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Producing wholesome seed product on site

The Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP in conjunction with project partners including Nordkorn Saaten GmbH from Güstrow in the German state of Mecklenburg-Western Pomerania, has developed a high production-capacity, compact, and scalable unit for non-chemical dressing of seed product. The new design will be debuted at the 26th MELA tradeshow for the agriculture, nutrition, aquaculture, forestry, hunting, and landscape architecture industries in Mühlengiez near Rostock in northern Germany, September 15-18, 2016 in Hall 2 at booth 249.

Providing the expanding population with healthy foodstuffs is an enormous challenge whose solution begins very early in the production chain. Besides familiar conventional chemical compounds for seed dressing, an additional process exists for effective destruction of harmful pathogens like fungi and bacteria. The environmentally friendly, purely physical process for disinfection of seed product is based on the germ-killing action of accelerated electrons.

If energetic electrons strike pathogens within the target area, the pathogens are destroyed effectively. During electron treatment, the electrons are only allowed to penetrate the seed coat to a depth that empirically precludes any influence on the embryo and endosperm within the interior of the seed kernel. Safe, non-chemical dressing of seed product has been proven during long-term development projects with independent institutes and companies. The process developed by the Fraunhofer FEP for using electrons to dress seed product has been employed in seed product operations for over fifteen years already. Nordkorn Saaten GmbH is producing electron-treated seed product using equipment of the Fraunhofer FEP and has been marketing it since 2012 under the brand name E-VITA®. The equipment is large in size, though, and designed for dressing seed product only in large volumes of up to 25 t/h.

However, it is not always large quantities of seed product that need dressing. The acquisition and operation of a large installation is usually not worthwhile for small-to-medium quantities below 15 tons per hour. Only a few seed product processing operations have annual sales that economically justify the investment in large-scale capital equipment. Then there are some products whose hourly throughput is less than five tons per hour. These include types of grass, sprout seeds, and various fine seeds such as vegetable, clover, and flower seeds for example. Scientists of the Fraunhofer FEP have jointly developed a new generation of equipment for this purpose under a project funded through the German Federal Office for Agriculture and Food (Bundesanstalt für Landwirtschaft und Ernährung / BLE).

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The objective of the project on seed product dressing using new, cost-effective and resource-conserving electron treatment modules (“Ressourcenschonende Saatgutbehandlung mit neuen, preiswerten Elektronenbehandlungsmodulen”) was to create broader market access for electron-based dressing and make the technology attractive for a larger arena of users. The pivotal development was the fundamental design of economical and modular electron-based dressing units for effective, resource-conserving, and ecological seed dressing. The known deficiencies were to be corrected during this project and existing restrictions removed through creation of user-friendly and adaptable solutions.

The following improvements for the new generation of electron sources were planned and successfully achieved:

1. At least a 50% reduction in investment cost compared to high-production units through simplification of all components
2. Better homogeneity of applied dose from compact sources as well
3. Simple and cost-neutral scalability for production capacities in the range of three to twelve tons of grain seed per hour
4. Significant reduction of energy losses caused by thermal radiation
5. Simplified high-voltage power supply
6. Utility for conventional products such as grains and corn as well as for new products like various fine seeds, flower seed, and grass seed.

An innovative tool for effective seed product dressing with optimum utilization of the input energy was developed using the successful realization of this type of electron source. The efficient use of resources is achieved by means of an annular cold-cathode source.

The centerpiece of the unit is the newly developed electron ring source. “The special aspect of this source is that it works without a thermionic emitter, allowing complete freedom for its shape. This means a unit with just a single electron source can be used for uniform and omnidirectional treatment”, explains André Weidauer, the supervisory head of the project. “The new compact source enables the unit to be mounted and operated in a small van, for example.”

Andreas Prelwitz, Managing Director of Nordkorn Saaten GmbH, enthuses: “The new unit is a direct result of the previous technology for dressing seed product with electrons. Thanks to its compact shape, the unit requires less energy for the same effectiveness against pathogens on and within seed. Nordkorn Saaten will be making a very strong commitment to this alternative form of seed product dressing in the future and using this new technology. The large demand from the agricultural sector attests to the positive experience and the high acceptance rate in an impressive fashion. Electron-based dressing of seed product makes a big contribution to low-impact agricultural production.”

This innovative, mobile, economically efficient, and ecological unit with a processing capacity of up to seven tons of grain seed per hour will be in operation in Germany and other countries beginning in early 2017.

The "Ressourcenschonende Saatgutbehandlung mit neuen, preiswerten Elektronenbehandlungsmodulen" project is funded actually by a grant totaling 2.87 million Euros from the German Federal Ministry of Food and Agriculture (BMEL) under promotional reference number 313-06.01-28-1-54.051-10. The project partners Nordkorn Saaten GmbH, BayWa AG and Glatt Ingenieurtechnik GmbH would like to thank the funding agencies for their support.



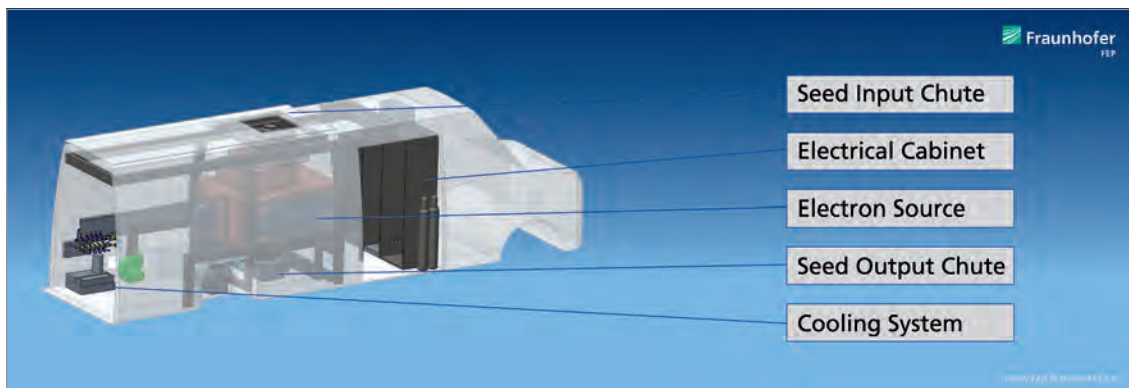
Electron ring-source, laboratory setup

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High-efficiency, compact, and mobile unit for on-site seed dressing

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Design of the new-generation unit in its mobile version

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The **Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP** works on innovative solutions in the fields of vacuum coating, surface treatment as well as organic semiconductors. The core competences electron beam technology, sputtering and plasma-activated deposition, high-rate PECVD as well as technologies for the organic electronics and IC/system design provide a basis for these activities. Thus, Fraunhofer FEP offers a wide range of possibilities for research, development and pilot production, especially for the processing, sterilization, structuring and refining of surfaces as well as OLED microdisplays, organic and inorganic sensors, optical filters and flexible OLED lighting. Our aim is to seize the innovation potential of the electron beam, plasma technology and organic electronics for new production processes and devices and to make it available for our customers. COMEDD (Center for Organics, Materials and Electronic Devices Dresden) with all known activities in organic electronics is now acting as a new business unit at Fraunhofer FEP, Dresden, Germany.