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Cultivating the endless art of mechanics

The future incorporates our history in a creative way: it has the memory and imagination of the dummy on the cover, which embodies a number of Brovedani components in ancient wood and is reminiscent of the early plates of machines from the first *Encyclopédie* by Diderot and D'Alembert. The future builds on our earliest knowledge, our experiences and our desire to amaze. In this spirit, we at Brovedani cultivate man's oldest trade: mechanics, which originates from the dawn of time, from the first flints fabricated by our forefathers. Yesterday, today, tomorrow there always has been, is and will be mechanics. It is an extension of nature, a substratum of work and transformed matter that pervades all human artefacts and activities, including intangible ones.

This is why we at Brovedani believe in the **inexhaustible vitality of mechanics**. This is why we persevere in nurturing **an industrial project that still flourishes today**, projecting our passion along the evolutionary trajectories that have brought us thus far, without ceasing to ask ourselves what we will be and what we should become in order to continue being.

In the 2023 Calendar, leaving aside clichés, we imagine the mechanics to come, indeed the mechanics we will be, in an attempt to seize the opportunities, contradictions and complexities of an epochal transformation that is taking place, with humanity suspended between the mind-blowing potential offered by digital instruments and a titanic challenge to sustain life on Earth.

We will take this journey into a universe scattered with more questions than answers, through futuristic hypotheses accompanied by photographic metaphors "assembled" with pieces of our history. It will be an evocative story that aspires to capture the artistic side of mechanics: we want people to touch worlds that are only apparently distant, as the Greeks knew only too well when they coined art with the word "tékne". Technics, art, mechanics: things-well-done, to give man future, beauty and happiness.





And the time came when showers of bits began to "wet" the earth. And man began to understand that those strange binary drops were profoundly connected with his destiny.



1 s	з 16 м
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15s

DIGIT**G**REEN: the inextricable revolution

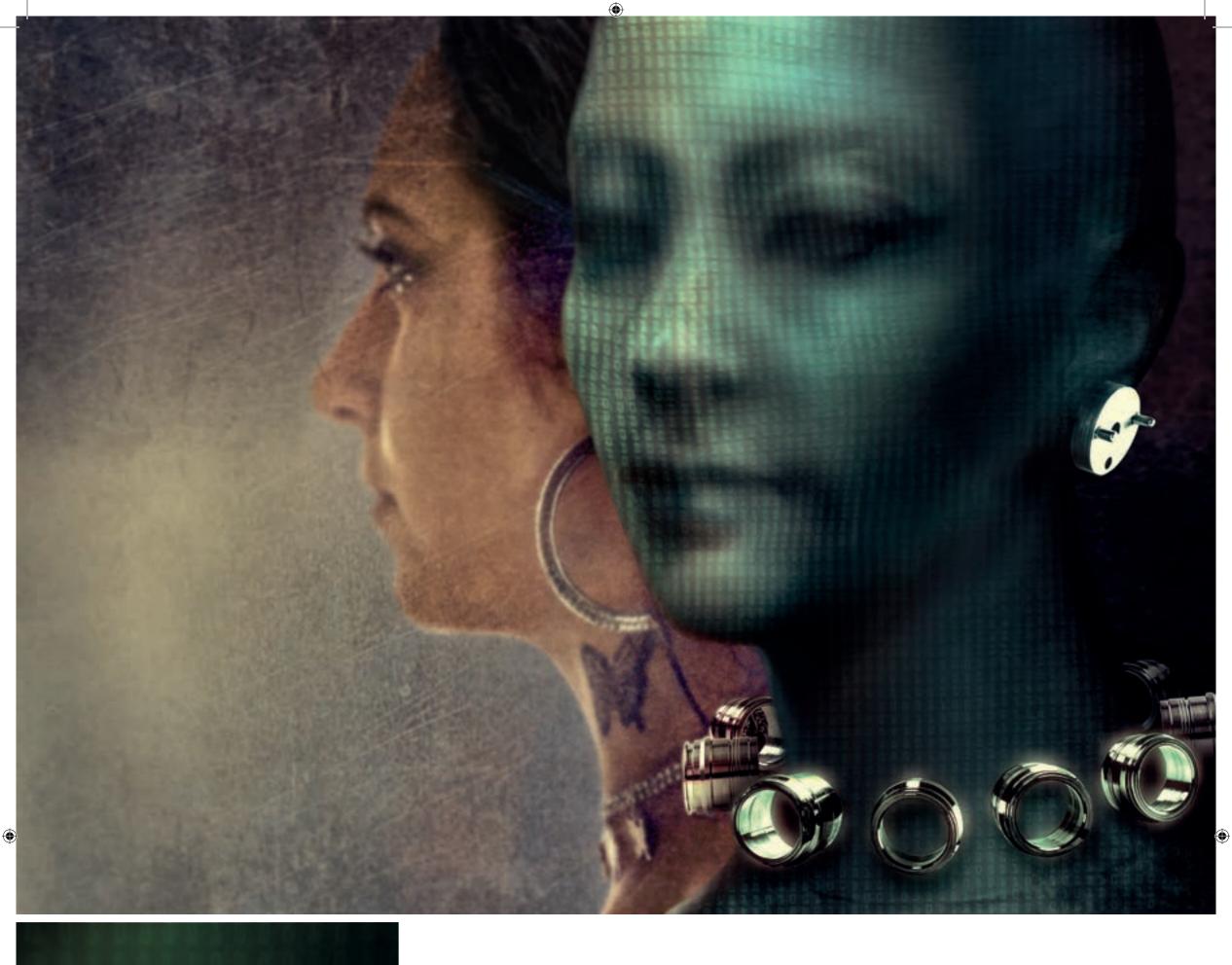
Words such as "digitalisation" (digital transition) and "sustainability" (green transition) are fashionable today. However, as stated in an article by the Symbola Foundation in regard to these concepts, "too often exists a compartimentalised approach, an artificial separation. In reality, the strategic interconnection between the two could become an element for further industrial innovation". We are more than convinced of this: indeed, to consolidate this thesis, we think that the hopes placed in the near future derive in particular from the extraordinary potential offered precisely by this inextricable revolution.

Digitalisation today is already working in the environment's favour. It does so in a myriad of specific applications, as evidenced for example by the results achieved in waste sorting or smart mobility management, through the use of sensors and vision systems, or the use of big data on a massive scale. Generally speaking, digitalisation affects industrial systems, making them "self-aware" and "responsible" for their own efficiency thus favouring the reduction of criticalities and wastage. It is a fundamental step along the road to environmental and - inextricably - economic and social sustainability. A step that Brovedani also seeks to undertake, both by participating in projects for green products in sectors such as EV (Electric Vehicles) or HICEV (Hydrogen Internal Combustion Engine Vehicles). And also through a profound rethinking of processes generated by radical innovations such as digital traceability.

January

5 30 м

31_T



A world populated by digital doubles...
An invisible mirror where the great river of data flows...
In front of the boundless mirror, the beauty of mechanics continues to shine to the tenth of a micron.

1 w	16 T
2т	17 f
3 F	18 s
4 s	19 s
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6 6 M	21 T
7т	22 w
8 w	23 T
9 т	24 F
10 f	25 s
11 s	26 s
12 s	9 27 м
7 13 м	28 T
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15w	

Digital twin: a friend of mechanics

Information is the key that opens the doors of the future.

The crux of digitalisation thus becomes the ability to transform real objects - products, machines, but also natural organisms and phenomena - into **data objects**, so-called "digital twins": "living" entities capable of receiving and transmitting information, and of becoming "talking" nodes in complex, growing interactions.

Almost like when Plato introduced the relationship between ideal models and objects of effected reality, mechanics has to pursue this path **to create industrial metaverses** in which products and processes have their own digital doubles and exchange information with each other – and with the outside world – that can autonomously modify the parameters and actions of production.

This *modus operandi*, which radically changes the environment, method and workflow, is made possible by the enormous potential of Industry 4.0, which is also being progressively applied at Brovedani: connection of smart objects in the net (IoT: Internet of Things), sensors and vision systems that capture information, enormous amounts of data processed in a cloud (big data), and artificial intelligence in the broadest sense. Thanks to these tools, which free man from time-consuming tasks and complex evaluations, we are able to focus on the one hand on strategic industrial choices, and on the other on "mechanics per se", raising the bar in terms of creative and technological challenges.

February



The idea conceived began to detach itself from the originator, to live a life of its own, to reflect its metamorphoses on other worlds. It began to tell its own story from unexplored distances. To amaze, even, those who were willing to listen to it.



2023

1 w	16 T
2т	17 F
3 F	18 s
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5 s	12 20 M
10 6 M	21 т
7 т	22 w
8 w	23 т
9 _T	24 F
10 f	25 s
11 s	26 s
12 s	13 27 м
11 13 м	28 т
14 T	29 w
15w	30 т
	31 F

New dynamic design scenarios

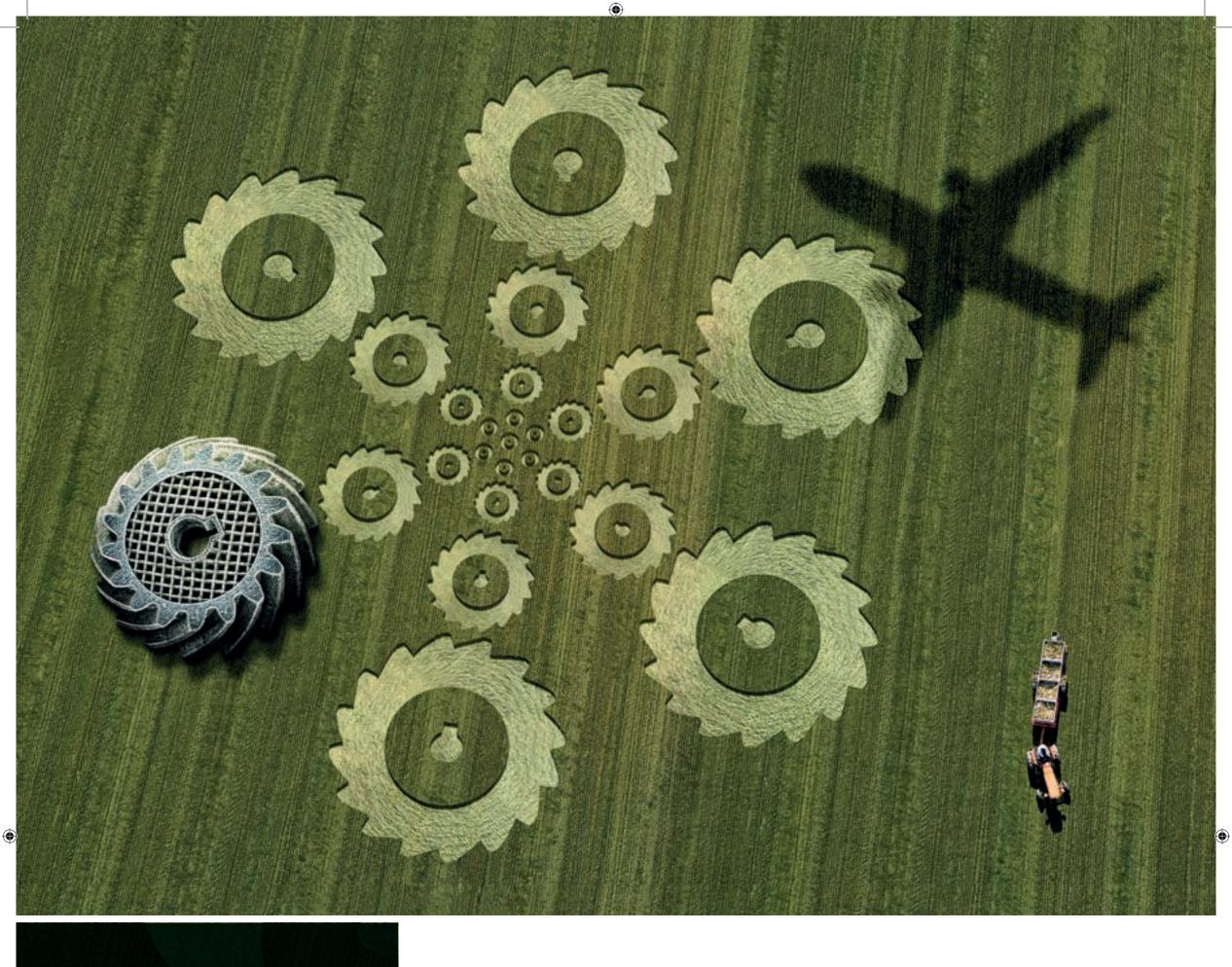
In this new information space, the way designing is done changes profoundly. From early on in the design process, the *digital twin* of the product to be made takes form. The **design** is no longer static, it becomes a **dynamic virtual entity** that can interface with different application contexts, whether geographical, climatic, technical or regulatory.

The design thus speaks to the designer, it informs him or her about how the product being developed will interact with the environment it will be placed in and with the intended user.

Thanks to big data, the designer will be able to interactively model the design in changing scenarios. An enlightening example of this *modus operandi* is provided by LEF, the **Lean Experience Factory in San Vito al Tagliamento**, managed by McKinsey but started up in 2006 as Keymec based on an idea from Brovedani. This model factory runs through the life cycle of a compressor for refrigeration systems, demonstrating how its design can already differ significantly, based simply on different climatic inputs. Through the availability of this huge amount of data, "ideal compressors" can be designed for different markets, then moving on to targeted prototyping and building on these foundations the industrial process.

In this artistic interpretation, the design reflected has the emblematic face of Mexican artist **Frida Kahlo**, who has Central European DNA and was ideally close to Friuli Venezia Giulia through her connections with Friuli-based photographer, Tina Modotti. It pays tribute to an emancipated, resilient, strong-willed woman, a symbol of modern plurality, who aligns with the spirit and industrial geographies of Brovedani.

March



Only a broad-sweeping view and glints of experience were able to illuminate the driving force of those ethereal cogwheels of thought. There opened up before us an immense green field, just waiting to be cultivated.



1 s	16 s
2 s	16 17 M
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5 w	20 т
6 т	21 F
7 F	22 s
8 s	23 s
9 s	17 24 M
15 10 M	25 т
11 _T	26 w
12w	27 т
13 т	28 F
14 F	29 s
15 s	30 s

Creating the impossible with layers of imagination

Much has been said about 3D printing or additive manufacturing, often without understanding the significance and profound implications of this technical and cultural revolution, which presupposes a new way of designing: additive thinking. Whereas in the usual ways of processing by removal (turning, milling, lapping, etc.) we remove, with 3D printing we add by depositing fine powders layer by layer. The designer therefore must adapt to a radical change: it's not a question of "simply" operating with a new tool, as in the transition from the drafting machine to the computer. We must imagine a new way of generating an object, produced as a sum of infinitesimal layers. This ingenious method of construction therefore requires that artefacts created in this way are also radically different in the design stage. Using this approach, extraordinarily complex products can be made, with honeycomb, lattice and curved structures inspired by living organisms. To work with this level of complexity however, we need to have a comprehensive mastery of the universe of mechanics: only those who are perfectly aware of the rules can indeed challenge them from new perspectives.

Thanks to its background, Brovedani has adopted *additive manufacturing* as a "natural" continuity of its consolidated activities, betting on **3D** first and foremost as a means of **improving and expanding processes**, from creating its own individual tools with special morphologies to the production of machine parts that are impossible to produce using conventional techniques. Exciting co-design projects with customers are also being consolidated, with a view to developing new 3D printed components.

April



A conscience disseminated in billions of intelligences embodied in metal, began to lead us into territories furrowed by invisible roads, on journeys that previously did not exist.

18 1 M	16 т
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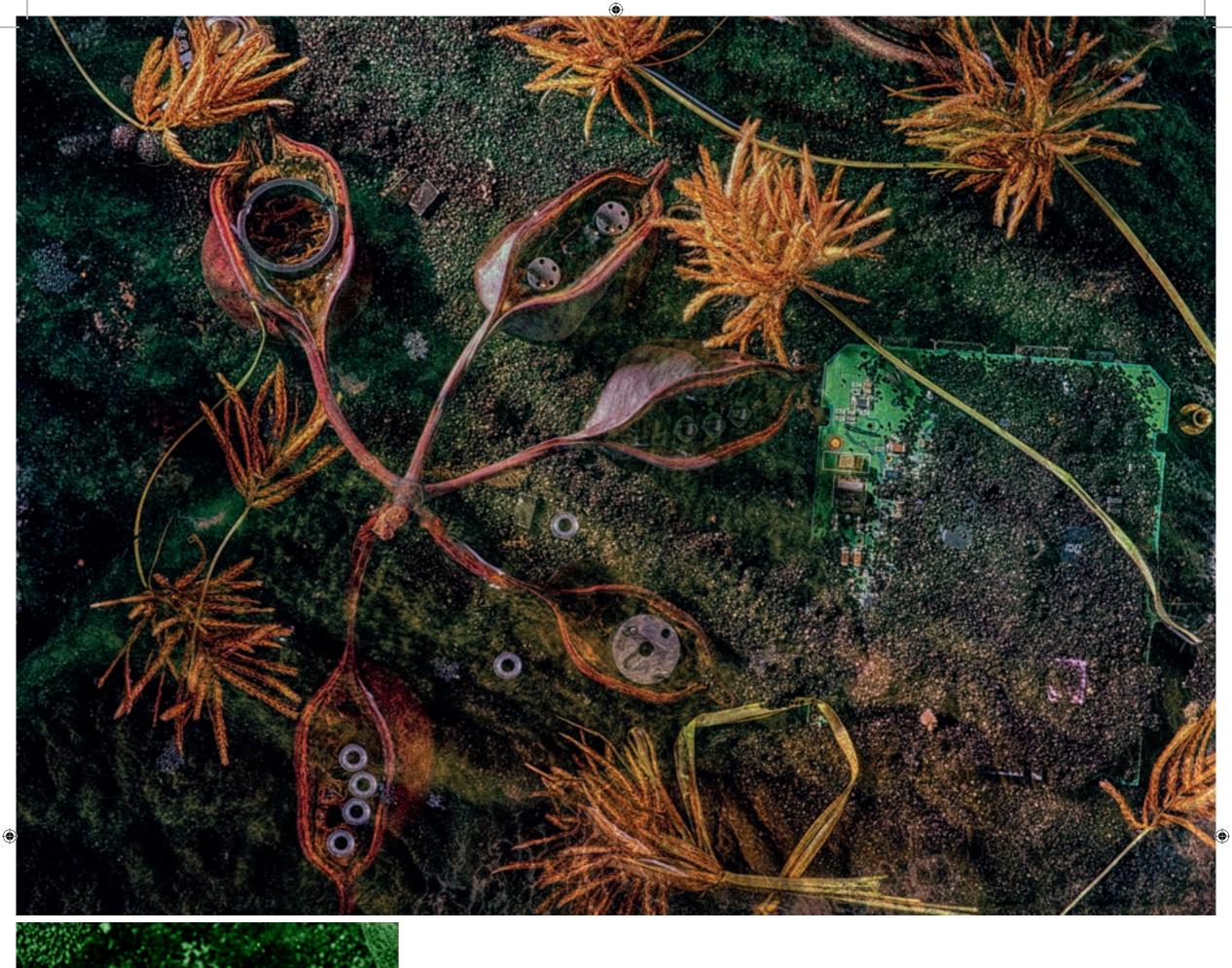
Atom&bit components for new mobility spaces

What will the mechanical components of the future be?
They may be ultra-mechanical assemblies integrating a variety of different materials: metals, plastics or resins. Raising to these multi-technological challenges will require being organised in clusters, in "galaxies" of companies united, including on a territorial scale, to undertake innovative projects such as A³ – Alliance for the Art of Assembly, led by Brovedani, which implies a great deal of manufacturing and organisational effort.

Innovation, moreover, may spur us on towards territories where function and service overlap with the object itself. The vehicle industry, with its automotive supply chain, will flow into the wider fluid world of **mobility**: urban, slow, sustainable, individual, shared... In this "expanding universe", Brovedani is developing new components for two and multi-wheeled vehicles.

Following a system logic, where every movement will be tracked and shared, we can envision the evolution from the purely mechanical component to a smart one that transmits and receives information, like a dynamic node in a network of movements inspired by new needs, which include sharing, with the monetisation that goes along with it, the automation of driving and safety. Looking ahead, the roads of the future could therefore provide an integrated product offering a high added value that brings mechanics and software, atoms and bits, closer together. In Italy this integration could give new impetus to the country's automotive industry, stimulating unimagined supply chain strategies.

May



The big reason that flows brings oxygen to machines. Like creatures of the Ocean, ideas built by man exist and live in the shared flow of knowledge.

1 т	16 F
2 F	17 s
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4 s	25 19 M
23 5м	20 т
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7 w	22 т
8 т	23 F
9 _F	24 s
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11 s	26 26 м
₂₄ 12 M	27 т
13 т	28 w
14w	29 т
15⊤	30 f

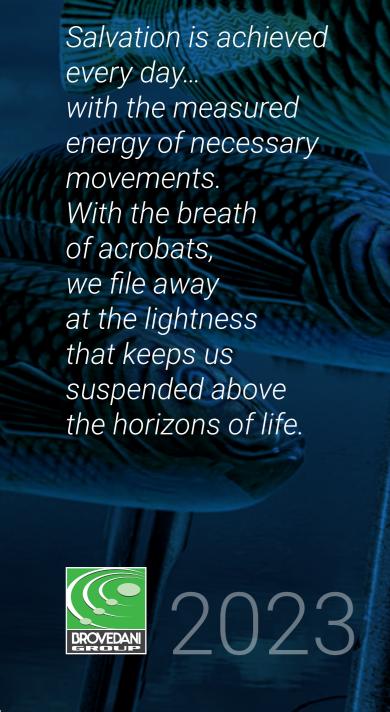
The fluid revolution of cyber-physical systems

The mechanics of the future will not only comprise new processing methods or individual innovative technologies, the revolution will take place on a broader and more comprehensive level. Smart factory 4.0 processes will be increasingly integrated with each other and governed by artificial intelligence. Cyber-physical manufacturing systems ("cyber", from the ancient Greek "kyber", "to govern") able to interact and operate "in science and conscience" will be able to mutually modify and adapt, equip themselves automatically and improve themselves (through machine learning) according to circulating data and experience acquired. Prosthetic machines will free man of onerous tasks, making work increasingly accessible.

The paradigm of the conventional factory as a sequence of separate, autonomous technologies connected to each other by human labour will be overturned. The **data** travelling through the processes will become the **lymph** and the **guiding thread of the manufacturing system**. So what is required is a digital, technological and cultural alignment of all departments in all the factories involved in a manufacturing process, extending even beyond geographical boundaries. This is how Brovedani has been operating for several years now, integrating information and production flows from the companies in the Group, from Italy to Slovakia to Mexico. But it is only a starting point: profound horizontal connections will have to involve the Supply Chain and synchronise with the customer. The digital divide, in any link of the chain, may indeed thwart isolated virtuous experiences.

June





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2 s	29 17 M
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₂₈ 10 M	25 т
11 т	26 w
12w	27 т
13 _T	28 F
14 _F	29 s
15 s	30 s
	31 31 M

Lean and green: a delicate virtuous equilibrium

Energy crises, water crises, climate change and mass migration caused by socioeconomic divides demonstrate that there is only one road that can lead us to the future: sustainability, the never-ending search for a balance between progress and survival, which we must always be aware of when designing processes and products.

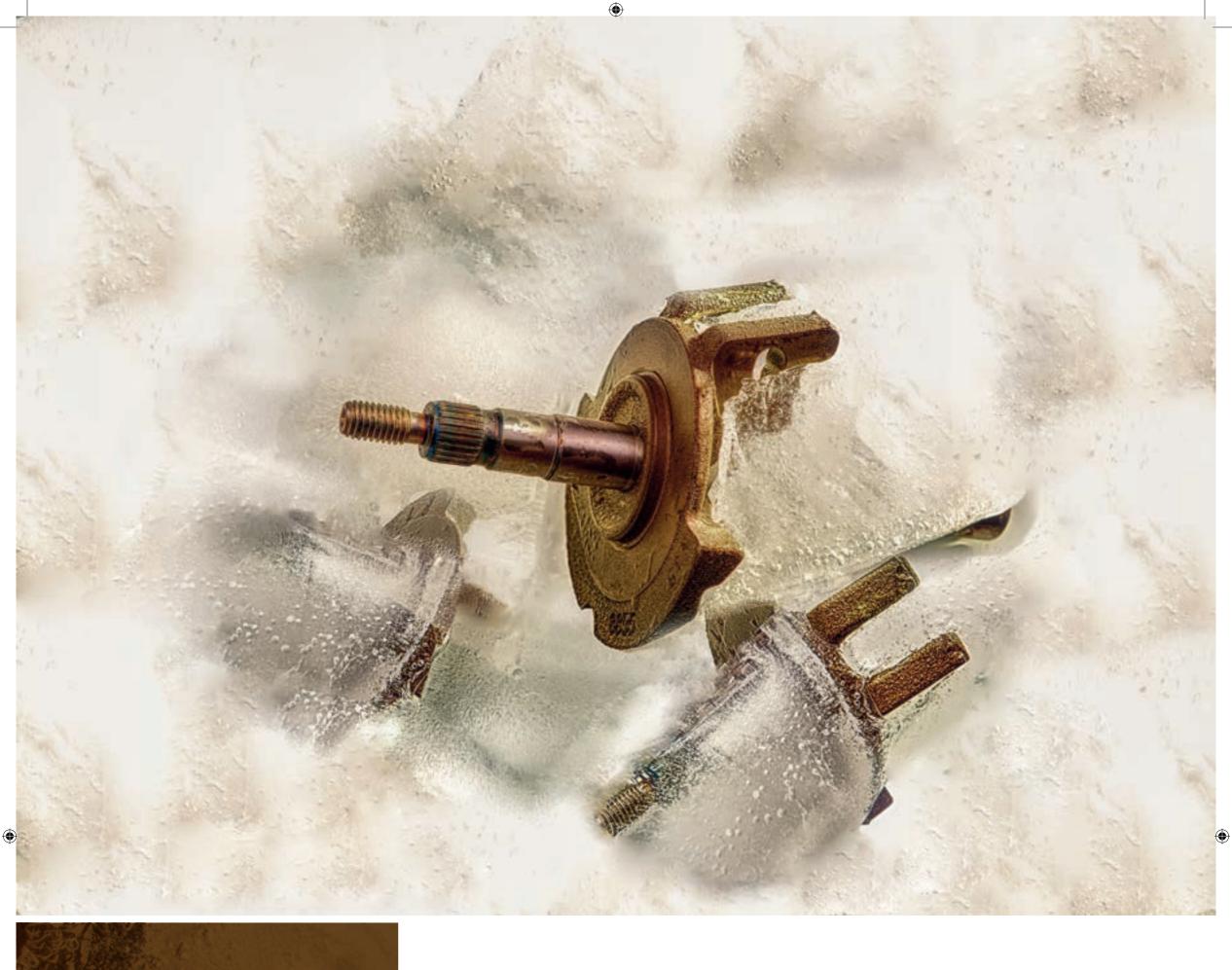
For years now Brovedani has been guided by lean methodologies that enable us to improve organisational geometries and to operate with a strict focus on the **3Rs**: **Reduction** (of waste and emissions), **Recycling** and **Re-use**.

On-going technological and manufacturing reinvention also helps the cause, not only for the purpose of producing the "new", but also the "old" with a new focus on efficiency.

Using 3D printing, Brovedani Technology produces components with a high added value for self-made machines. These parts can be reproduced and replaced as needed during revamping operations, or modified for re-use with new features.

Information, through big data and the processing thereof, will also make it possible to become increasingly lean, to find **the shortest path between two points**. We will be able to monitor potential suppliers on a planetary scale in real time, simulate process scenarios and plan medium-to-long-term strategic investments, thereby increasing business efficiency from purchase through to sales.

July



We had confidently called them "eternal glaciers": we had not calculated that the poetry of nature would fight against the existence of the "things" and machines that man has created.

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11 F	26 s
12 s	27 s
13 s	з5 28 м
33 14 M	29 _T
15 т	30 w
	31 т

Components that maintain the temperature of the future

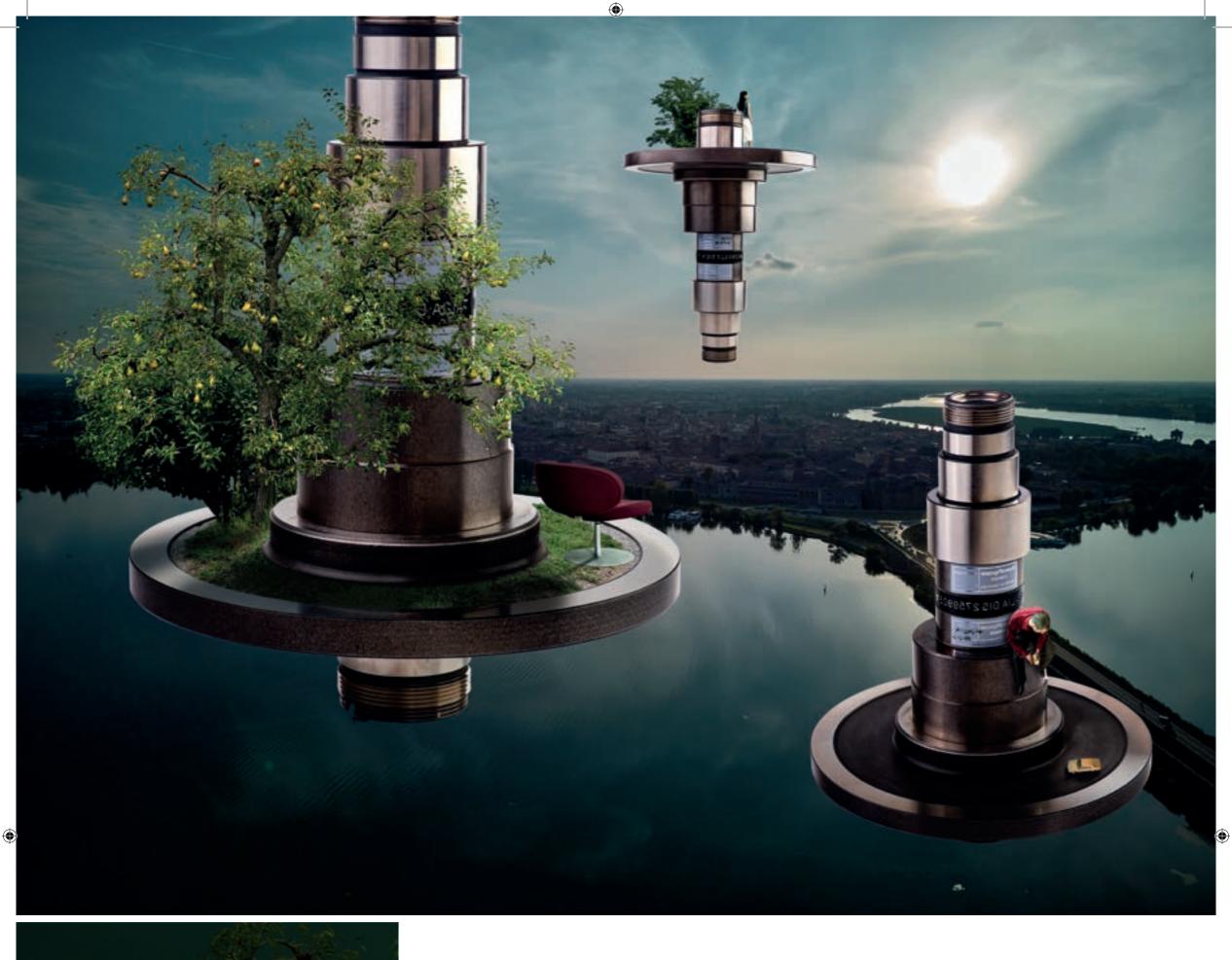
The "temperature of the future" – meaning that of the climate and beyond – is increasingly dependent on the quality and timely precision of our choices. To give humans prospects of life on Earth, revolutions in terms of manufacturing and organisation are not sufficient.

We need to rethink the meaning, value, efficiency, inception and life cycle of products even more radically. It is not only a question of manufacturing products but ensuring that these become parts of a possible future. Hence Brovedani is also committed to undertaking a **radical rethink of its components**: Who are they intended for? How are they designed? What "costs" are involved? So we turn to sectors, such as the bike market and in general **mobility with a low environmental impact**, which meet the prerequisites of sustainability.

Choosing "what" to make however is not sufficient, it is just as important to think "how" to make it. At Brovedani, therefore, new ways of conceiving and constructing product are emerging, with R&D paths centred on alternative materials and a strong **focus on carbon footprint**. On the design front, new pathways are being undertaken such as generative design, which challenges consolidated practices and even shapes, by emulating the morphologies of nature.

Last but not least, "how much" to make should be planned sparingly, ranging with a certain amount of flexibility from large series with high quality standards and technological specialisation to customised "one-off parts", manufactured according to a logic of mass customisation.

August



"What is the boundary of an ecosystem? What energy sustains it?"
As he was asking himself these questions, up there he glimpsed some semblance of an answer:
"We are born and live under the vast sky of the world."

1 _F	16 s
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36 4 _M	19 т
5 T	20 w
6 w	21 т
7т	22 F
8 F	23 s
9 s	24 s
10 s	з 9 25 м
37 11 M	26 т
12 _T	27 w
13 w	28 т
14 T	29 F
15 F	30 s

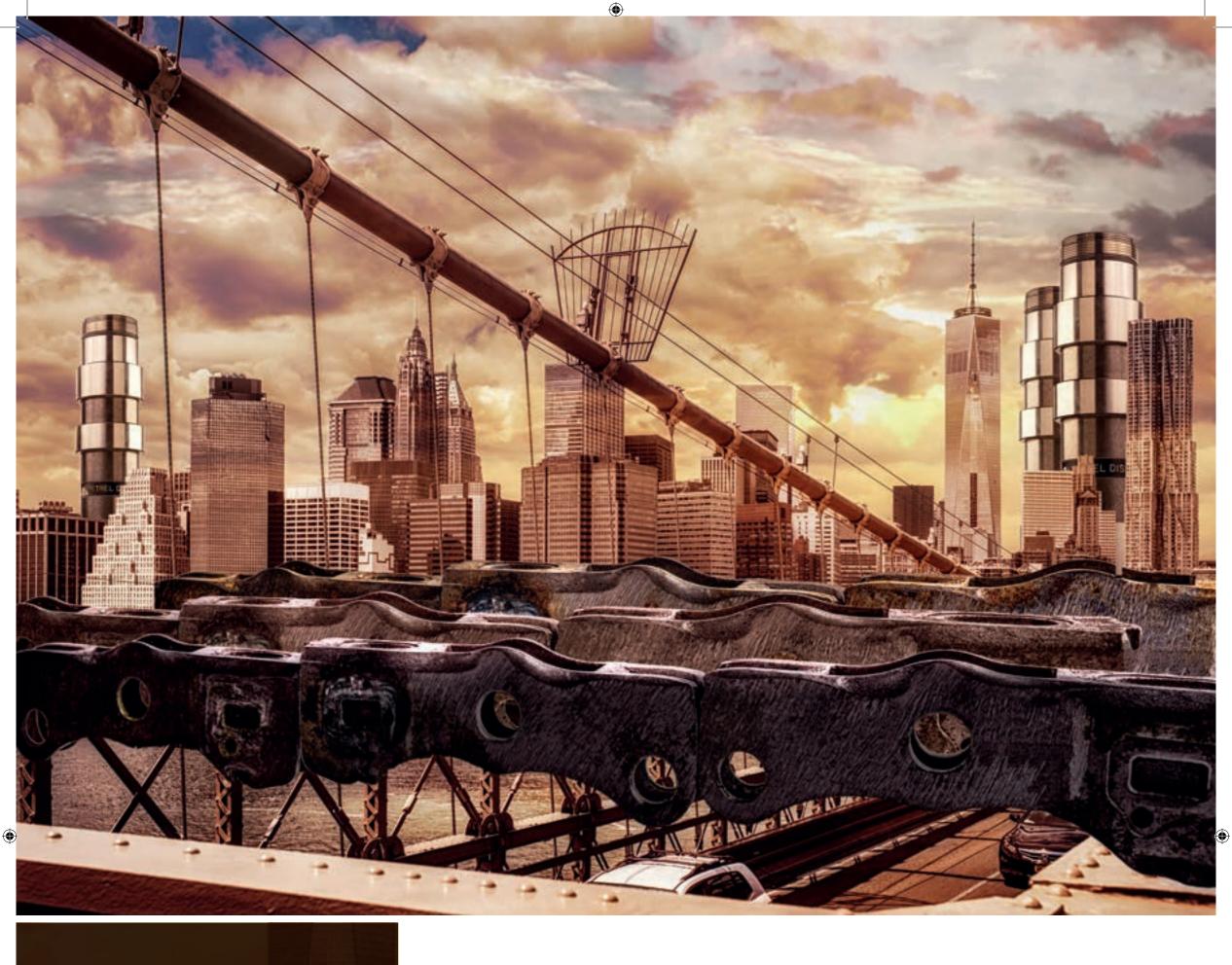
Industrial ecosystems: shared sustainability

Operating in a sustainable way, like being digital, should not be an isolated practice, on pain of a *sustainability divide*. Every industrial enterprise must make the choice, at all internal levels and through co-operation with its suppliers and customers, to imprint **ESG** (*Environmental*, *Social*, *Governance*) orientations and investments on its activities. It then has to integrate itself organically into its territory, supply chain and network of relationships, with players who share the same philosophy, in an ecosystem perspective, indeed of progressively enlarged ecosystems.

Brovedani has started with sustainable choices within the Group: reducing waste and emissions, and focussing on the social dimension of company life. It actively and proactively fits in with the economic setting of the **Ponte Rosso Industrial Area of San Vito al Tagliamento**, where sustainability is pursued in a variety of ways: **zero-kilometre supply chains**, economic differentiation choices to guarantee employment, **energy self-sustainability** projects and the creation of an **Ecologically Equipped Production Area (APEA)**.

Proximity to strategic customers is also inspired at Brovedani by a lean philosophy, which aims to eliminate unnecessary movement... under the vast sky of the world.





We cross rivers and build bridges, because hope is all - or even very much, or just to a certain degree - on the other side: there where we continue to find parts of ourselves.



2023

$_{42}\,16\,\text{M}$ 17 т 18w 3 т 19_T **4**w 20 F 5т **21** s **7**s **22**s 43 **23** M **8** s 9_{M} **24** T 10 T 25w **26** T 11_w 12_T 27 F 13_F **28** s **14**s **29**s **15**s 44 $30\,\mathrm{M}$ 31 T

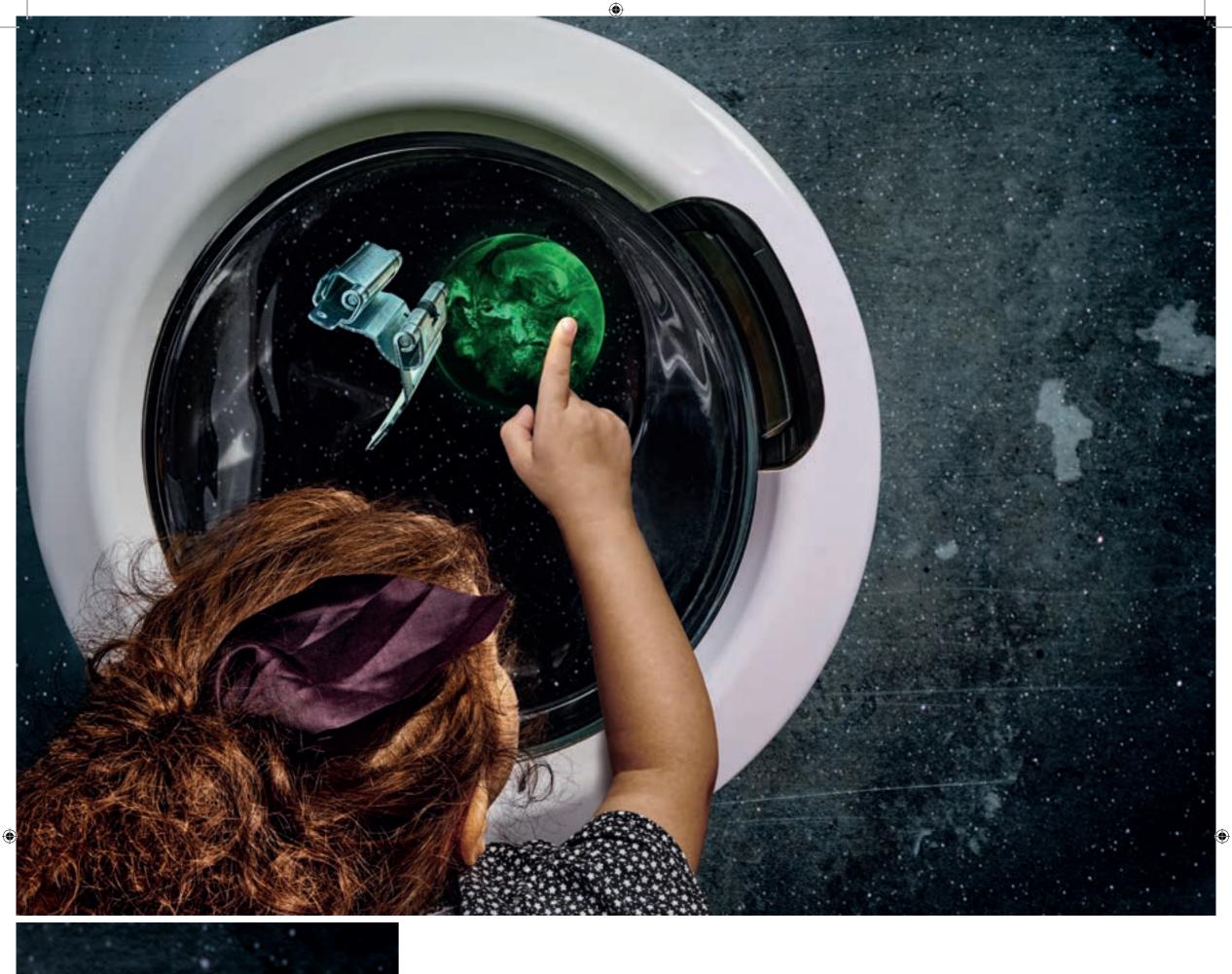
Being out in the world, to continue building tomorrow

The fate of mankind is being played out on a planetary scale, through vital connections that combine business motives with those of the environment, employment, research and development, and production continuity. It is becoming essential to maintain a delicate balance between global and local, between barrier-free digitalisation and the concentration of related production. This is especially true for the engineering industry, where every unnecessary move involves the weight of the material, generating entropy, and where every distance beyond one's control becomes a factor of unpredictability.

Fragmentation and dispersion of production proved to have dramatic limits during and after the pandemic, multiplying criticalities in supplies. For this reason, especially in the automotive industry, "polarised globalisation" is taking place, with big players establishing large production hubs in strategic markets, bringing swarms of suppliers with them. With its factories abroad, Brovedani has embraced this philosophy, investing in relationships of mutual trust with customers, offering medium- and long-term prospects. Being out in the world has not affected the Company's intrinsic Italian qualities: it has, on the contrary, enriched it with new experiences, thanks to the contributions it has made to customers' reshoring projects for business with a high added value.

Through its past and present, through tens of millions of home appliances and computers and hundreds of millions of vehicles that have travelled and are travelling the planet, Brovedani feels that it and its components are taking part in building that bridge that will take us to the shores of the future.

October



Let her look on, encourage her concentration. With the remaining pieces of our spaceships, along trajectories we have only sketched, she will take us to planets very far away, that we have a hard time imagining.



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12 s	48 27 M
$_{46}13\text{M}$	28 т
14 T	29 w
15w	30 т

Cultivating an insight that is self-renewing

In a future that requires us to face increasingly complex issues and decisions that are strategic and vital to the development of the company, big data and artificial intelligence will become powerful tools for analysis, yet choices will still rely on "analogue" human vision. As futurologist John Naisbitt wrote, the more high tech there is, the greater the need for high touch, which is that sensitive counterbalance to binary predominance woven from emotional intelligence, business philosophy and culture, a "political" propensity for dialogue, know-how of the hands, and educational skills. Businesses, in particular, will have to "ex-ducĕre", "draw out" latent potential: cultivate young people's profound insight, which points to invisible trajectories. Young people, the new collaborators of the latest and penultimate generations, need however "non arrogant tutoring" from the "experts" who came to the Company before them, in order to take advantage of their natural tendency towards participation, seeking a balanced lifestyle, protecting the environment, and even towards a work ethic aligned with a spirit of justice and recognition of increasingly autonomous professional responsibilities.

Only in this way will we at Brovedani continue to transfer that substratum of knowledge and skills that provides the substance of business, the lymph that impregnates those who are part of it: through a living and constant **comparing of ideas between generations**, **departments and people**, in a climate of **shared trust**, where the human resource continues to flow and never stops "rising".

November



Nothing is created.
Nothing is destroyed.
Everything is destroyed.
Everything changes.
Like ancient
civilisations,
mechanics buried
under the dust
of time could once
again inspire us.
And the motion of the
future could sparkle
in the sky whence
everything came.



2023

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12 T	27 w
13 w	28 т
14 T	29 F
15 F	30 s
	31 s

Sustaining or disrupting innovation? The provocations of hydrogen

magining the evolution of mechanics does not mean gazing into the magic ball of mechanics of the future. The politics of businesses, industrial ecosystems, nations, international agreements and a hoped-for world government will have to continue their journey with an assiduous travelling companion: **the certainty of the uncertain**. This will have to accompany the "green transition" with wisdom and a gradual approach. It will have to incorporate **flexibility and the ability to handle complexity**, with its contradictions, its irruptions and multiple coexisting solutions.

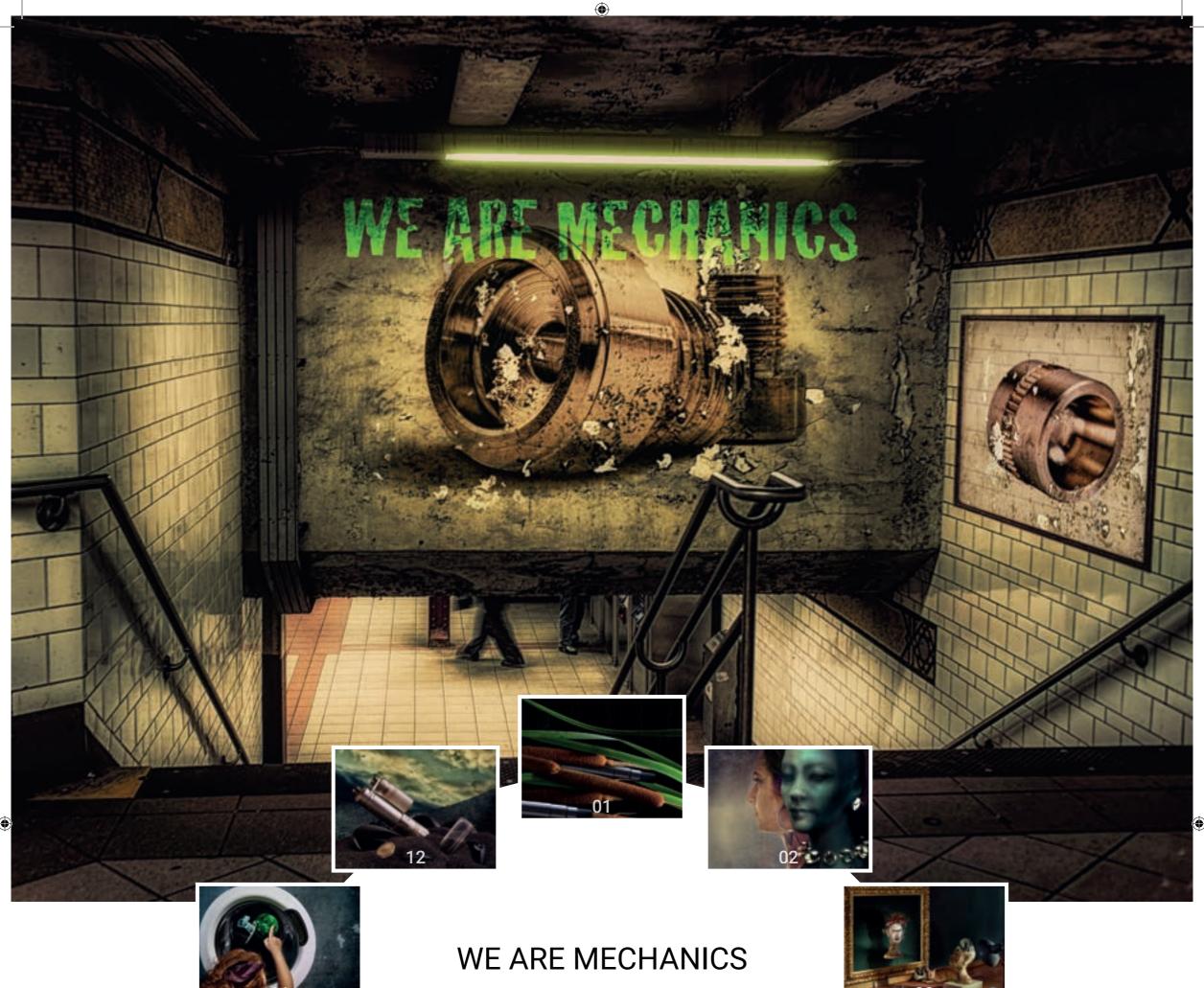
Innovation may be able to be sustainable, favouring technological continuity: injectors, for example, have happily grafted themselves onto combustion engines. Innovation may also be disruptive: smartphones have annihilated mobile telephony, transforming it into connectivity.

What will the mobility of tomorrow look like? How long will the injection engine powered by fossil fuels hold out? How will the transition to electric be managed? Will electric win or will the outsider hydrogen emerge? Will the hydrogen fuel cell or **hydrogen combustion engine** prevail? Either way, Brovedani will be able to revitalise the outstanding experience it has gained in fluid injection: from the automotive industry to medical applications.

We also have to prepare for a **sustainable revolution** that harvests the universe's primordial element, enabling advantage to be taken of Brovedani's half a century of mechanical expertise.

A future in which origins and experience come together.

December



Pordenone, December 16, 2023 Everywhere Beyond







03. Dynamic Designing **04.** Additive Thinking

05. Atoms, Bits and Mobility

06. Cyber-Physical Systems 07. Lean and Green

08. Components for the Future

09. Industrial Ecosystems

10. Being out in the World

11. An Insight that is Self-Renewing

12. The Provocations of Hydrogen











2023

UN CALENDARIO MULTICULTURALE

MULTIKULTÚRNY KALENDÁR

UN CALENDARIO MULTICULTURAL

A MULTICULTURAL CALENDAR

FESTE ITALIA:

SVIATKY SLOVENSKO:

FIESTAS MÉXICO:

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