The application of electrons –
in a new, compact and green technology

COMET – the company behind e-beam

COMET has a dedicated e-beam business within the COMET Group’s Industrial X-ray business unit. With its COMET and YXLON brands, COMET ranks among the world’s leading manufacturers of systems and components for non-destructive testing, security inspection and for the excitation of plasma processes used in the manufacture of memory chips, flat panel displays and solar panels. COMET AG was established in 1948 and is now represented in key markets across the globe. COMET Holding AG has a headcount of over 700 highly qualified staff and is quoted on the SIX Swiss Exchange.

Other COMET products:
- X-ray components
- Vacuum capacitors & RF match boxes
- Integrated X-ray systems

COMET Technologies USA, Inc.
Industrial X-ray
76 Progress Drive,
Stamford, CT 06902/USA
T +1 203 969 2161, F +1 203 969 2162
www.comet-xray.com
e-beam@comet.ch

COMET China
1201 Guiqiao Road,
Building 10, 1st floor
Pudong, Shanghai 201206 / P.R. China
T +86 21 6879 9000, F +86 21 6879 9009
e-beam@comet.ch

COMET AG
Herrengasse 10,
CH-3175 Flamatt
T +41 31 744 95 00, F +41 31 744 95 90
www.comet-xray.com
e-beam@comet.ch
The power of electrons – a new take on a proven technology

With its compact e-beam technology, COMET is the first manufacturer to succeed in cost-effectively deploying the power of accelerated electrons for production processes. COMET has joined forces with prominent industry partners in its development of the technology and, in so doing, has leveraged its in-depth knowledge of vacuum, X-ray and material science.

The benefits to you: COMET’s e-beam is...

- **Economical**
  - Substantial reduction of costs
  - Faster throughput times
  - Shorter production times

- **Ecological**
  - Paves the way for production processes that are healthier and more environmentally sound
  - Saves energy, reduces CO₂ emissions and cuts out potentially hazardous chemicals

- **Versatile**
  - Adaptable to a wide range of applications
  - Technology paves the way for new production techniques and material properties
  - Scalable R&D to production

Many industrial processes can profit from the power of electrons. Beverage packaging, for example, can be sterilized efficiently and in an environmentally friendly manner.
In contrast to other irradiation-based sterilization processes, the use of low-energy electrons for sterilization or disinfection requires only simple, local radiation shielding. As a result, the technology is compact and easily integrated into existing inline process chains – our partner, COMET, has extensive experience in all aspects of e-beam technology.

Olaf Röder, Fraunhofer Institute for Electron Beam and Plasma Technology FEP, Dresden

**How e-beam technology works**

Bombarding objects and surfaces with low energy (< 300 keV) electrons kills microorganisms. This is a principle that is well established. In the past, this technology has only been feasible as an off-line process, which required the building of large sterilization systems. It could not be successfully integrated into an in-line production process on a large scale. COMET’s e-beam solution makes it possible, for the first time, to completely replace chemical processes or gamma irradiation with an environmentally sound, sustainable and compact solution. The advantage of this solution is that it can be integrated into any production process. COMET’s e-beam technology works with low-energy electrons. As a result, it requires only simple, local radiation shielding. Production staff no longer have to work with hazardous materials and technologies.

**e-beam by COMET – functionality**

In simple terms, electrons are accelerated in a strong electrical field to near the speed of light. With their high energy, the electrons pass through an ultra-thin window and act on the surface of the object in question. This consists of breaking chemical bonds (when neutralizing microorganisms) or creating bonds between molecules (when curing inks or hardening materials).

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**The power of electrons – safe and environmentally sound**

“..."
6 Applications Sterilisation

- **Wide range of applications**
  - **Food Preservation**
    - Electron beam treatment protects food from spoiling for long periods without the need for chemical preservatives.
  - **Ink and Coating Curing**
    - Electron beam treatment results in instantaneous and fully cured inks and coatings (cross-linking of polymer chains) without the need for photoinitiators as is required in UV curing. This is particularly important when printing food packaging material, as the migration of chemicals from incomplete cured inks into the food poses a health problem.
  - **Polymerization, Transformation, Cross-linking of Web-based Materials**
    - Surface e-beam treatment can enhance various properties of a given polymer or substrate such as PE, PVDF, PVC, Nylon, PTFE, and broaden or enhance specifications. In-line electron beam irradiation of film and foil materials results in special properties and increased quality of the materials treated.
  - **Food Packaging Sterilization**
    - Packaging material for food can be sterilized or disinfected in-line by means of electron beam treatment. It replaces chemistry-based processes, e.g. dipping in hydrogen peroxide.
  - **Sterilization of Medical Products**
    - An example is the in-line sterilization of containers (tubs) of pre-filled syringes in the field of pharma packaging. Electron beam irradiation ensures that the filling area does not suffer contamination when tubs are introduced.
  - **Wire and Cable**
    - Cross-linking of wire and cable insulations is a long-standing application for electron beams. It replaces chemistry-based processes, e.g. dipping in hydrogen peroxide.
  - **Pollution & Abatement Control**
    - Electrons can be used to treat live air streams. Organic pollutants can be destroyed at room temperature replacing high-temperature applications.

COMET’s e-beam technology is highly versatile in its application. We have worked with renowned partners to develop solutions to some of industry’s most challenging applications. Other partners anticipate e-beam to provide the answer to the needs of their market.

COMET’s application specialists dedicate a major portion of their resources to the development of new applications and processes in partnership with our customers. In so doing, COMET also provides the necessary resources and expertise (both in simulations, application laboratories and test facilities) required to successfully create custom solutions.

**Sterilization and disinfection**

Sterile objects and materials are free of microorganisms, either living or in suspended animation, e.g. spores. COMET’s e-beam technology is suitable for reaching a sterility assurance level of 10^-6, which means that the probability of an irradiated object being non-sterile is “one in a million”.

COMET’s technology delivers the dose (usually 20-30 kGy) to achieve an SAL of 10^-6 typically required by medical device manufacturers. In this way companies can be certain that they will fulfill their market segment’s required standards.

Using COMET’s compact e-beam solution enables integrated, production-line sterilization in an efficient and environmentally sound manner, free from potentially harmful chemicals.

**Wide range of applications**

- **Food Preservation**
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“COMET’s e-beam technology represents a mini revolution. The technology is small and compact and can thus be integrated inline into existing production chains for a wide range of applications. As a result, these are environmentally sounder, more sustainable, more efficient and therefore more cost effective.”

Charles Flükiger, Head of Industrial X-ray, COMET
Companies interested in e-beam technology can simulate and test their applications on COMET’s laboratory machines.

"We have subjected COMET’s e-beam technology to rigorous testing. Based on our test results, we have determined that it is the best alternative to traditional sterilization processes and meets all of our expectations. The emitters are extremely durable and reliable. COMET has proved to be a dependable development partner; its experts are driving forward the development of technology in the pharma packaging arena with immense dedication and involvement.”

Dr. Johannes Rauschnabel, Robert Bosch GmbH, Packaging Technology Business Unit Pharma

COMET e-beam technology: Engineering services, collaboration and support worldwide.

Looking for an efficient, environmentally sound process for sterilization, curing and other applications? We can show you innovative ways of improving your production processes.

To ensure the success of your project, COMET’s specialists work in a tight collaboration with your company’s R&D experts. They provide you with all the necessary integration support, the scale up from development to production and help you to overcome any hurdles associated with the new process.

COMET has a global reach with representation in all the major markets worldwide.

COMET has a variety of resources at its disposal for verifying the benefits of e-beam in your production process:
- Simulations
- COMET application laboratory
- Laboratory equipment for the customer’s own test runs

Companies realize a number of benefits having COMET as a partner:
- Reports and customized simulations
- Access to COMET’s application laboratory for feasibility testing
- Engineering support for the integration of e-beam technology in the production chain
- Technical support throughout the lifecycle
- Straightforward exchange of e-beam emitter (plug & play, refurbishable design)
- Global service and support

COMET is a proven R&D and engineering partner. For research collaboration, tests of electron beam emitters across a range of applications and general advice on e-beam please contact:
Tel: +41 31 744 97 99
E-mail: e-beam@comet.ch
COMET’s e-beam is...

...ecological
The technology paves the way for production processes that are healthier and more environmentally sound by cutting out the need for potentially hazardous chemicals. COMET’s e-beam also reduces energy consumption and CO₂ emissions substantially.

...easy to integrate
COMET provides companies with in-depth support when it comes to adapting e-beam to your production chain. A company’s R&D department is able to develop its own techniques based on the COMET e-beam solution.

...economical
Offering straightforward handling and operation and relatively quick to integrate in any production process, e-beam leads to a marked reduction of costs and faster throughput times.

...efficient
Conventional sterilization processes rely on chemicals or gamma irradiation, with all the costly logistical implications outside of the in-house production chain. e-beam helps keep costs and risks to a minimum.

...versatile
e-beam is adaptable to a wide range of applications and paves the way for new production techniques and material properties.

Award for the COMET e-beam
Only Switzerland’s best and most innovative companies stand a chance of success in the Swiss Technology Awards, the country’s premier technology awards platform. The Awards honor outstanding endeavors in the realm of innovation and technology that demonstrate above-average potential in the marketplace and opportunities for growth.

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Any questions?
We’re here to help.

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Phone: +41 31 744 97 99
E-mail: e-beam@comet.ch
www.comet-xray.com

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