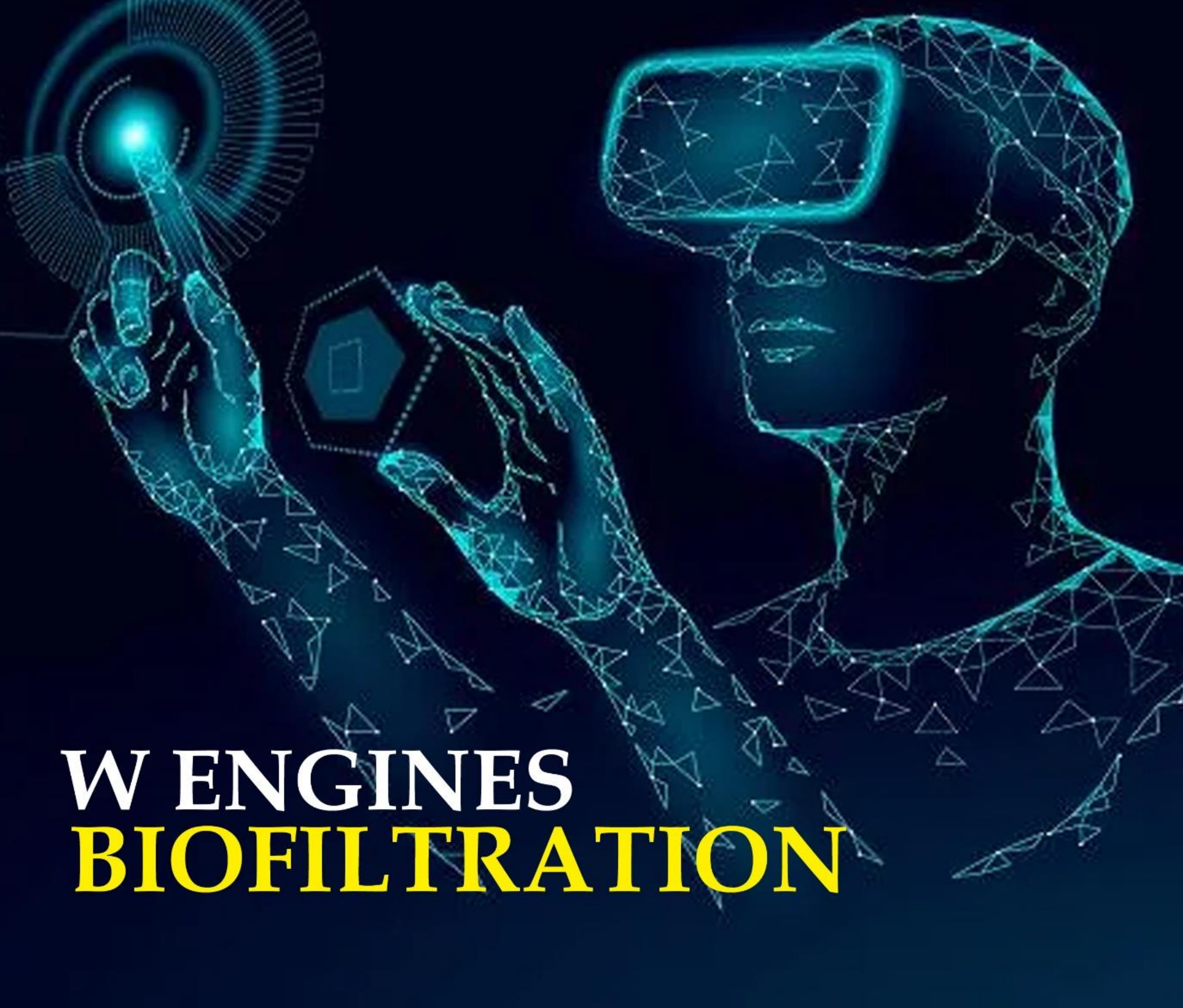
VOLUME 3 ISSUE 1

DEPARTMENT OF MECHATRONICS

ASIMOZ

DEPARTMENT TECHNICAL MAGAZINE

HOW COBOTS ARE HELPING WITH THE WELDER SHORTAGE?



W ENGINES

BIOFILTRATION

ASIMOZ

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INSTITUTE VISION

To mould true citizens who are millennium leaders and catalysts of change through excellence in education.

MISSION

NCERC is committed to transform itself into a center of excellence in Learning and Research in Engineering and Frontier Technology and to impart quality education to mould technically competent citizens with moral integrity, social commitment and ethical values. We intend to facilitate our students to assimilate the latest technological know-how and to imbibe discipline, culture and spiritually, and to mould them in to technological giants, dedicated research scientists and intellectual leaders of the country who can spread the beams of light and happiness among the poor and the underprivileged.

DEPARTMENT VISION

To develop professionally ethical and socially responsible mechatronics engineers to serve the humanity through quality professional education

MISSION

1. The department is committed to impart the right blend of knowledge and quality education to create professionally ethical and socially responsible graduates.
2. The department is committed to impart the awareness to meet the current challenges in technology.
3. Establish state of the art laboratories to promote practical knowledge of mechatronics to meet the needs of the society.

PROGRAM EDUCATIONAL OBJECTIVES (PEO'S)

PEO1: Graduates shall have the ability to work in multidisciplinary environment with good professional and commitment.

PEO2: Graduates shall have the ability to solve the complex engineering problems by applying electrical, mechanical, electronics and computer knowledge and engage in lifelong learning in their profession.

PEO3: Graduates shall have the ability to lead and contribute in a team with entrepreneur skills, professional, social and ethical responsibilities.

PEO4: Graduates shall have ability to acquire scientific and engineering fundamentals necessary for higher studies and research.

Prof.Dr. Ambikadevi Amma.T
Principal,NCERC

Message from Principal

I commend the Editorial team for bringing out yet another edition of the Mechatronics Department magazine " ASIMOZ" 2017-2018. As principal of the college, I am proud of the commitment of the faculties and students of the department.

My best wishes are with faculties and the students of mechatronics department

Mr. Niveth L
HoD Incharge , MTR Dept.

I feel privileged in presenting the third volume of our department association magazine "ASIMOZ". I would like to place my sincere and heartfelt thanks to all those who have contributed to make this effort a success.

I extend my gratitude to the entire team of the Editorial Board for their constant exertion, revision and support in bringing out the magazine in the present form.

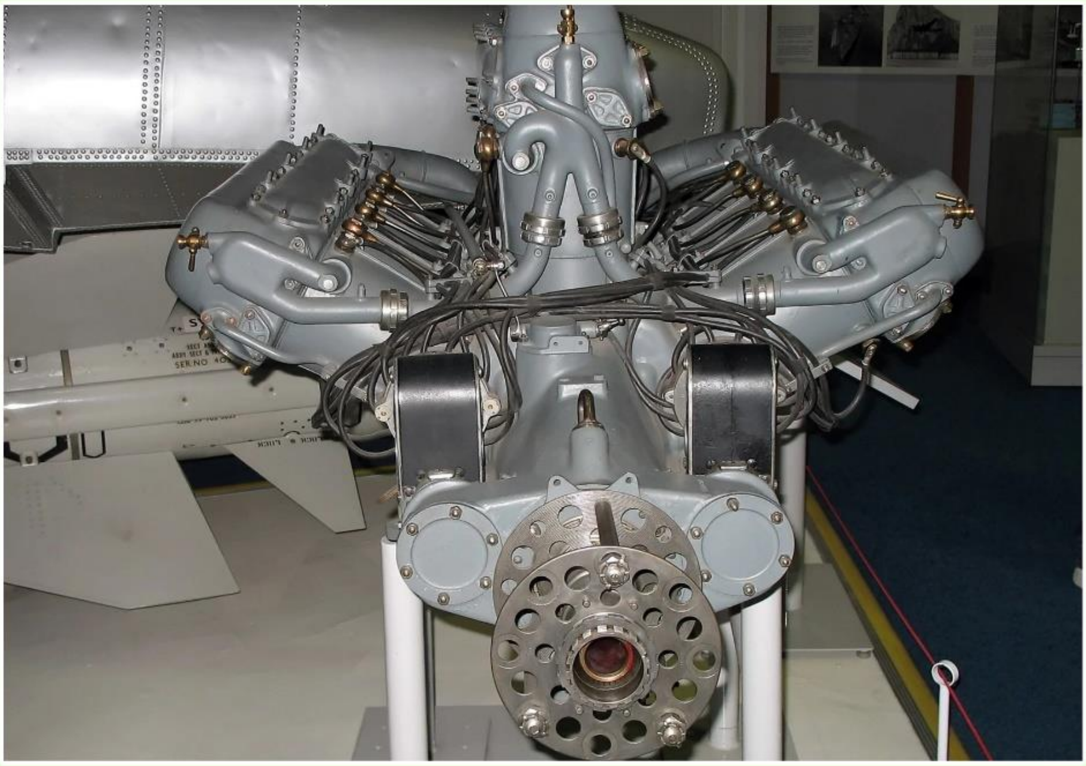
W ENGINES

:- VINAY VIJAY
Nehru College of Engineering and Research Centre

With the rising demands of power , better performance & fuel economy in automobile vehicles, engineers do many research & finally they got success in the form of a new breed of engines the 'W Engines'. One of the first W engines was a three-cylinder (W3), built by Anzani in 1906 to be used in motorcycle. The 1917 Napier Lion aircraft engine was an early W12 engine.

After many years of research Volkswagen Group created the first successful automotive W engine, with the introduction of itsW8 engine (as a tested for W12). The W12 combines two narrow-angle VR6 engines around a single crankshaft for a total of four banks of cylinders. For this reason, the four-bank configuration is sometimes, and more accurately, referred to as a "VV" or "VR", to distinguish it from the traditional three-bank "W" design. Volkswagen Group went on to produce a W16 engine prototype which produced 465 kilowatts (624 bhp). A quad-turbocharged version of this engine went into production in 2005 powering the 736 kilowatts (987 bhp). The major advantage of these engines is packaging; that is, they contain high numbers of cylinders but are relatively compact in their external dimensions. In 2006, the Volkswagen Group-owned Bugatti produced an impossible missile, the Bugatti Veyron EB16.4, a supercar; with an 8.0 litre W16 engine. This had four turbochargers, and it produces motive power output of 736 kilowatts (987 bhp) at 6,000rpm. It utilises four valves per cylinder, 64 valves total, with four overhead camshafts. This car is now the fastest production car of world with unbelievable speed of 432kph and may be it goes on in coming years.

- The constantly rising demands regarding performance, running comfort and fuel economy have led to the advancement of existing drive units and the development of new drive units.
- The new W8 as well as the W12 engines are representatives of a new engine generation - the W engines.
- Large numbers of cylinders were adapted to the extremely compact dimensions of the engine. In the process, more attention was paid to lightweight design.
- With the aim of building even more compact units with a large number of cylinders, the design features of the V and VR engines were combined to produce the W engines.
- As with the V engines, the cylinders are distributed to two banks. In the W engines, these banks of cylinders are aligned at a V-angle of 72° in relation to one another.
- When the W engine is viewed from the front, the cylinder arrangement looks like a double-V. Put the two Vs of the right and left cylinder banks together, and you get a W. This is how the name "W engine" came about.



SOLAR COOLING

:- JITHIN CHERIAN
Nehru College of Engineering and Research Centre

Solar cooling refers to any cooling system that uses solar power. This can be done through passive solar, solar thermal energy conversion and photovoltaic conversion (sun to electricity). The U.S. Energy Independence and Security Act of 2007 created 2008 through 2012 funding for a new solar air conditioning research and development program, which should develop and demonstrate multiple new technology innovations and mass production economies of scale. Solar air conditioning will play an increasing role in zero energy and energy-plus buildings design. Solar energy, radiant light and heat from the sun, has been harnessed by humans since ancient times using a range of ever-evolving technologies. Solar radiation, along with secondary solar-powered resources such as wind and wave power, hydroelectricity and biomass, account for most of the available renewable energy on earth. Only a minuscule fraction of the available solar energy is used. Solar powered electrical generation relies on heat engines and photovoltaic. Solar energy's uses are limited only by human ingenuity. A partial list of solar applications includes space heating and cooling through solar architecture, potable water via distillation and disinfection, day lighting, solar hot water, solar cooking, and high temperature process heat for industrial purposes. To harvest the solar energy, the most common way is to use solar panels. Solar technologies are broadly characterized as either passive solar or active solar depending on the way they capture, convert and distribute solar energy. Active solar techniques include the use of photovoltaic panels and solar thermal collectors to harness the energy. Passive solar techniques include orienting a building to the Sun, selecting materials with favourable thermal mass or light dispersing properties, and designing spaces that naturally circulate air. The core idea is to use the solar energy directly to produce chilled water. The high temperature required by absorption chillers is provided by solar troughs. The system doesn't require "strategic" materials (like in PV systems) and has peak production in the moment of peak demand.

How Cobots are Helping With the Welder Shortage?
-ANAS MOHAMMED ALI
Nehru College of Engineering and Research Centre

The welder shortage is continuing to grow. Are cobots the answer to help relieve the welder shortage gap?

Machinists, welders, sheet metal workers, plumbers, and other trade positions are in short supply. The scarcity has been predicted for decades, but the last several years have brought it to a head. Trade positions have been difficult to fill due to COVID-19 limits, supply chain challenges, and other factors, with far more demand than supply. Unfortunately, years of institutions preferring college over trade schools have harmed the trade school pipeline. In the end, more seasoned professionals quit the crafts than newcomers.

Welder Shortage

Welders are especially hard to come by. According to current trends, 314,000 more welders will be required by 2024, according to the American Welding Society (AWS) and WeldingWorkforceData.

WeldingWorkforceData

While industry expansion and current unfilled opportunities contribute to the welder shortage, perhaps the most concerning trend is that welders are departing the profession due to retirement or advancement in their careers, and no one is filling their positions. According to the AWS, around 160,000 welders out of 750,000 are approaching retirement age.

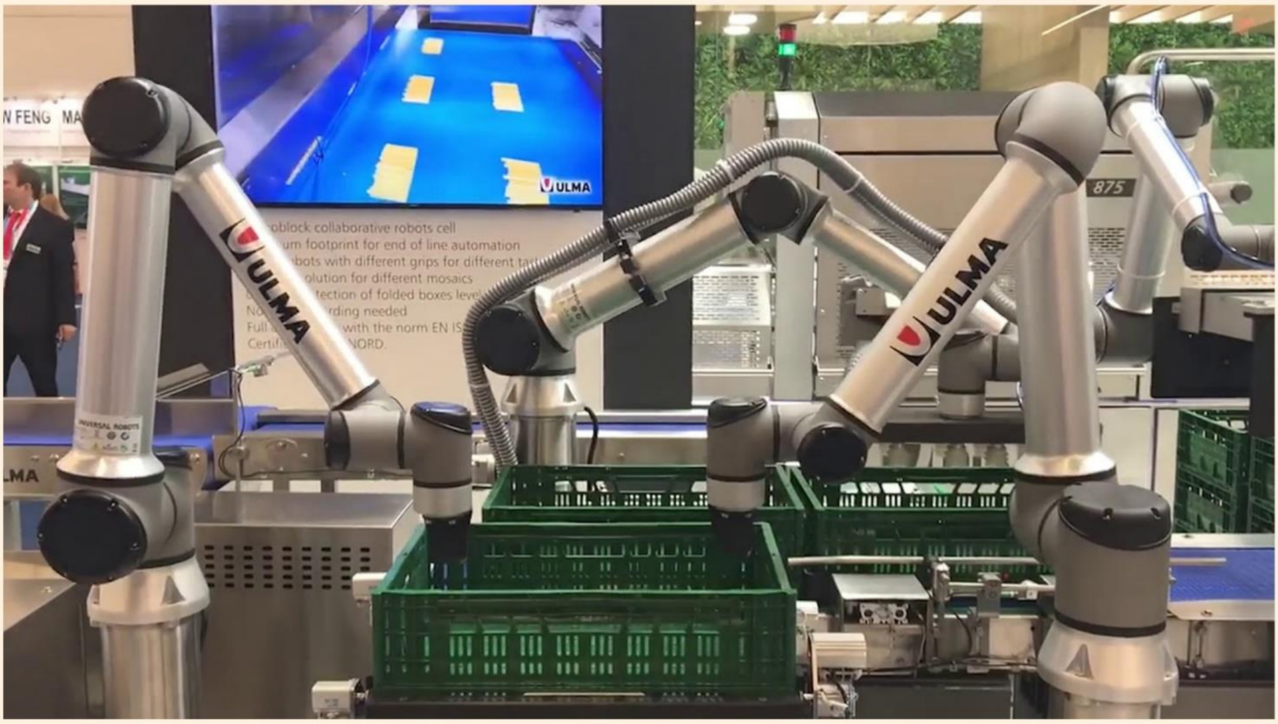
Welding Robots vs. Welding Cobots

will robots take the place of welders? Unlikely. Instead, skilled welders and collaborative robots can work together (cobots). The fundamental idea is that the cobot is taught to execute risky or repetitive welds by the welder. Cobots, unlike typical welding robots, can work with humans in a safe manner. Cobots can aid welders in their work and are equipped with intelligent sensors to keep the human safe, whereas welding robots may need to be kept in a cage or encircled by a light curtain.

Consider a complex, hefty assembly with numerous welds. The cobot may first hold the pieces together while the welder performs a few tack welds. Because it is a cobot, it can properly position the components, and when properly furnished, it is not at risk from the weld's heat. Once the piece is tacked together, the human and cobot can weld together, each finishing portions of the welds for the finished item. The cobot may then transfer the completed, heavier portion and retrieve the remaining bits. Human welders currently train cobots to do repetitive motions. This training stage can be accomplished considerably more easily with existing welding robots, depending on the application and cobot.
Instead of operating in three dimensions and programming x,y,z coordinates for each weld, modern cobots can be programmed using machine vision. This makes robot programming more accessible to welding experts without requiring them to master complicated computer programming.

Benefits of Using Cobots: Added Safety
Risky welding jobs might be delegated to a well-trained cobot, sparing lives and limbs. High-risk occupations, such as initial large-piece assembly, pressure vessel cutting, empty fuel storage containers, and possibly some underwater welding procedures, may one day be handled by a cobot rather than a human.

Take a look at a defunct fuel storage facility. Many enormous fuel storage tanks have remained "empty" for years on the property. These tanks must be chopped into manageable parts so that they may be loaded onto trucks and recycled. While hydraulic shears can be used to achieve this mechanically, it is still dangerous for the operators. There are already processes in place to help with the task's safety, but cobots might potentially add another layer of protection. Welding cobots could be employed in tight locations or underwater welding in the future. A confined space is one that "contains or has the potential to contain a hazardous atmosphere; contains material that has the potential to engulf an entrant; has walls that converge inward or floors that slope downward and taper into a smaller area that could trap or asphyxiate an entrant," according to the Occupational Health and Safety Administration (OSHA).



Assume a major industrial facility includes an access tunnel for plumbing water, compressed air, steam, and process gases that must be accessed by a person but is not intended for long-term residence. A broken nitrogen pipe that has been locked out and tagged out must be repaired by the welder (LOTO). Where did the nitrogen go when it leaked? is the first question to consider. The access tube is likely to include nitrogen gas, which poses an asphyxiation risk to the welder. There are safety precautions in place, but a companion cobot that either

conducts the weld or accompanies the welder, monitors air oxygen contact, or alerts outside aid if a problem arises might add another layer of protection.

The Future of Cobots in Welding

The cobot will increase the speed and quality of welded components in industry as artificial intelligence (AI) processes develop. In the future, a cobot may be able to do pipe inspections and welds in dangerous environments without putting a human welder in danger. On pipeline inspection gauges (PIGs), welding cobots could be fitted to identify and fix leaks as the PIG travels through the pipeline. Welding cobots of the future may feature built-in inspection capabilities in addition to lifting heavy, hot parts and executing repetitive welds. To verify that welds are clean and free of slag inclusions, a cobot might use embedded ultrasonic sensors. Perhaps they will be able to examine the flame parameters of oxygen-acetylene torches and optimise them for the specific situation. Instead of becoming a replacement for the welder, Cobots have the ability to live up to the “collaborative” portion of their name by being a loyal companion.

BIOFILTRATION

By: - Nirmal C R
Nehru College of Engineering and Research Centre

Air streams can be purified by passing them through a biologically active filter medium to destroy organic and inorganic contaminants. It is especially effective for low concentrations of VOCs and inorganic chemicals (e.g., sulphur compounds). It has proven effective for mixed waste air streams and especially applicable for odour abatement. Heavily halogenated compounds present problems Biofiltration is generally effective for aqueous wastes where concentrations are less than 1%. As with all biological treatment, it requires stable, consistent operating conditions.

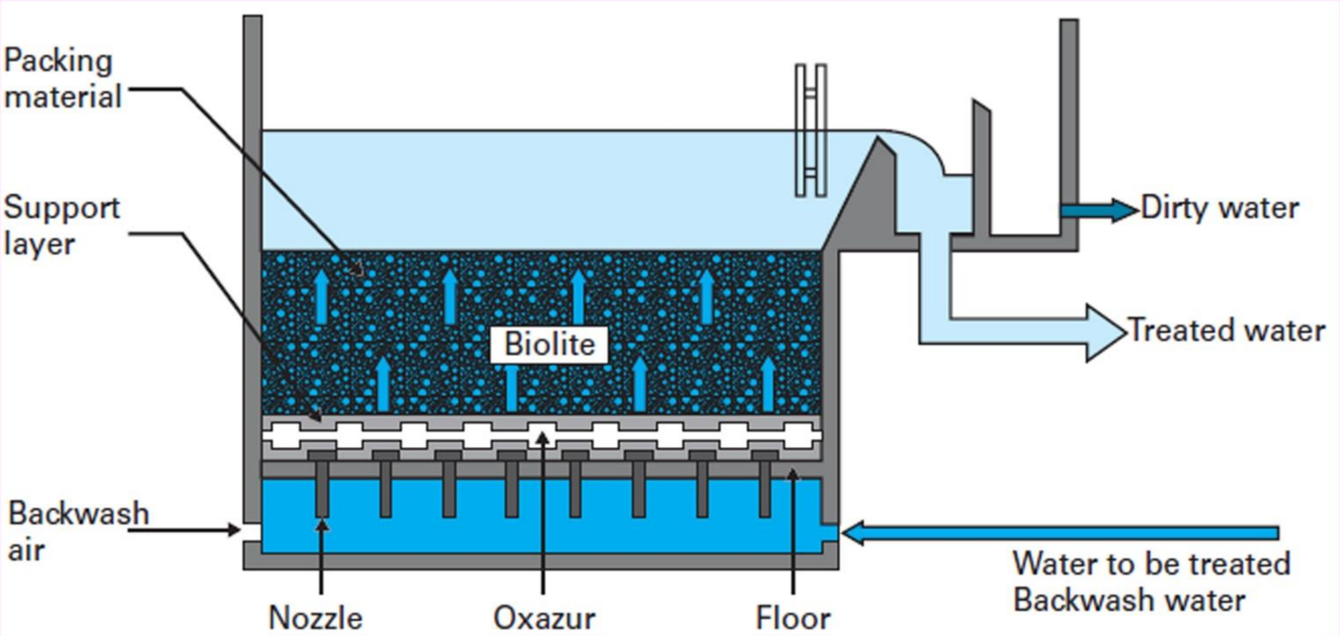
Biofiltration is not suitable for highly chlorinated organics, aliphatic, amines, and aromatic compounds.

Heavy metals and organic chemicals may kill the microorganisms. Heavy metals and non-biodegradable organics may also concentrate in the sludge. Hydrogen sulfide gas may also be released. Biofiltration swales and strips are vegetated areas that remove pollutants from storm water runoff as it flows through the vegetation.

Removal mechanisms include filtration and infiltration. In this study, one biofiltration strip and six swales treat highway runoff, while two strips treat runoff from maintenance yards (for pre-treatment for infiltration trenches). Runoff is captured in drain inlets and routed to the swales, while strips receive sheet flow directly from the pavement. Swales are conveyance channels where storm water flow passes through the grass. Strips are broad surfaces with a grass cover that allows storm water to flow in relatively thin sheets.

Biofiltration swales and strips are providing useful information about vegetation that can filter storm water pollutants effectively in dry areas with little rainfall. These biofiltration devices can also be used for pre-treating storm water going to infiltration BMPs (i.e., trenches and basins). This "treatment train"

approach can increase the overall effectiveness of storm water treatment.



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