

Olon's vision of the future

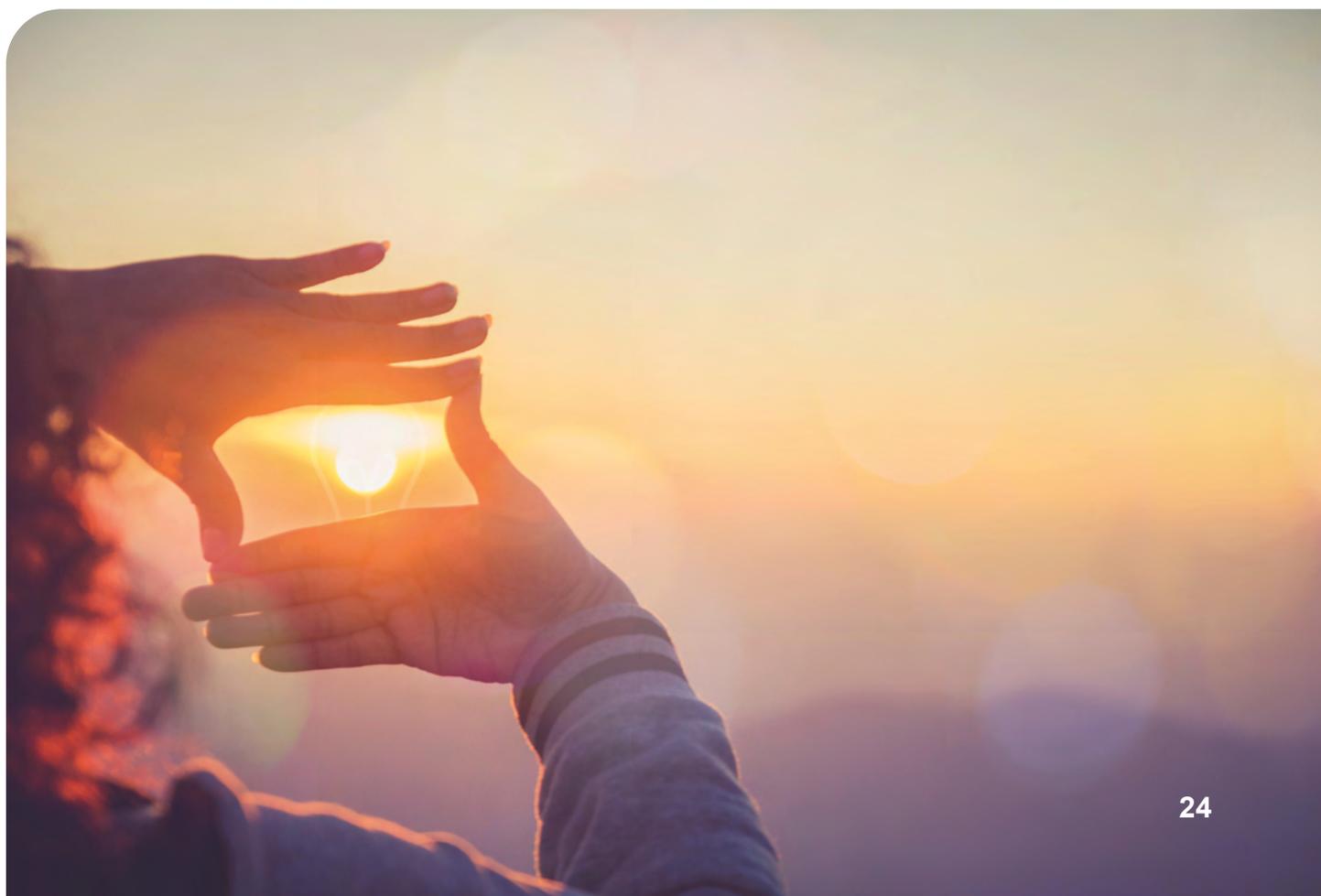
Our vision starts from the business and extends to the entire sector, looking at the will to be a persistent enabler of skills. Our ambition is to promote a more sustainable production of APIs, meeting the highest standards of quality, investing in innovation and technology processes.

A deep technological revolution, that challenges the production as we know it, must be carried on: the time frame to be taken into consideration will necessarily be longer but requires to develop more eco-friendly processes, which use fewer resources and produce less waste.

The approach to chemical synthesis implies steps of reactions, which may require significant amounts of energy. The challenge is to reduce energy consumption and the use of solvents that are needed along the chemistry process.

Our research for innovative technologies is therefore focused on tackling these issues.

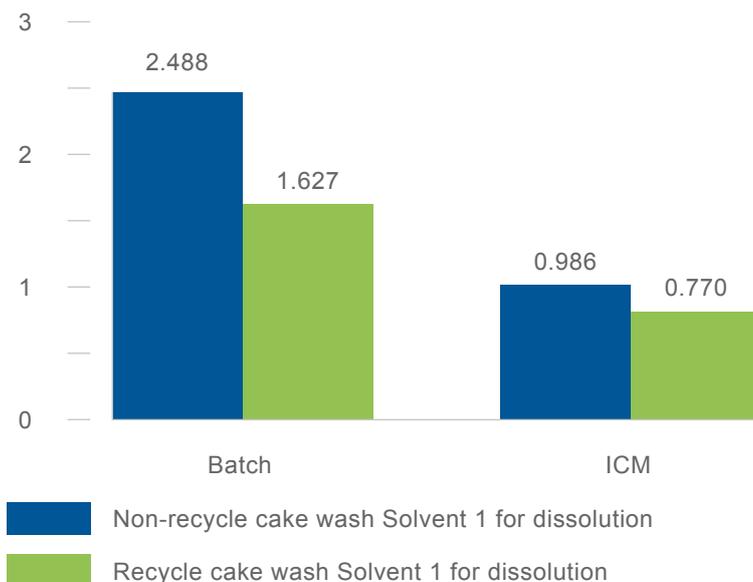
To overcome the significant amounts of energy required for reactors, we are implementing several continuous manufacturing processes investigating both the flow chemistry approach as well as CSTR (continuous stirred tank reactors). It means no batch reactors with loading and unloading phases, but constantly active production units (either microreactors or small classical reactors), which process fewer materials, thus requiring significantly less energy for cooling and heating procedures.



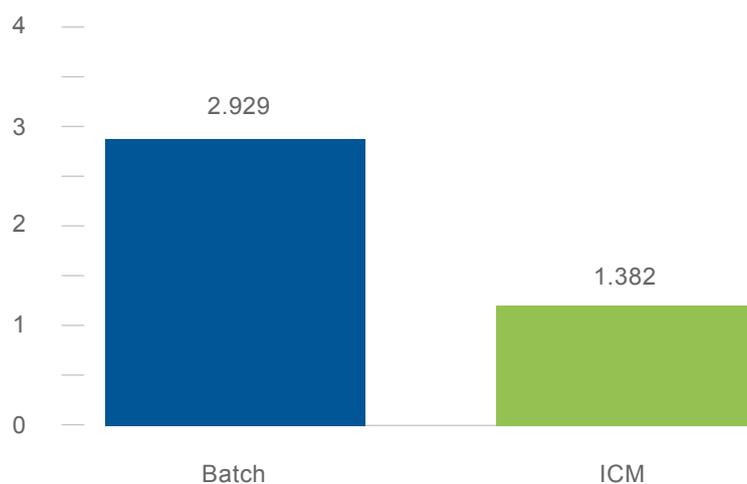
It also provides greater safety for operators and the process itself, due to using limited quantities of products that react together at any given time.

Moreover, the latest technological development will make it possible to use light (photochemistry) or electricity (electrochemistry) to run reactors, which would be unfeasible under more conventional conditions.

E-factor (kg Waste/kg Product)



Energy Intensity (MJ/kg)



$$\text{Energy Intensity} = \frac{\text{Total process energy (MJ)}}{\text{Mass of product (kg)}}$$

To reduce the use of solvents, **biocatalysis** is well established within our reactor portfolio: laboratory-created enzymes are able to transform a given starting material into the desired finished product by using water at room temperature, without requiring special technology.

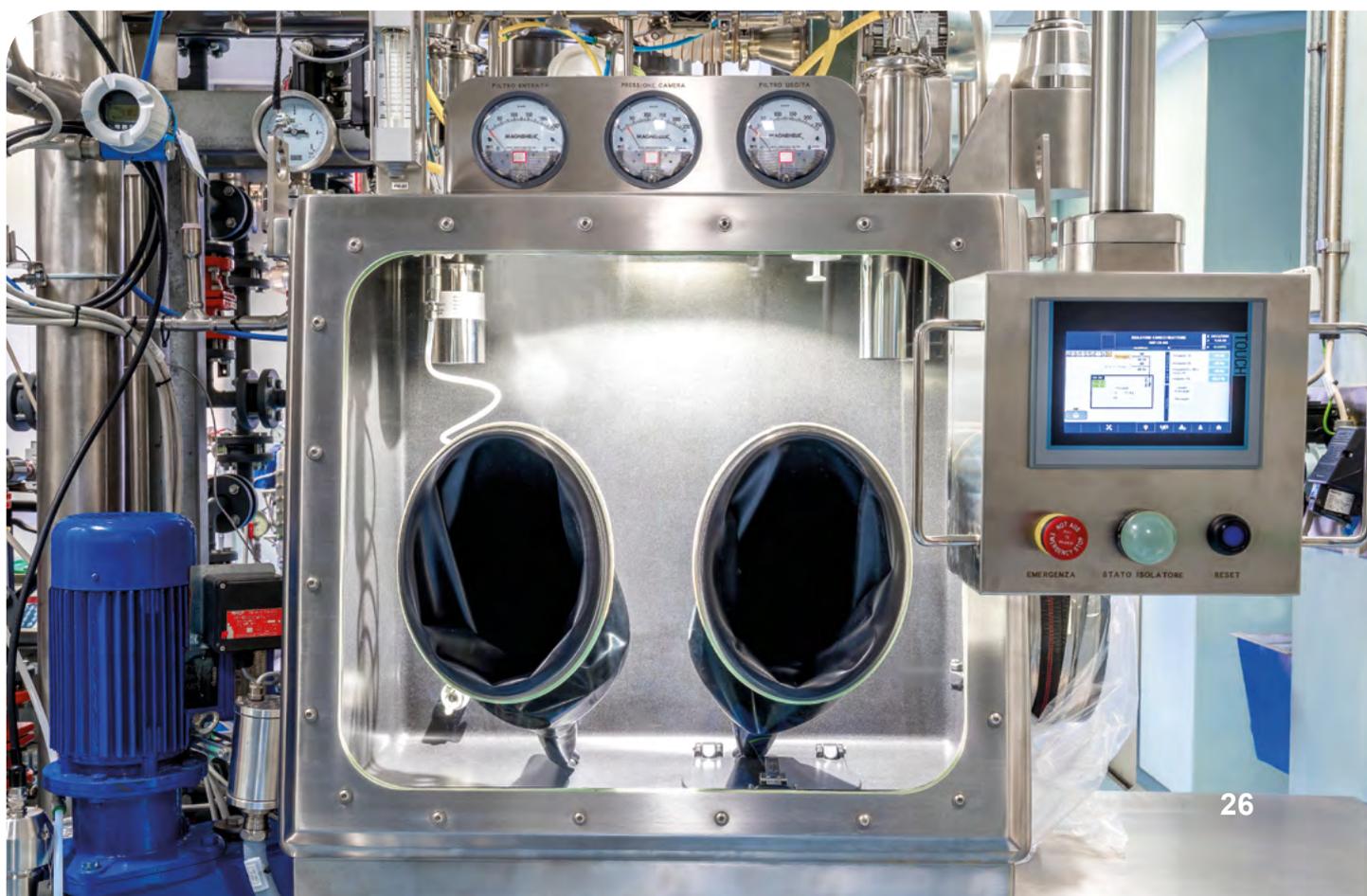
This revolutionary process reduces the energy required to heat water and potentially virtually eliminates the use of solvents, responding perfectly to sustainability targets. It is applicable to numerous types of transformations. We have started to put it into practice on an industrial scale.

We need to continue investing in research and development, in collaboration with universities and research companies that develop individual enzymes, as demonstrated by the pilot project we have been carrying out for more than two years in Segrate in collaboration with the University of Milan.

We are grappling with a change of mindset, in which there is a continuous exchange of knowledge and information between the chemical and engineering sectors, also generating new specific know-how.

This investment will have a double impact in terms of sustainability: it is less energy and labor-intensive due to the high level of embedded automation. All this is in a context of greater safety, with the aim of reaching end-to-end manufacturing: from raw product to ready drug, with fewer steps and purification processes.

Technological progress also has an impact on the entire production chain, producing a rapid evolution in terms of procedures and digitization, towards an effective Industry 4.0.



With its **Biotechnology Centers**, Olon is a global leader in **microbial manufacturing**.

Microbial fermentation is the first biotechnological process that has ever been applied to drug manufacturing. Several of these drugs have been revolutionary breakthroughs in the history of medicine and are still life-saving treatments for millions today. Olon began manufacturing by microbial fermentation in the 1960s, applying the technology to the production of antibiotics and later to many other molecules including cancer drugs. Today, fermentation, which is a recombinant DNA technology, is applied to manufacturing life-saving treatments such as insulin for diabetics, as insulin for people suffering from diabetes.

Microbial fermentation is an eco-friendly and highly sustainable process that mainly uses only water, renewable nutrients and microorganisms. It reduces the use of chemical solvents, which are already significantly limited in all Olon Biotechnology Centers.

However, we are firmly committed to further reducing the environmental impact and strive to limit the use of chemical solvents in all our manufacturing processes.

We want to take on a leading role in the chemical-pharmaceutical sector from an ethical and social point of view even before the economic and productive one, by being bearers of a new perspective.