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NORRES PRO<sub>2</sub>AIR aeration systems  
Product Quality Pre-PUR<sup>®</sup>

*simply flexible*

**N**  
**NORRES**



# NORRES INDUSTRIAL HOSES HOSES FOR ALL APPLICATIONS.

## About us

### NORRES Group

NORRES, headquartered in Gelsenkirchen, Germany, is a global player and a leading manufacturer of technical hoses, hose systems and other innovative, high-performance plastic products. With production and sales office locations in the USA, Asia and Europe, NORRES is the trendsetter in constantly developing product and system innovations, many of which are protected by patents or utility models. As a well-established manufacturer with 130 years of tradition, NORRES is known for its customised solutions. The objective: NORRES customers save time and money thanks to efficiency and decisive product advantages.

### NORRES product portfolio

NORRES offers its customers a comprehensive portfolio of standard products as well as made-to-measure products. NORRES' certification to ISO 9001 in Germany underlies the consistently high standard – from product development through to production to purchasing and logistics. NORRES products comply with a wide range of regulations such as the ATEX Directive, UL approvals, FDA conformity, EU directives and numerous others. Furthermore, NORRES offers convincing solutions in the field of cable protection systems and environmental

technology thanks to the use of high quality plastic materials such as Pre-PUR®. NORRES thus provides a comprehensive and unparalleled product portfolio with future-oriented solutions in the field of plastic hoses. The objective: Reliability, certified quality and a broad spectrum across all product segments.

### NORRES innovations

An extremely high level of vertical manufacturing combined with an in-house engineering department with proven expertise in this field is the key qualification and the hallmark of NORRES within the industry. Innovations and standard products are designed to help you solve even the most complex technological challenges. The objective: Further extending our technological leadership to the benefit of our customers.

### NORRES services

Know-how, individual consultation and quality are the distinctive features of our services: From consulting and modern logistics through to customer-specific marketing services. NORRES offers impressive performance. The objective: NORRES develops customised service packages that add real value for successful cooperation.

Take advantage of the competence and performance of the market leader in the field of technical hoses and hose systems. NORRES – simply flexible!

### NORRES Group – expertise in quality and service

Founded in 1889, NORRES has 130 years of experience and tradition. Today, NORRES is a global player and leading manufacturer of technical hoses and hose systems: Highly abrasion proof Pre-PUR® polyurethane hoses, suction and transport hoses from PVC, TPE, PE, EVA, silicone etc., high temperature hoses up to 1,100 °C, electrically conductive and antistatic hoses, connecting elements and accessories, many certified products (e.g. ATEX Directive, EU Directives, FDA compliance, UL approvals and numerous others, customised solutions. NORRES products are available as suction and transport hoses and for transportation of bulk solids in the food and pharmaceutical industry, in agriculture, for mobile and stationary extraction systems, for machines in the wood and plastic industry, for municipal vehicles, as cable protection hose system in the electro-technical area and as energy-saving and long lasting membrane diffuser in sewage plants.



# Pre-PUR®

makes the difference

## NORRES Pre-PUR®

Not all polyurethanes are the same! NORRES uses a special polyurethane mixture that is differentiated with the name Pre-PUR® for its diffuser membranes.

Our Pre-PUR® raw materials are distinguished in the following ways from many of the membrane materials commercially available:

Applications/ properties of the different materials in comparison

Applications/ properties	Pre-PUR®	EPDM	Silicone
For municipal waste water acc. to DWA-M115		■	■
For industrial waste water		■	■
Free of softener and therefore no embrittlement			■
Resistant to organic oils and greases		-	■
Resistant to mineralic oils		-	■
Smooth surface to prevent incrustations		-	■
Permanently resistant to microbes and hydrolysis		-	■
Extremely good resistance to flex cracking (De Mattia) to ISO 132		■	-
High permanent elasticity		-	-
High tensile strength and tear resistance		■	■
Good resistance to UV		-	■

- = excellent
- = good
- = moderate
- = poor

### Proven expertise and all-round service

NORRES customers acquire an end-to-end solution backed up by all-round service and proven expertise in process technologies. In addition to convincing product solutions that meet the highest quality standards, NORRES also offers comprehensive consulting support. Engineering services, systems fine-tuned to the needs of each individual user and an efficient network of tried-and-tested plant manufacturers guarantee sustainable operation based on energy efficiency from day one of every NORRES customer project.

### NORRES services at a glance:

- Comparison of specified/ actual aeration performance
- Process optimisation and design
- Customised solution concepts
- Compressed air aeration system design based on tank geometry
- Choice of diffuser types and grid geometries

NORRES customers can also opt for an individually designed solution concept that is tailored to a specific product. This encompasses the complete range of NORRES aeration systems – from membrane tube diffusers to disc and plate diffusers. The aim of every NORRES solution is to leverage the maximum possible cost cutting and efficiency potential hidden in your aeration system.

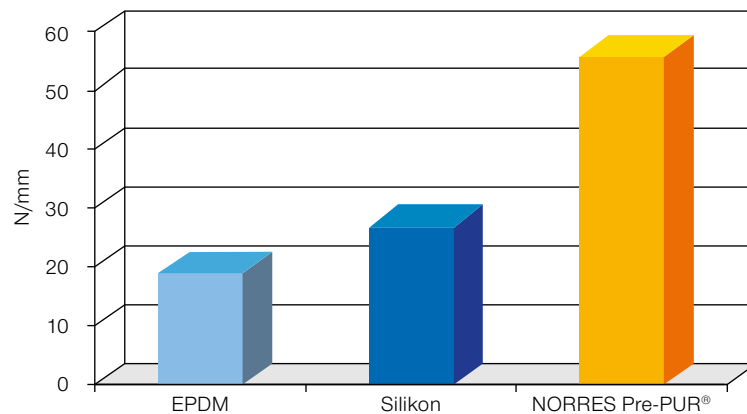
### Applications PRO<sub>2</sub>AIR Pre-PUR®

Quality PRO<sub>2</sub>AIR products from the NORRES stable are mainly used for fine-bubble, compressed air aeration.

Our membrane material exhibits very good resistance to municipal wastewater according to the latest version of the DWA-M 115 Advisory Leaflet. Please ask NORRES for advice before using it in industrial wastewater.

- Oxygenation in the aeration tank to facilitate selective nitrification
- Continuous or intermittent aeration
- Mixing of aeration tanks (municipal and industrial)
- Grit trap aeration
- Aeration of collecting and intermediate storage tanks
- Restoration (aeration) of rivers and lakes
- Aquaculture (fish farming)

Tear strength\*



\* acc. to DIN ISO 34-1



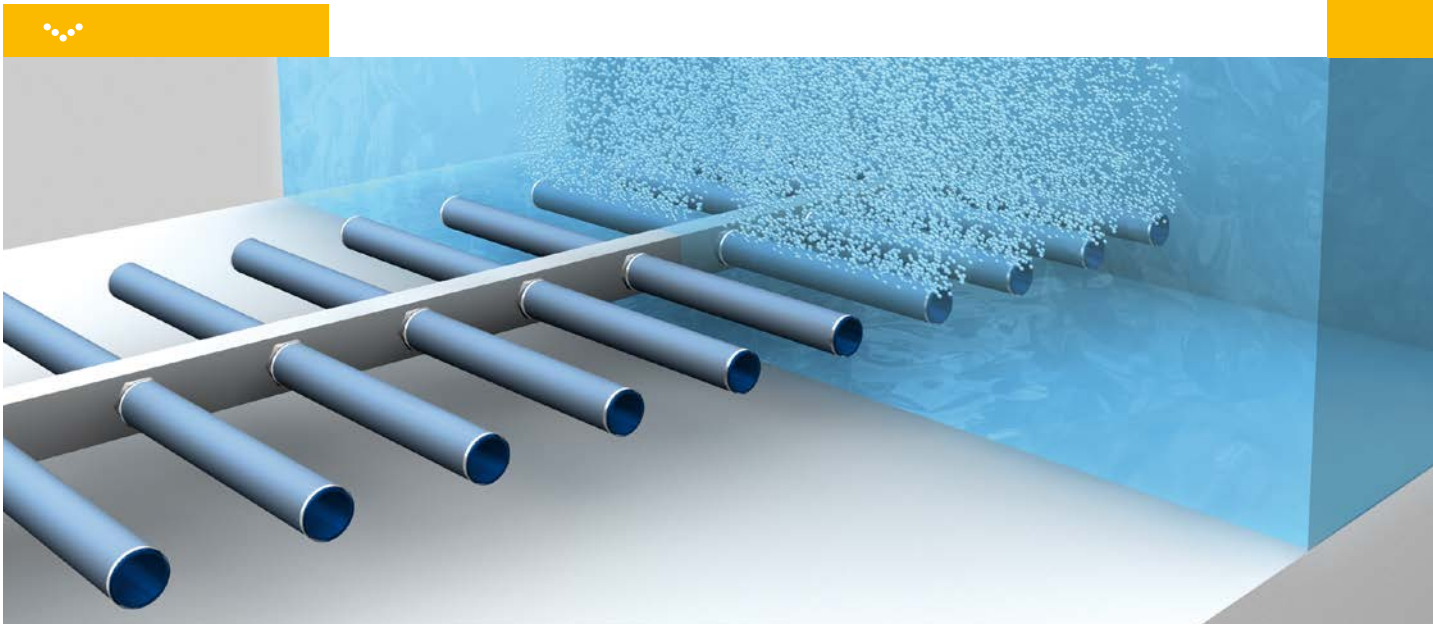
### NORRES Pre-PUR®

NORRES uses special ether-polyurethane mixtures known as Pre-PUR®. Compared to many other plastics, rubber formulations and „simple“ polyurethanes, the NORRES premium polyurethane has clearly superior properties owing to its combination of hard and soft Pre-PUR® segments. The hard Pre-PUR® segments are responsible for the extremely high mechanical strength while the soft Pre-PUR® segments give the finished product its remarkable flexibility and high dynamic load capacity.

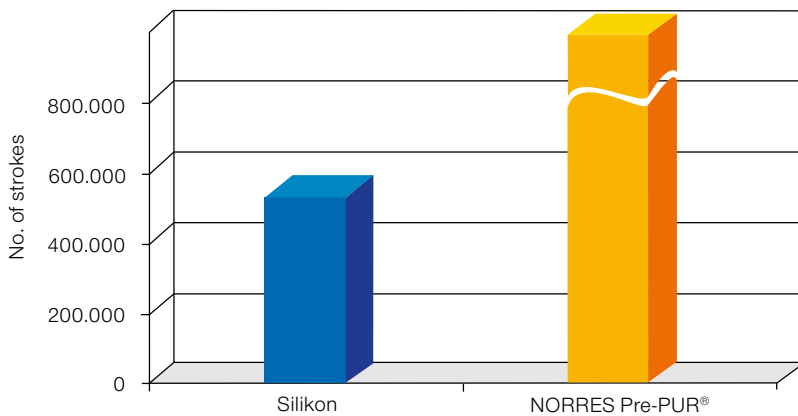
### PRO<sub>2</sub>AIR Pre-PUR® diffuser membrane

The Pre-PUR® raw materials used for NORRES PRO<sub>2</sub>AIR diffusers make a huge difference: NORRES Pre-PUR® is absolutely free of softeners, so that material embrittlement is ruled out.

To improve the chemical, hydrolytic and thermal stability of the Pre-PUR® diffuser membrane, NORRES has collaborated with raw material suppliers on the development of special stabilisers.



Resistance to permanent kinking\* (De Mattia)



\* According to DIN ISO 132. The permanent kinking test on the PRO<sub>2</sub>AIR Pre-PUR® test objects was terminated after 909,116 strokes without cracking.

The properties of the finished product have been optimised in several ways:

- Better durability
- Better chemical and hydrolytic stability
- Excellent mechanical and chemical properties compared to EPDM and silicone
- Very high tensile and tear propagation strength

Customers reap the benefits of an all-inclusive package: quality products combined with added value in the form of better durability, increased safety and various other advantages.

**NORRES PRO<sub>2</sub>AIR Pre-PUR®** tear propagation strength and resistance to permanent kinking

The low resistance to permanent kinking and insufficient tear propagation strength of many conventional diffusers can lead to premature cracking under dynamic loads. The performance of the aeration system is significantly reduced as a result.

Pre-PUR® membrane tube diffusers are characterised by a very high tear propagation strength and far superior resistance to permanent kinking. The operational reliability and hence the performance of the aeration system are greatly enhanced.

- ➔ Quality product developed and manufactured in Germany
- ➔ Special polyurethane mixture made from guaranteed high-quality raw materials
- ➔ Absolutely freedom from softeners and permanent elasticity



Kartonfabrik  
Buchmann GmbH  
76855 Annweiler  
(Germany)

On-site waste water treatment plant:  
Two high rate sludge tanks each  
with a volume of 550 m<sup>3</sup> and a  
900 m<sup>3</sup> sludge basin

Overall size typically 95.000,  
Maximum up to 160.000 PE  
(population equivalent)

Waste water volume:  
ca. 5.500 m<sup>3</sup>/d

## USER'S REPORT KARTONFABRIK BUCHMANN

### Reference

#### The problem

High CaCO<sub>3</sub> load and an increased sulphur level (aluminium sulphate), as a result of the treatment of recycled paper, are the characteristics of the waste water in the Kartonfabrik Buchmann. In addition the waste water does not contain any nutrients so that these must be added.

One peculiarity of the water meant that the air diffusers used previously, because of the material used, started to lose their mechanical properties over time which resulted in premature damage, such as cracks in the diffuser membrane. In addition some air diffusers suffered from an increased pressure loss over the duration of their period of service due to the leaching of the plasticiser. Consequently they only had a coarse bubbled, insufficient air outflow. The old diffusers should have been revised quite often, due to a lack of spare parts and damage to the distribution system this had not been feasible for the operator for a long time. The oxygen injection dropped, as a result the oxygen yield also dropped. An energy saving operation of the waste water treatment plant was no longer really possible, because a high energy consumption resulted from the high loss of pressure and the low oxygen yield.

#### The solution

In the sludge tanks with 12 druggable venting grids, which can be removed and revised during operation, 576 PRO<sub>2</sub>AIR Pre-PUR<sup>®</sup> membrane tube diffusers from NORRES have been installed. The use of PRO<sub>2</sub>AIR Pre-PUR<sup>®</sup> membrane tube diffusers ensures a low pressure loss and a significant energy efficiency. They are 100% free of plasticisers and thus permanently elastic. The membranes become neither brittle nor hard.

#### Conclusion

The motor power of the blower is 120 kW. Prior to the reconstruction work the diffuser practically ran in full-load operation. After the installation and start of operation with the PRO<sub>2</sub>AIR membrane tube diffusers the biology sometimes only needed 50% of the total motor power installed for the aeration, the yearly average is about 60%. As a result the energy requirements could be reduced by ca. 40 % after the installation of the fine bubbled pressure aeration. This corresponds to an energy saving of ca. 415.000 kWh per year which in turn means cost saving of almost 50.000,- € per year.



Old diffuser system prior to reconstruction



New diffuser system from NORRES



The PRO<sub>2</sub>AIR Pre-PUR<sup>®</sup> membrane tube diffuser from NORRES in operation



Reference Harald Baack,  
Manager Technical Planning and Project Manager Redevelopment:

„As early as during the first bubble test a completely uniform profile was evident, this hasn't changed up to today: until now we have not had to use a single one of the reserve diffusers that were supplied! The initial pressure when starting the compressor is, 3.5 years after start of operation, unchanged. I would not hesitate to use the PRO<sub>2</sub>AIR Pre-PUR<sup>®</sup> membrane pipe diffuser again in the future.“

Sewage Treatment  
Plant Oldenburg  
Oldenburgisch  
Ostfriesischer Wasser-  
verband (OOWV)  
26123 Oldenburg

The OOWV operates a total of  
46 sewage treatment plants:  
A total of about 906,000 PE  
(Population equivalent)  
Sewage Treatment Plant  
Oldenburg:  
210,000 PE  
max. up to 230,000 PE



## USER'S REPORT SEWAGE TREATMENT PLANT OLDENBURG

### Reference

#### The Problem

The sludge in both digestion towers of the sewage treatment plant Oldenburg is broken down in carbon dioxide, water, and sewage gas (methane) that is used on the site in a combined heat and power plant for the generation of energy. Centrifuges are used to drain the water from the accrued digested sludge. In order to relieve the load of the existing aeration tanks, the centrate – which accumulates 800 m<sup>3</sup> to 1,000 m<sup>3</sup> per day – is treated in two sequentially operated reactors. Since the treated water contains a highly concentrated amount of ammoniacal nitrogen (NH<sub>4</sub>-N) of approx. 800 mg/L, 40% acetic acid is added as carbon source.

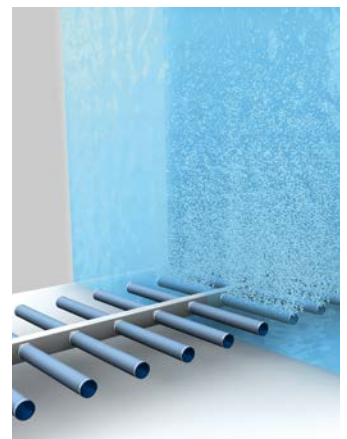
After successful nitrification and denitrification, the reserved centrate, that contains an ammoniacal nitrogen concentration of approx. 100 mg/L, is fed into the sewage treatment plant Oldenburg. The property of the centrate that must be purified, however, contributed to the declining qualities of the EPDM membrane tube diffusers. In the past, commercially available EPDM membranes had to be replaced after several months. This was the only option to maintain a consistent and high oxygenation capacity. The increased effort, the high purchasing costs, and the restricted operation of the centrate treatment plant due to the replacement of the membranes was cause for growing dissatisfaction.

#### The solution

As an alternative, in 2011 the reactors were equipped with diffusers made of silicon, and in a separate test Pre-PUR<sup>®</sup> was used. After 3 years, the silicon membrane diffuser was defective and had to be replaced. As of today, the Pre-PUR<sup>®</sup> membranes and their bubble image do not indicate a visible change. So far, the oxygen supply is still consistent and at a high level.

#### Conclusion

The Pre-PUR<sup>®</sup> membrane tube diffusers are up to 100% unplasticized and permanently elastic. The membrane does not become brittle and does not harden. The use of PRO<sub>2</sub>AIR Pre-PUR<sup>®</sup> membrane tube diffusers made by NORRES in particular are very durable and at the same time allow a high oxygen input and ensure a minimal loss of pressure. This results in a significant energy efficiency. The restricted operation of the centrate treatment plant due to increased maintenance efforts is omitted.



#### Reference: Waste water manager Ronald Chritonenkov:

"The EPDM membrane had to be replaced after a few months. Silicon diffusers are still not the best solution. Only the Pre-PUR<sup>®</sup> membrane tube diffusers made by NORRES are satisfactory: After 3 years, the NORRES diffusers are still working like brand-new, while the silicon diffusers had to be replaced already. We decided to replace the remaining silicon diffusers with Pre-PUR<sup>®</sup> membrane tube diffusers by NORRES".



● Manufacture, warehouse, distribution ● Warehouse, distribution



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