for top coat application in high speed machines. Apcotex PC200 is higher particle size specialty latex product using for metalized paper coating. Apcotex P8800 is the styrene acrylate binder with the glass transition temperature of 20°C and can provide excellent coverage, coating hold out and ageing resistance to the finished FBB. All apcotex binder products are compliance to FDA 176. 170 for food contact applications.

Apcotex also extensively helping our customers through value added technical service, paper and board testing and quantitative print quality analysis. We take up print evaluation to address: paper and paperboard quality check, evaluation of new quality paper and paperboards, the print defect issues and training in printing technology.

**By: Dr Renji Reghu**



**Dr Renji Reghu**, Manager - R&D, Apcotex Taloja is having 12 years of experience in Research and Development, testing, and technical support to customers.

He is working in the R&D and customer support of paper binder latex segment with Apcotex for the last two years. He has completed his PhD from Kaunas University of Technology, Lithuania as part of Marie Curie Research program and had multiple postdoctoral stints in Europe, Taiwan and India.

He has published his research works in 18 peer reviewed international articles and presented in many international conferences.



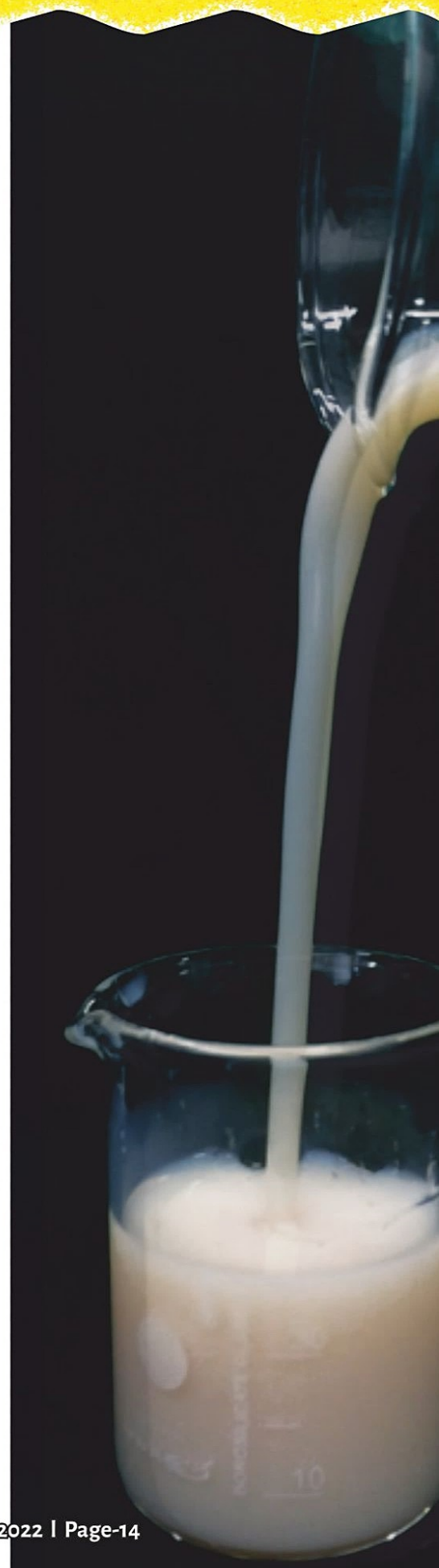
☼☼☼

## Commonly used names for Latex Emulsion Polymer

LANGUAGE	NAME	TRANSLATION
Arabic	المستحلبات	Milky liquid
Chinese	乳液高分子	Milky liquid of a polymer
Danish	Latex Polymer dispersion	Latex Polymer dispersion
Dutch	Latex Polymeerdispersie	Latex Polymer dispersion
English	Latex Emulsion polymer	Latex Emulsion Polymer
Finnish	Lateksi Dispersio	Latex Dispesion
French	Latex Colloides polymères	Latex Polymer colloid
German	Polymerdispersion	Polymer dispersion
Greek	Λάτεξ Πολυμερές Γαλάκτωμα	Latex polymer dispersion
Hebrew	לומי	Latex
Hungarian	Latex Diszperzió	Latex Dispersion
Indonesian	Polimer emulsi	Emulsion Polymer
Italian	Lattice Emulsione	Latex Emulsion
Japanese	ラテックス ディスパーション	Latex Dispersion
Korean	라텍스 수성 폴리머 디스퍼전	Latex Aqueous polymer dispersion
Malay	Lateks Polimer emulsi	Latex Emulsion polymer
Norwegian	Lateks Polymerdispersjon	Latex Polymer dispersion
Polish	Lateks Emulsja Dyspersja polimerowa	Latex Emulsion Polymer dispersion
Persian	لاتكس	Latex
Portuguese	Latex Dispersie	Latex Polymer dispersion
Romanian	Látex Dispersão Polimérica	Latex Dispersion
Russian	Полимерные дисперсии Латексы	Polymer dispersion Latex
Spanish	Látex Dispersión Emulsión	Latex Polymer dispersion Emulsion
Swedish	Latex Polymerdispesjon Emulsion	Latex Polymer dispersion Emulsion
Turkish	su bazli polimer disperiyonu	Aqueous polymer dispersion

Compiled by:  
**Pravin Khutale**  
Asst. Manager, R&D

Courtesy: 'Polymer Dispersions and Their Industrial Applications'

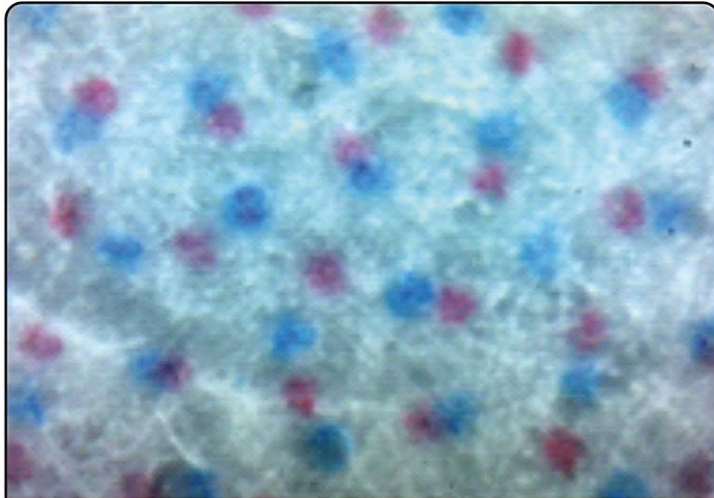




# Paper Coating Technique

Paper has played a vital role in the cultural development of mankind. It still has a key role in communication and is needed in many other areas of our society.

Uncoated paper is generally rougher than coated paper and tends to be more porous, which makes it very absorbent and ink soaks into uncoated paper surface.



**Printed Uncoated Board**

The main objectives of coating papers and paperboards are to improve their aesthetic appearance and printability.

Coatings impart smoothness, gloss, brightness, opacity to the base sheet and create surface suitable for printing. It also improves ink receptivity and ink gloss. The coated layer reduces the penetration of ink into the paper sheet. Therefore, the ink does not spread as much and the print image is clear and sharp.

A coating color / slurry consists primarily of pigments dispersed in water, binders (Latex), co-binders and additives.

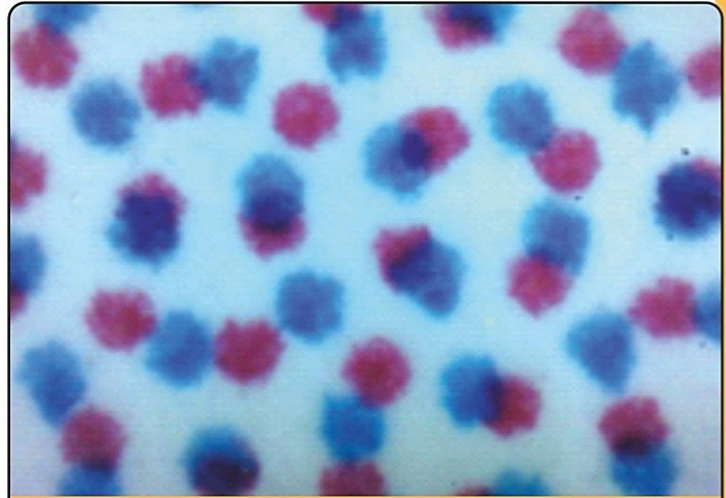
Various types of emulsion polymers such as styrene-butadiene (S/B), styrene- Acrylate (S/A), are widely used as binders in paper coatings.

Latex particles binds the pigment particles and adhere them to the surface of the paper. Furthermore, Latexes are also added to improve the processability and/or runnability of the coating color. Overall, latexes play a major role in paper coatings.

Coating is typically applied onto paper and board for printing or packaging. Papers and paperboards are coated with various coating formulations by a variety of coating processes: size-press, air-knife, rod, curtain coating and blade coating process.

While the surface of an uncoated paper comprises numerous individual fibers of varying degrees of hardness, the surface of a coated paper is, by contrast, uniform and homogeneous in structure.

Coated paper exhibits more uniform ink receptivity and better holdout than uncoated papers. Coating also produces a much smoother paper surface that is



**Printed Coated Board**

particularly a significant factor when printing individual dots, especially when using a rotogravure process.

**By: Rupesh Gharat**

**Rupesh Gharat**, Assistant Manager - Technical Services is associated with Apcotex for last 16 years and he has total work experience of 20 years.

He is a B. E. Printing tech and M.sc (Chemistry). He is handling technical service–paper segment. His work involves technical support to paper customers, visiting to customers for product trial, print trials, testing, troubleshooting and printing training to customer.



☪☪☪



*Dear All,*

The Year 2022's Quality Week festival we are celebrating with the publication of 'Quality Chronicle' magazine's 4<sup>th</sup> issue. Last year with an ultimate enthusiasm and supreme fanaticism, we have started the unique initiative of publishing 'Quality Chronicle' based on qualitative approach of Apcotex in its products; services and processes.

With the practical and sensible support received from all cadres of Taloja and Valia sites during this journey of publishing 'Quality Chronicle' magazine, almost a year has been successfully completed with 3 quarterly issues on very versatile subjects like quality, safety, environment and the latest one with R&D and technology.

Through this platform, we have been able to instill confidence in our stakeholders and customers about the continual and sustainable enhancement of quality environment in Apcotex.

At this moment, all of us at editorial committee are confident about this purposeful journey which echoes our dedicated and focused quality pursuits, will continue hereon with the same zeal and passion.

As sub-editor and key workforce in the said publishing activity I would like to express a few words of gratitude on behalf of Quality Chronicle's editorial committee.

I owe much gratitude to our Chairman Shri. Atul Choksey, our Managing Director Shri. Abhiraj Choksey, and Shri. Ravi Shankar Sharma-Chief Operating Officer, for mentoring us to go ahead on this project with their astute backing in way of valuable recommendations and messages suitable to our magazine's themes!

Herewith, I have also being thankful to Dr. S. V. Govindaraju – VP, R&D and Technical Services for accepting our wish to be the Chief Editor. Our maddening fervour of publishing the magazine was controlled with his caring inquisitions & judicious guidance in timely and precise manner.

Moreover, I am expressing our grateful thanks to Shri. G. R. Manmode and Shri. Kaushik Patel respectively the Plant Heads of Taloja and Valia facility, Shri. R. R. Sawant–VP HR and the member of Editorial Committee, and Shri. Sanjay Desai-AVP, Production from Valia for their observations, innovative ideas and fresh perspectives

to make our instinct - 'Quality Chronicle' journey in to a constant reality!

I am also very much thankful to the honourable members of editorial committee, Dr. Sreenath PR (Ex-Executive at Technical Services, Taloja) and Shri. Jignesh Goswami (Head QC, Valia) who contributed a lot to sustain the magazine initiative.

Especially, I would like to say thanks to Dr. Asish Sharma (Manager-Technical Serviecs, Taloja) for being a member of editorial committee without any hesitation; extending his helping hand and fostering this initiative towards a great going.

I would be like in onus to my associates; Messieurs Hemant Choudhari & Kashim Khan, respective Heads - Plant Initiatives from Taloja and Valia, Dr. Renji Reghu (Manager-R&D), Pravin Khutale (Asst. Manager-R&D), Rupesh Gharat (Asst. Manager-R&D), Sachin Penkar (Asst. Manager-QC), Sunil Popeta (Asst. Manager-R&D), Kiran Khutale (Executive-QC) and Arun Gaikar (Sr. Officer-QC), Taloja for their valuable inputs; state-of-the-art suggestions and meticulous support to get this magazine done in timely manner!

I also appreciate the painstaking and sincere efforts taken by Mr. Omkumar and his team from M/s. Urja Art & Advertising to prepare articles, page designs and quality printing of all issues of 'Quality Chronicle' magazine up to a constructive level.

Hereby, if I overlooked to mention someone who backed us aptly and made tangible-n-intangible contribution during this journey, treat it as my personal gaffe and forgive me considering to erring is human!

It is fair to conclude that, Apcotex 'Quality Chronicle' is a grand success forever and added one more feather in Apcotex's Qualitative Approach.

Last but not the least, I would be indebted to the valued readers of this magazine; who rationally appraise our determinations and make them to a royal affluence! Your assessments are most welcome!!!

Till then bye-bye and see you soon!!!!

**Dr. Ajay Kumar Pandey**

*Sub-Editor 'Quality Chronicle' and Head QA/Qc, Apcotex - Taloja*



## Technical Paper Presentations at National Rubber Conference - 2022

Apcotex is well known as a very strong knowledge-based and technologically advanced company. Right from our top-n-foremost technocrats up to our executives in R&D and Technical Services are regularly presenting various technical papers in conferences; exhibitions and seminars. These paper presentations help us in reiteration of the importance of Apcotex researches. Also our products key features are emphasized in a great manner and thus getting overwhelming acclamations by participating peers.

Recently, our topmost technocrat Mr. Bhagaban Panda, DGM - Technical Services, made two paper presentations at AIRIA - All India Rubber Industry Associations conferences, one the topic – “Apcoflex Nitrile Rubber: Technical Insight and Its Industrial Application” at Hotel La Meridien, Gurgaon on 11.05.2022 organised by AIRIA Northern region and another on the topic – “Apcoflex Carboxylated Nitrile Rubber – Special Purpose Rubber for Critical Industrial Application” at Hotel ITC Grand Maratha, Mumbai on 13.07.2022, organised by AIRIA, western region. Here are those proud moments...



Felicitation by the organizers



Pride moments for Team Apcotex @ Conference

## One more feather in our cap!

### Recognition by Saint Gobain - A global market leader:

Recently, Saint Gobain has recognized M/s. Apcotex for the excellent effort and dedication displayed to meet Saint Gobain plant operation needs during Covid 19.

On 11th October 2022, during an award ceremony organized by Saint Gobain, Apcotex has been appreciated and felicitated as *The Valuable Business Partner*; who provided immense support during the pandemic of COVID-19. The Award was received by Mr. Parikshit Kotkar of Apcotex Sales and Marketing Team.





celebrates

~~WORLD~~  
~~QUALITY WEEK~~ 2022

7<sup>th</sup> - 11<sup>th</sup> November

“Quality conscience:  
Doing the right thing”



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OF THIS EVENT