

VacuTEC+ COAD® **CO**ntr**OL**led **AD**hesion



VacuTEC+ COAD® combines Tantec's proven VacuTEC vacuum plasma system with the **COntr**OL**led **AD**hesion (COAD®) process developed by Fraunhofer IST. The result is a unique solution that sets new standards in plasma coating and precision surface treatment.**

How COAD® works

With advanced vacuum plasma coating technology, both cleaning and functionalization of the surface are performed in a fully automated process.

In the first stage, contaminants are removed with high precision. A precursor is then introduced and activated by the plasma, forming an ultra-thin, highly reactive layer. This layer dramatically enhances adhesion between the substrate and subsequent coatings, sealants, or adhesives – all without solvents or energy-intensive intermediate steps.

Key benefits of VacuTEC+ COAD®

- Maximum adhesion – even on challenging material combinations
- Eco-friendly process – no solvents or aggressive chemicals
- Long-term stability and reproducibility
- Flexible adaptation to customer requirements and new materials
- Fully automated and easy to integrate into production lines

Head Office

Tantec A/S
Industrivej 6
DK-6640 Lunderskov
(+45) 7558 5822

USA:

(+1) 630-351-1320

Mail:

sales@tantec.com

Web:

www.tantec.com

The Fraunhofer IST, Tantec A/S and Rohloff AG collaborate on the development of a sustainable method for the optimization of adhesion processes

Small space, big challenge: New plasma system ensures reliable bicycle technology

In high-precision internal-gear hubs, all the components must function reliably within an extremely confined space - even in cases where the installation space does not allow the insertion of conventional shaft seals. In such cases, liquid sealants are utilized; their adhesion to metallic surfaces, however, often poses a challenge. The collaborative work of the Fraunhofer Institute for Surface Engineering and Thin Films IST, Rohloff AG, and the Danish plasma and corona equipment manufacturer Tantec A/S has now resulted in an innovative solution that specifically improves the adhesion of these sealants.

In a specially developed plasma system (the new VacuTEC2020+ designed for COntrolled ADhesion), a coating process developed by the Fraunhofer IST (COAD®) is applied which ensures reliable adhesion of the sealant to the steel of the rolling bearing. The system has been in use at the Rohloff AG site in Fulda since June 2024 – marking a significant success.

Plasma provides the process solution

The path to the solution was, however, anything but straightforward: Neither wet-chemical cleaning processes nor conventional plasma treatments led to satisfactory results. The challenge: The sealant simply failed to adhere optimally to the polished surface of the bearing - even after intensive pre-treatment. It was when the COAD® process was introduced that the turning point was reached.

This is a dry plasma process, specially developed at the Fraunhofer IST, in which the individual cleaning and coating steps are fully automated and run consecutively. In the first step, impurities are removed from the surface. Subsequently, a so-called precursor is introduced, which is activated by the plasma and creates an extremely thin, highly reactive layer on the surface. As a result of its high reactivity, this layer significantly improves the adhesion between the component and the sealant – with no need for solvents or energy-intensive intermediate steps.

“COAD® is a real game-changer for industrial surface functionalization,” explained Prof. Dr. Michael Thomas, Head of the department Circular Products and Processes at the Fraunhofer IST. “The great advantage lies in the combination of high chemical reactivity and stability and the possibility of tailoring the process precisely to the most varied range of applications - without additional cleaning or drying steps.”

Collaboration leads to success

The implementation was a collaborative project: Tantec A/S supplied the VacuTEC 2020 as the basic system and adapted the system technology and software for the new process. The Fraunhofer IST not only developed the COAD® process but also the coating unit and the system underframe, optimized the process parameters, and trained the personnel. Rohloff tested the coating in terms of adhesion and quality and integrated the system into its own production process.

“For us, it was crucial to find a reliable and sustainable solution that could be integrated directly into our production process. The new system therefore represents real progress: It not only significantly improves the adhesion of the sealants, but also reduces the time and effort required for post-processing,” said Mathias Gleim, Technical Manager at Rohloff AG.

Sustainability meets efficiency

The COAD® process is not only technically convincing but also ecological: It is solvent-free, requires no complex drying processes, and produces only extremely low CO₂ emissions - particularly when renewable energy is used. Furthermore, it can be flexibly adapted to varied materials, component sizes and unit quantities.

A process with a future

The new system in Fulda is just the beginning: In collaboration with the company Tantec A/S, the Fraunhofer IST is planning to implement the technology on larger system dimensions. For example, a large-volume version of the process is already being tested on a VacuTEC 8080+ at the Fraunhofer Center Circular Economy for Mobility CCEM in Wolfsburg - a consortium of several Fraunhofer institutes under the leadership of the Fraunhofer IST.

“For us, the integration of coating processes into our system technology opens up completely new markets and possibilities,” said Morten Thrane, Sales Director and Partner at Tantec A/S.

The aim of the Fraunhofer IST is, in collaboration with partners, to enable the COAD® process to be used for larger components and other industrial applications - for example in the automotive and aerospace industries or in medical and pharmaceutical technology.