

SiYPro™ Performance Additives

SIMPLIFY YOUR PROCESS WITH OUR ANTIFOULANTS FOR
MONOMER PRODUCTION



CONTENTS

4

1. Simplify your process and improve efficiency in monomer production

6

2. Our performance additives

9

3. Research capabilities

10

4. Our philosophy

11

5. Balanced Effective Service Technology (BEST)

LEADING BEYOND CHEMISTRY

Evonik is one
of the world's leading
specialty chemicals
companies.

We may not manufacture tires, mattresses, medications, or animal feeds, but Evonik is part of all of those products – and many more. While we often contribute only small amounts of material, those contributions are precisely what make the difference. That's because Evonik products make tires fuel-efficient, mattresses more elastic, medications more effective, and animal feeds healthier.

That's what specialty chemicals are all about. And when it comes to specialty chemicals, we're among the best in the world.

Evonik is active in more than 100 countries around the world and goes far beyond chemistry to create innovative, profitable and sustainable solutions for customers. More than 33,000 employees work together for a common purpose: We want to improve life, today and tomorrow.

Within the product portfolio of product line Dynamic Intermediates a broad range of functional building blocks and special reagents, like e.g., alkyl chlorides, TAA-derivatives, alpha, omega-unsaturated olefines, TEMPO-derivatives, functional alcohols, ortho esters can be found.

The products can be produced with customized specifications and supplied in different suitable packagings (drums, IBCs and bulk) to customers world-wide.

This brochure gives an overview of the products and examples in which attractive market segments they could be employed, in order to support our customers position in the value chain.

1.

Simplify your process and improve efficiency in monomer production

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Producing vinyl monomers is the gateway to the plastics industry, and has been around for decades. The industrial processes for making monomers have become very efficient, with many advances in reaction, distillation and storage technology. However, even today not every plant runs smoothly all the time, and the process can be costly when a plant goes down – for these producers, down time is real money.
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Fouling is one of the most common problems in the manufacturing of petrochemicals and in particular of vinyl monomers. Deposits of polymeric and other insoluble materials conspire to limit the efficiency of the process. Standard solutions to this

problem are to reduce throughput, reduce process temperatures, and on a broader level, to redesign the plant. Although such solutions may reduce fouling, they may also reduce productivity or involve capital investment.

Evonik Performance Materials has a wealth of experience in managing the effects of fouling. Over the years we have carefully studied innovative and cost effective solutions. We call this service SiYPro™ – **Simplify Your Process**. Where there is a fouling problem, our experts can analyze the process, advise on what formulations of performance additives are needed and come to the site to assist in the start-up phase. After successful start-up, we provide ongoing tech-

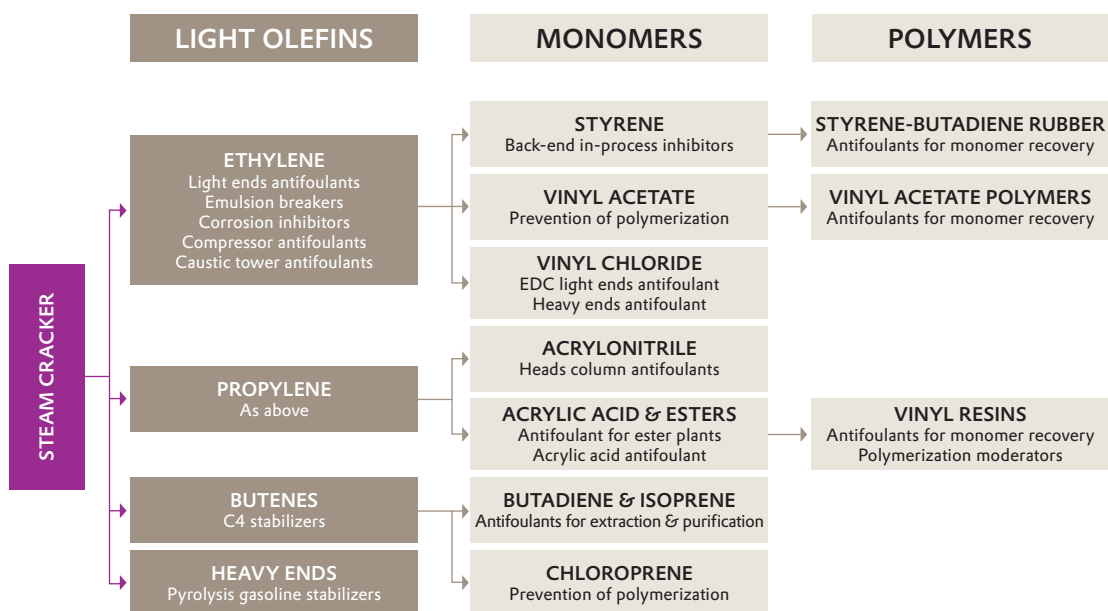
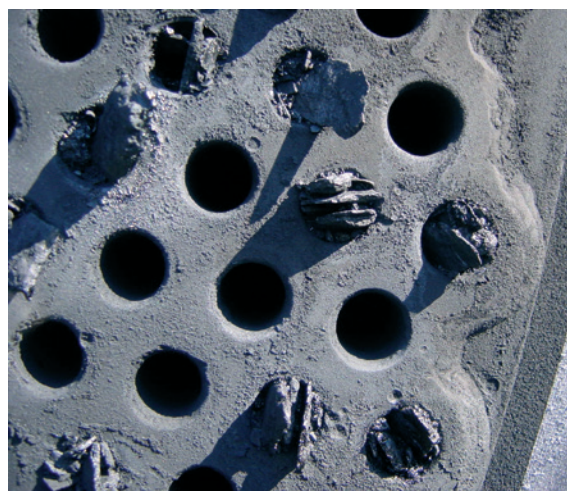
nical support. The goal here is not just a quick fix, but a solution that goes to the root of the problem and prevents the problem from recurring. After all, we're monomer producers too, so we fully understand the importance of assuring plant availability.



1.1 PROCESSES WE TREAT

Our product range extends across the full breadth of hydrocarbon production – anywhere that unwanted fouling occurs. In addition to the common monomers, we work with producers of specialty monomers and in the monomer recovery section of polymer plants.

With our proven track record, there is no fouling situation that we cannot treat.



2.

Our performance additives



Downtime for petrochemical producers means loss of money. For example, a medium-sized steam cracker that produces 500 kilotonnes of ethylene per year could experience a daily loss of up to a million euros, depending on market conditions. Of course, these downtimes don't usually just last for one day.

Our additives are designed to deliver maximum plant availability in combination with an attractive return on investment.

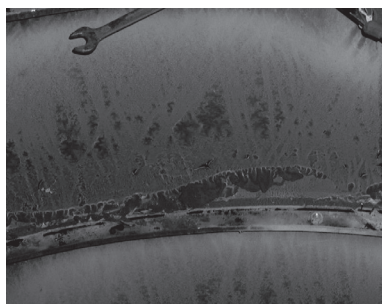
The SiYPro™ additives family is specially designed to minimize downtime and maximize availability of plants. If only one unexpected shut down is prevented, the use of SiYPro™ additives will already give a huge return on investment.

And nothing can be more dramatic than being off-line at the time where the market pays the highest prices. Overall SiYPro™ is the insurance to operate plants more safely, more smoothly and more economically.

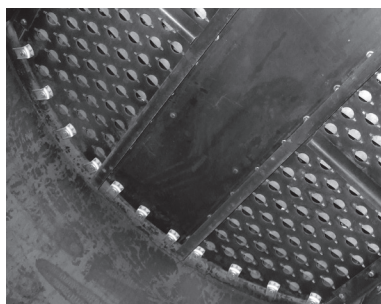
Being a back-integrated producer of the major components of antifoulant formulations, we are in a strong position to deliver excellence in both performance and price.

SiYPro™ antifoulants can allow plants to generate less heavy material, which reduces the burden on the waste incinerator. For styrene production, our nitrogen-free retarder can help to reduce harmful emissions to the environment, and eliminate the handling of toxic substances.

Success can be measured by a number of methods. Our SiYPro™ experts work closely with plant personnel to identify the relevant success criteria, to enable the team to optimize the treatment in the shortest possible time. Ultimately the proof is a clean plant.



BEFORE

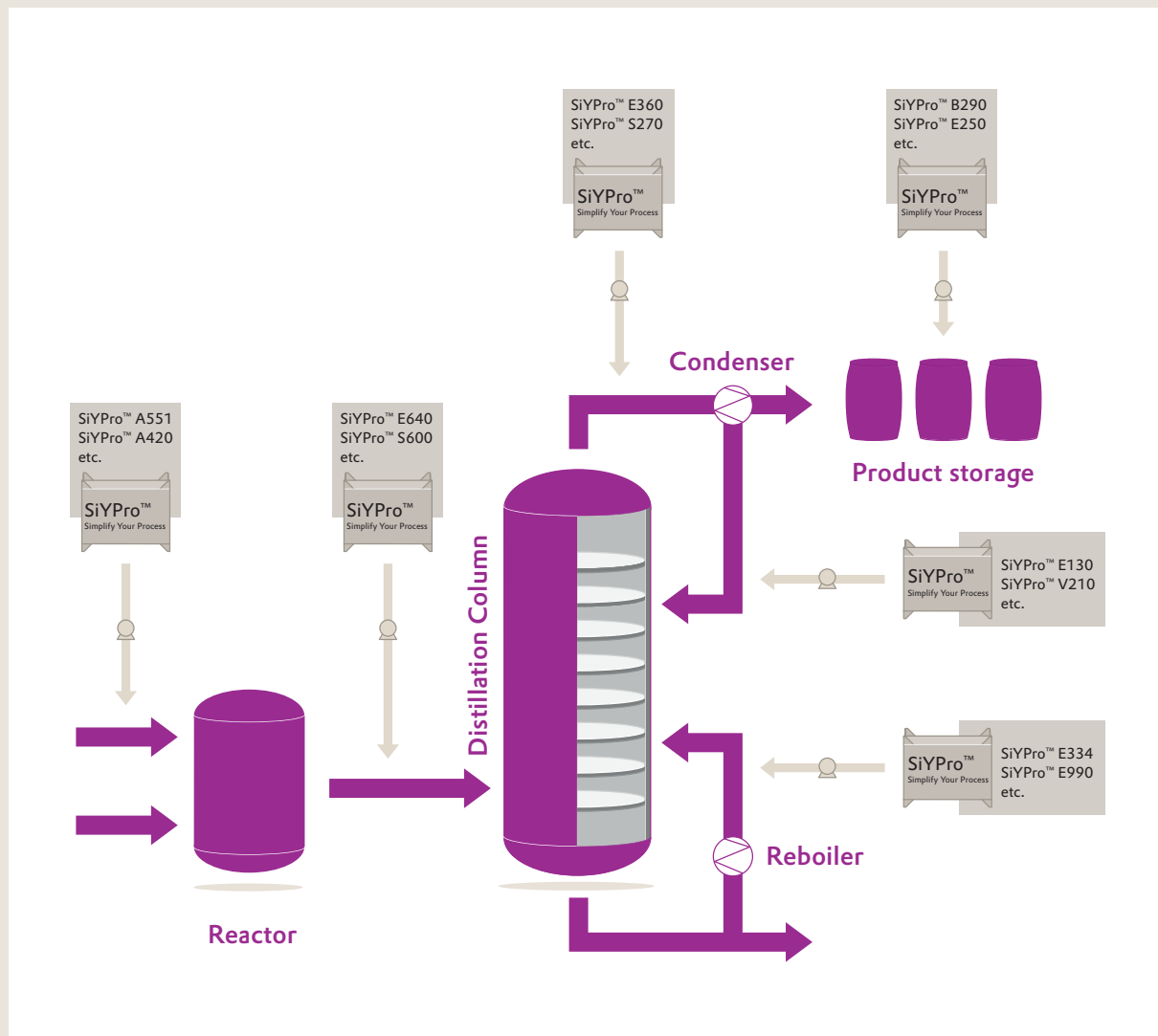


AFTER

2.1 WITH SIYPRO™ PERFORMANCE ADDITIVES, PRODUCERS CAN

- Prevent in-process deposition
- Increase run length
- Increase throughput
- Improve end-product properties
- Reduce production costs
- Reduce carbon footprint

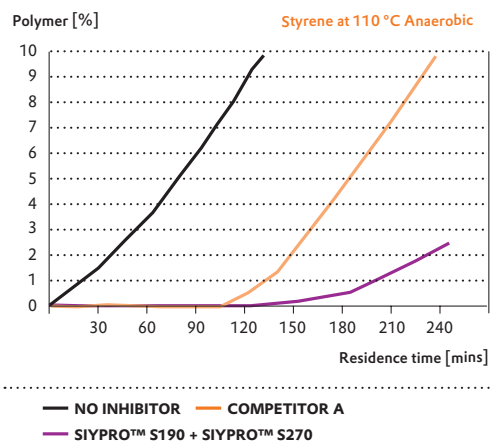
Each additive is carefully applied to the system at the location that achieves maximum performance.
The diagram above demonstrates some of the possibilities.



Ready-to-inject products formulated with a range of functional additives, tailor-made to limit the causes and effects of fouling in petrochemical systems. Components of these formulations include:

- Antipolymerants
- Antioxidants
- Dispersants
- Antifoams
- a range of other carefully chosen components

Inhibitor performance test



3.

Research capabilities

In our dedicated research laboratories we are able to simulate a variety of industrial processes, ranging from acrylic acid to styrene. This way we know that our SiYPro™ product range is always up-to-date.

To solve our customers' problems we evaluate the most suitable performance test method, find out the right process additive and develop tailor-made product formulations.

We also have a fully equipped analytical service, allowing us to probe deeply into deposits taken from plant equipment, in our search for the root cause of fouling.

Our pipeline of new SiYPro™ antifoulants always passes through stringent evaluation in the laboratory before venturing into industrial applications.

Extreme care is taken to comply with intellectual property matters. Our team of patent attorneys is constantly monitoring the global situation, and we actively protect our innovations through new patent applications and selected licensing agreements. Furthermore, Evonik Industries is at the leading edge of implementing regulations relating to the supply and use of chemicals.

Through our "Linking Knowledge" approach we are able to combine Evonik Industries' company-wide knowledge on monomer production, fine chemical synthesis and state-of-the-art process additives. Being a major producer of monomers and process additives provides opportunity for fast-track development.



4.

Our philosophy

Evonik Industries has a long history of producing high quality innovative products for a wide range of industrial applications. SiYPro™ follows this tradition to support our customers in their daily business.

Our philosophy is to be flexible in helping you solve your process challenges. If you simply want to replace an additive that is not doing its job, we can help you. If you have a problem that needs to be solved, we can help you with that, too. We can also provide on-site support to the extent that you require it.

4.1 THESE ARE SOME OF THE TOOLS WE PROVIDE:

- Root cause analysis
- Designing tailor-made antifoulants
- Finding the right process location
- Constant process monitoring
- On-going treatment optimization

SiYPro™ – Simplify your process



5.

Balanced Effective Service Technology (BEST)

Service is an integral part of any chemical additive application; at the two extremes are no service and full service. Without service, treatment costs can be relatively low, but the risk of failure is high. With full service, the supplier provides manpower to ensure success, but there can be high costs with this approach. Evonik's BEST concept takes the advantages of the two extremes to give a low-cost, low-risk solution.

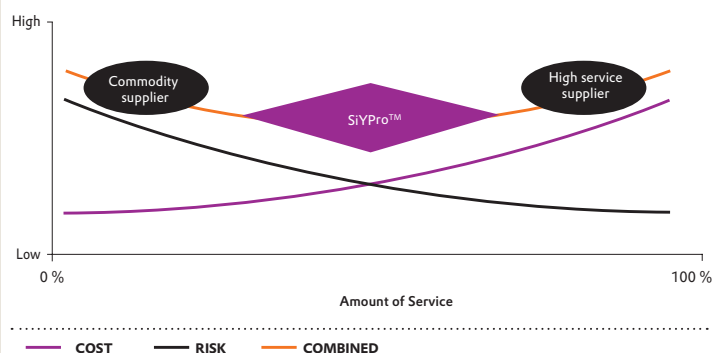
At first, Evonik technical specialists are on-site to ensure that the additive program meets the objectives. Then the program will be managed by both the customer and the Evonik specialist. Routine monitoring is generally performed by the customer with methods provided by Evonik. Evonik provides support on an as-needed basis.

BEST offers the most effective means of achieving the success of an additive application without the inbuilt inefficiencies of the full service approach or the high risk of the no service option. These cost savings are passed on to the customer in the form of lower additive costs, and the customer develops a stronger sense of ownership of the treatment program. BEST is a balanced approach that benefits both Evonik and the customer.

5.1 USING BEST, EVONIK DESIGNS THE PROGRAM TOGETHER WITH THE CUSTOMER. THE TEAM AGREES ON:

- Selecting the right product, dosage and location
- Performance monitoring
- Managing troubleshooting
- Success criteria

Balanced Effective Service Technology



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