



EFFLUENT TREATMENT PLANTS (ETPS): Improving Performance & Reducing Pollution



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INTRODUCTION

The process of industrialization is adversely impacting the environment globally. Pollution generated by incorrect management of industrial wastewater is one of the major environmental problems in India as well, especially with burgeoning small scale industrial sector in the country. To address the pollution discharge of industries, adoption of cleaner production technologies and waste minimization initiatives are now gaining ground.

Effluent Treatment Plants (ETPs) are considered as one of the viable solution for small to medium enterprises for effective wastewater treatment. An Effluent Treatment Plant (ETP) is an integral part of production processes with relevance to

wastewater, the sewer/drainage system at the site and the pollutants with their respective limit values that have to be reduced. In addition, the ETP also facilitates in reduction of number of discharge points in an industrial estate for better enforcement by environmental regulatory agencies in terms of pollution reduction and environmental improvements. However, many of the operating ETPs are not performing optimally due to various technical and managerial reasons.

Industrial wastewater treatment describes the processes used for treating wastewater that is produced by industries as an undesirable by-product. The treated industrial wastewater (or effluent) may be reused or released to a sanitary sewer or to surface water in the environment. The main objectives of an ETP are:



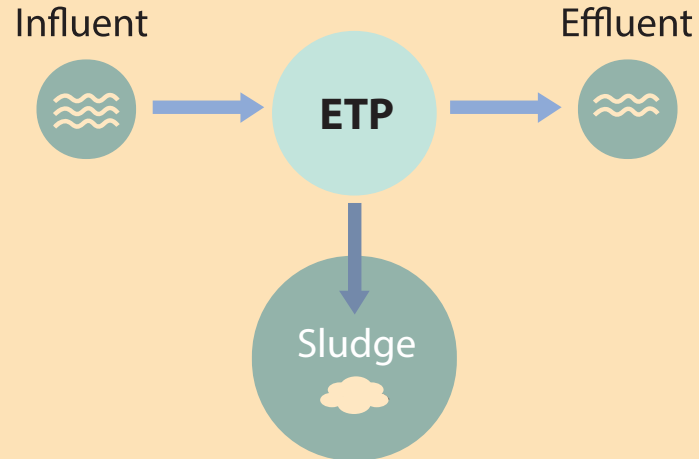


- Water recycling for further use
- Reduction of water consumption
- Reduction of operative production costs

- Meeting of requirements of legislative standards
- Contribution for environmental protection and sustainable development

What is an ETP?

- ETP (Effluent Treatment Plant) is a process design for treating the industrial waste water for its reuse or safe disposal to the environment.
- Influent: Untreated industrial waste water.
- Effluent: Treated industrial waste water.
- Sludge: Solid part separated from waste water by ETP.





Need of an ETP ?

- To clean industry effluent and recycle it for further use.
- To reduce the usage of fresh/potable water in Industries.
- To cut expenditure on water procurement.
- To meet the Standards for emission or discharge of environmental pollutants from various Industries set by the Government and avoid hefty penalties.
- To safeguard environment against pollution and contribute in sustainable development.

Treatment levels and Mechanisms of an ETP?

Treatment levels:

- Preliminary
- Primary
- Secondary
- Tertiary (or advanced)

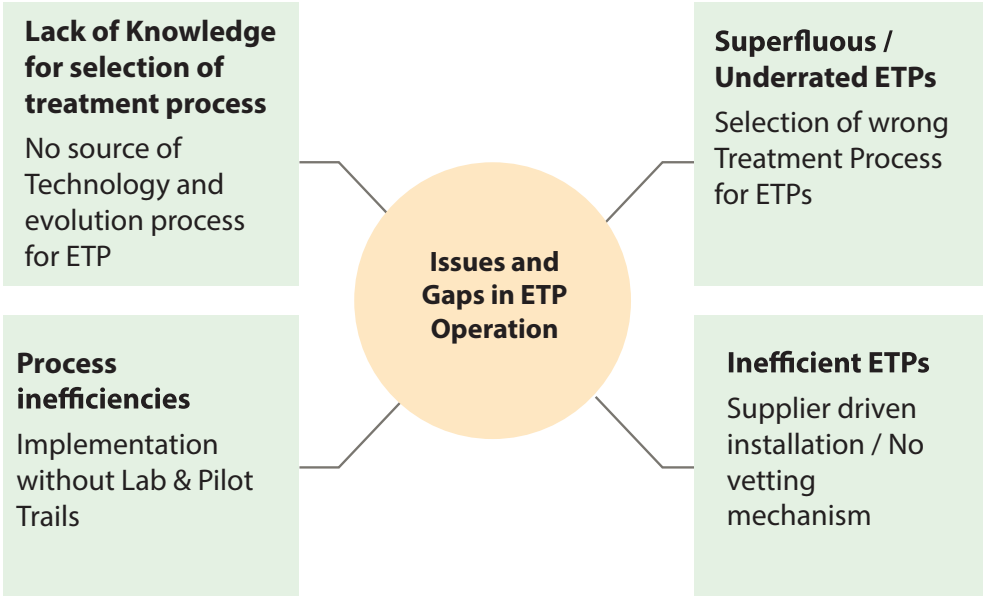
Treatment mechanisms:

- Physical
- Chemical
- Biological



ISSUES AND GAPS IDENTIFIED

1. Lack of Knowledge for selection of treatment process: Wastewater, depending on its characteristics is subjected to different treatment options. Industries usually do not have access to latest technological advancements in effluent treatment process, the lack of information results in various associated issues in efficient operation of an ETP.
2. Superfluous / Underrated ETPs: Industries commission their ETP solely on technical expertise of consultant without actual data on waste water generation quantity and quality from the production processes and thus the installed ETPs result as either superfluous or underrated.





Activities covered

Under the Sustainable and Environment-friendly Industrial Production Project (SEIP), various activities were taken up in all three project sites, namely, Uttarakhand, Delhi and Gujarat to enhance the performance improvement of ETPs and CETPs:

In Uttarakhand (IIE SIIDCUL):

- Upgradation & ZLD for CETP
- Improvement of ETPs in Individual industries

IN Delhi (Patparganj, Lawrence Road, Mayapuri)

- Conceptual design for new CETP at Patparganj
- Improvement of performance of existing CETPs
- Improvement of ETPs in Individual industries

In Gujarat (GIDC Estate Vapi)

- Moisture reduction of CETP sludge
- Improvement of ETPs in Individual industries

3. Inefficient ETPs: Often, there is no mechanism applied to check whether the proposed treatment scheme is suitable for treatment of effluent with specific quality generated through their respective processes. Industries follow the supplier driven approach in selection of treatment scheme.
4. Process Inefficiencies: Industries usually operate ETPs without any actual lab or pilot tests being performed for particular effluent quality treatment, resulting in process inefficiency and non-compliance of discharges effluent. Also, the resource consumption (Chemicals, Energy etc.) are also not assessed in ETP operation resulting in non-viable system and difficulties of operation.



METHODOLOGY ADOPTED

To systematically improve the situation, IIE Haridwar, the Industrial Estates at Lawrence Road, Mayapuri and Patparganj in Delhi and the Industrial Estate Vapi were included as project sites under the “Sustainable and Environment-friendly Industrial Production (SEIP)”. In cooperation with the State Infrastructure and Industrial Development Corporation of Uttarakhand Ltd (SIIDCUL), Delhi State Industrial and Infrastructure Development Corporation Ltd. (DSIIDC) and Gujarat Industrial Development Corporation (GIDC), the project is being implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH to find solutions to improve the efficiency and efficacy of wastewater treatment plants and reduce pollution. The SEIP Project aims at mitigating

environmental problems caused by industrial production focusing on industrial wastewater and solid waste management. Since the project’s initiation in 2015, technical solutions as well as business and management models to reduce acute environmental pollution and to improve resource efficiency in industrial production have been piloted in a total of five Indian industrial estates. One of the aims of the project is to demonstrate that the pollution caused by municipal wastewater and industrial effluent can be reduced by efficient management of wastewater and functionality of treatment plants.

A German consultancy GOPA Infra was hired to assess the ETPs installed in industries. In July 2017, national and international experts from GOPA Infra visited the industries to collect





data and samples in order to do preliminary assessments. Many industries with ETPs were chosen to undergo a detailed assessment for improvements. Regulatory pressure, economic motivations as well as the wish to act more responsibly and sustainably were drivers for the companies to invite the consultants to undertake the assessments and to subsequently implement the solutions.

It was proposed to take up detailed studies for upgradation/ improvement of ETPs from nineteen industrial units in the selected industrial estate in the State of Uttarakhand and Gujarat that generate effluents and have a functional Effluent Treatment Plant installed.

The overall approach was as follows:

- Develop Questionnaire
- Gather field/ unit level information

- Analyse data and shortlist few industries (max. 9 nos from multiple sectors) for detailed study and demonstration
- Conduct detailed studies to understand specific concerns faced by the units and develop specific solutions including Best Available Technologies.
- Support in Implementation phase.
- Document benefits achieved and share with other industries to bring in multiplier effect.



CAPACITY BUILDING OF TECHNICIANS/ OPERATORS OF ETPS/CETPS

India's industrial wastewater is treated by over 170 CETPs, mostly located within the industrial areas, and several thousand ETPs installed at individual industries. Proper operation of Effluent Treatment Plant (ETP) / Common Effluent Treatment





Plant (CETPs) is the key to compliance to Water (Prevention & Control of Pollution) Act, 1974 and amendments made thereby. There is, however, a whole team of ETP / CETP operators who are responsible for the functioning of the pollution control systems. The ETP/CETP operational skills are acquired mostly through on-job training. Trainees usually start as attendants or operators-in-training and learn their skills on the job under the direction of an experienced operator. They learn by observing and doing routine tasks. ETP operation is a team work. It requires proper team selection, training need assessment, training, on-job trainings, laboratory and statistical analysis for ensuring desired performance, trouble forecasting and trouble shooting. However, inadequate operations and managerial skills are one of the main reasons for the inefficient operation of

these treatment plants. Therefore, many water treatment plants are operated inefficiently and their positive effect towards the prevention of pollution is unnecessarily limited.

Under SEIP, a number training programmes were conducted to enhance the skills of the technicians, operators and helpers of ETP/CETP. The aim of these trainings was to raise the awareness and develop the skills of helpers and operators of ETPs/CETPs using the knowledge and experience of the resource persons who are experts in this field. It was a step make them aware of the fundamental aspects of operation and maintenance of ETP/CETP. The trainings intend to improve their skill and performance leading to enhanced compliance and improved environmental pollution control. It would further help them to understand the aspects of





Advantages of professional training and skill development

- Professional training of the personnel operating CETPs and ETPs is particularly necessary to unlock this potential.
- Well-trained staff is able to maintain the wastewater treatment plants optimally and run them with maximum efficiency.
- The professional training of the staff and technicians operating wastewater treatment plants does not merely benefit the environment; it has a clear positive impact on the profitability of single companies with ETPs and companies located in industrial parks with CETPs as well as the water quality of close rivers and waterbodies.

health and safety in a better way to assist them to achieve cost-effective operation, improved performance and abatement of environmental pollution.

The trainings conducted competent by technical experts aimed to help industries in effective treatment of their wastewater. The training program was delivered based on the National Skills Qualification Framework (NSQF) designed by SCGJ for the operators and technicians. The Qualification Pack has 3 compulsory National Occupational Standards –

- SGJ/N6601: Operate the Wastewater Treatment Plant
- SGJ/N6602: Monitor and Maintain Wastewater Treatment Plant
- SGJ/N6605: Work Safety at Wastewater treatment plant.



Capacity building of technicians/operators of ETPs/CETPs

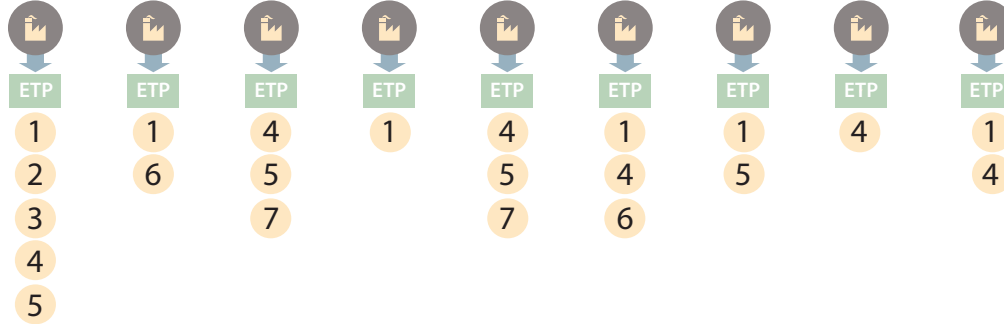






RECOMMENDATIONS & IMPLEMENTATION STATUS

The summary of the recommendations implemented are depicted in the Infographics given below.



1	Reduction of pollution load of waste water discharged to CETP (COD, others) also through in-house improvements	I. Textile Industry II. Chemical Industry III. Soaps and Cosmetics Industry IV. Beverages Industry V. Cosmetics and Detergents Industry VI. Pharmaceutical Formulations VII. Healthcare VIII. Metal Finishing IX. Ayurvedic Soaps
2	Reduction in waste water discharge (quantity)	
3	Recycling of treated waste water	
4	Reduction in sludge generation through ETP process optimisation	
5	Reduction in energy consumption at ETP and achieving better quality of treated waste water	
6	Reduction of air emissions from waste water and ETP and achieving better quality of treated water	
7	Improvement in pre-treatment systems (Oil and Grease removal)	





EFFLUENT TREATMENT PLANT (ETP UPGRADATION IN DIFFERENT PRODUCTION COMPANIES)

Measures Undertaken	Approach Adopted
Reduction of pollution load of waste water discharged to CETP (COD, others) also through in-house improvements	<ul style="list-style-type: none"> Improving in-house practices such as reducing wastage of raw materials, chemicals and auxiliaries Improving the pre-treatment and precipitation process and mechanical processes Replacement of all defunct media from PSF/ACF Use of appropriate poly electrolyte for better coagulation 25 – 75% reduction in COD
Reduction in waste water discharge	<ul style="list-style-type: none"> Recycle of treated waste water for in-house processes Reduction of water used in processes 15 – 20% reduction in waste water discharge quantity to CETP
Recycling of treated waste water	<ul style="list-style-type: none"> Reuse of treated waste water in the dyeing process of dark color yarns which do not require high water quality About 15 – 20% of total fresh water used for dyeing of black shades saved (reduced 80 KLD to 50 KLD) Reuse of last wash for first wash of next batch
Reduction in sludge generation through process optimisation	<ul style="list-style-type: none"> Soaking of lime in water before charging it to the treatment plant instead of direct charge (which leads to an increase in sludge) Dividing the tanks for ferrous-sulphates and lime of the wastewater treatment plant, so that these substances do not neutralize each other, become ineffective and end up as sludge (25% sludge reduction) Installation of mixing mechanisms and constant water flows in the tanks Customize dosing of chemicals according to requirements of wastewater treatment Use of ferrous sulphates of at least 80 % purity and lime with minimum of 75 %t purity



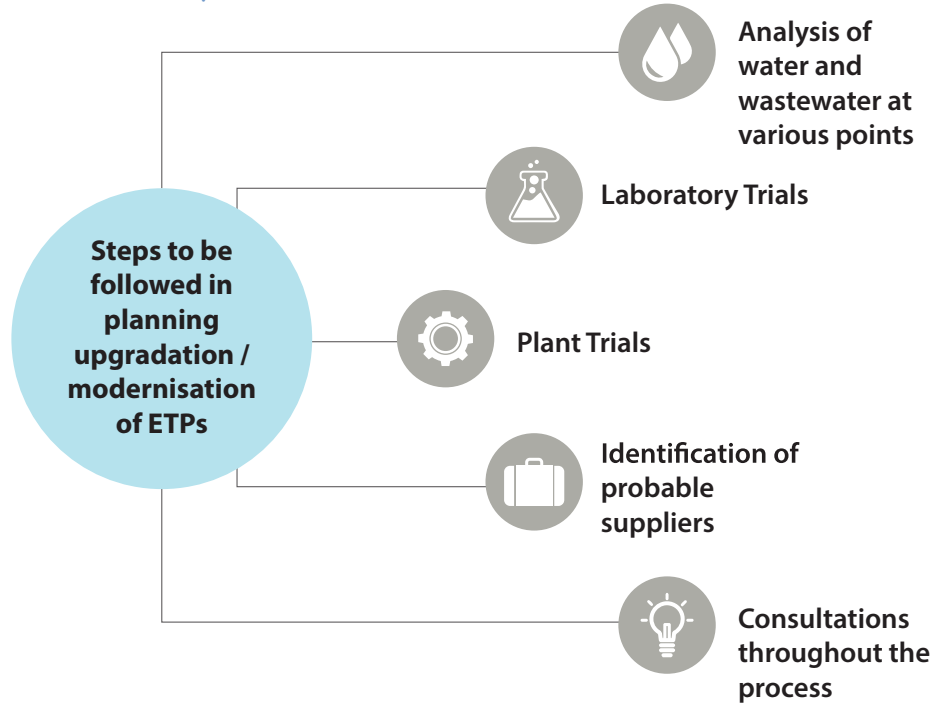
FACTS AND DATA – ETP IMPROVEMENT

Industry	Results
Latex Product Manufacturer	<ul style="list-style-type: none"> • 75% reduction of COD level • Annual cost saving of ~ 225,000 INR • Removal of odour
Personal Care Product Mfg.	<ul style="list-style-type: none"> • More than 20 % reduction in COD • Annual cost saving of ~ 60,000 INR
Yarn Dyeing	<ul style="list-style-type: none"> • 25 % sludge reduction • 15% - 20% of total fresh water used for dyeing of black shades, saved (Reuse) • Annual cost saving of ~ 96,000 INR
Cosmetics & Personal Care	<ul style="list-style-type: none"> ▪ 28 % reduction of COD level
Pharmaceutical	<ul style="list-style-type: none"> • 20% reduction in chemical use • 25% reduction of COD level • 25-30% reduction in Sludge • Annual cost saving of ~ 1,80,000 INR





ETP PLANNING / UPGRADATION - APPROACH





SUCCESS STORIES

Several case studies have shown positive results:

1



Rubber Products Plant: Controlled Odour nuisance with improvement in efficiency of the treatment unit





2



Yarn Dyeing Unit:
Successfully recycled treated waste water for dyeing of dark coloured yarns.
Target: Zero Liquid Discharge



Cosmetics goods producing company:
Reducing ETP operational costs through optimum use and minor modifications of existing infrastructure





3



Soap and personal care product company: Achieved efficiency of ETP operations through upgradation of FOG (fat, oil, grease) trap leading to monetary savings of appr4,000 – 5,000*1 INR/month

Success Stories





4



Large-scale textile company removed the problems in the settling of solids in the ETPs clarification tanks due to insufficient capacity of clarifier tanks by increasing the increase the capacities of the Primary and Secondary Clarifiers.





5



A textile colouring company improved the problems in the coagulation and flocculation process in the primary treatment section of the ETP, improper settling of colour particles by adjusting the dosing of Lime and Ferrous Sulphate and addition of polyelectrolyte.

Success Stories



23



6



Poor filtration of sludge before intervention



Better filtration of sludge after intervention

Another cosmetics goods manufacturing company achieved sludge and COD reduction along with improved and faster drying of sludge



Testimonials:



Dharmendar
Dwive
Technician

“I knew my work as a technician but not the science behind it. The skilling programme of GIZ helped me in understanding the causes behind different problems. This will certainly help me in troubleshooting at the plant. I feel



Mr. Pratap
Patel,
*Owner of
M/s Sterling
Pigments and
Colours, Vapi*

“We have drastically improved COD, BOD, Sludge and most importantly color which was my biggest headache to improve upon. All the reductions were achieved just by fine-tuning the dosing which is remarkable. I am thanking GIZ for saving INR 128,000 per year which is a reward for the efforts and also motivational for further tertiary improvement. So, this is my upvote to sustainability.”





Mr. Rangaram,
*ETP Operator
& Technician
of M/s Sterling
Pigments and
Colours*

“I am very much amazed after the achievement of results. The colour almost vanished and we have got crystal clear effluent.”



Mr. Anand
Sreeraj
*Plant Head,
Faze Three
Ltd., Vapi*

The improvements which we implemented at our Primary and Secondary Clarifiers are giving us better results. We are now able to maintain 25 % MLSS in the aeration tank. Due to this improvement, the quality of the water that we are discharging to the CETP is much improved. We are now also planning to install Tertiary Treatment, such as RO or UF.



Mr. Bheemanna
Chikkerur,
Admin Head,
Faze Three Ltd.

Frequent interactions with the German experts and the GIZ-Vapi-team led to improvements in SS and Colour removal by increasing the capacity of the Primary and Secondary Clarifiers. Faze Three Ltd. is keen to do more for environmental improvement.





Notes



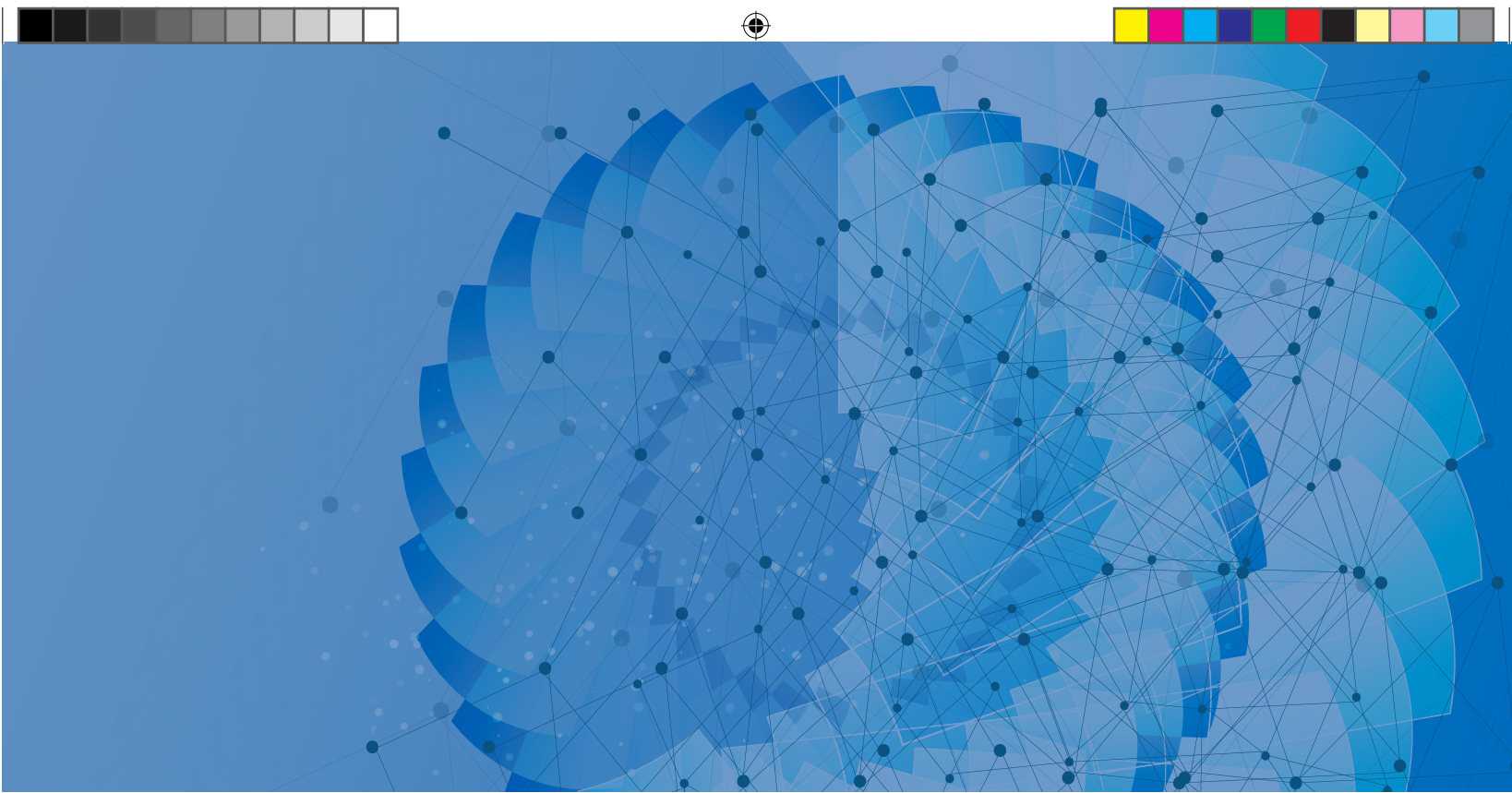


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Notes



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