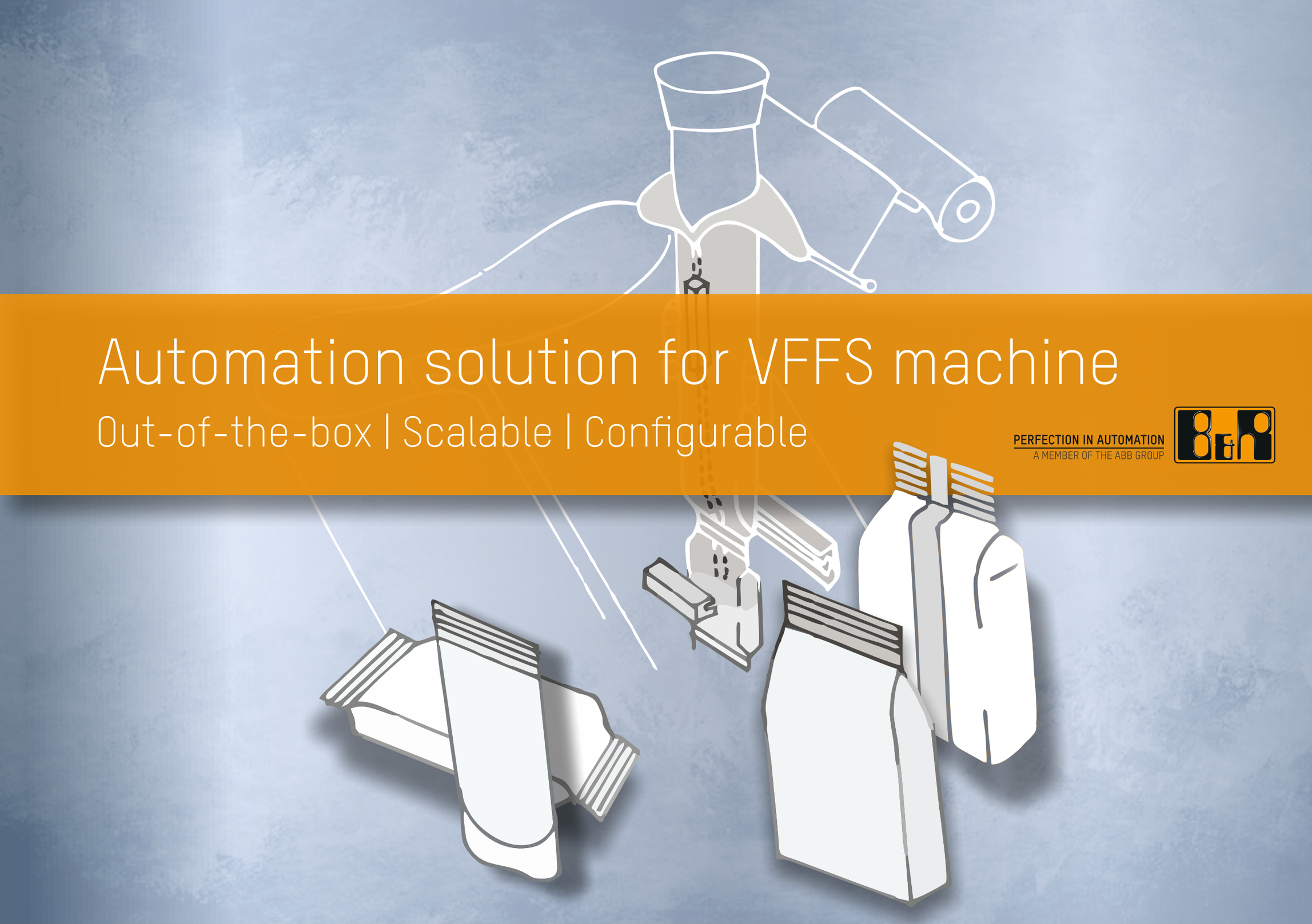
Automation solution for VFFS machine

Out-of-the-box | Scalable | Configurable

PERFECTION IN AUTOMATION
A MEMBER OF THE ABB GROUP



Flexible packaging lines are replacing conventional packaging lines

Quality, product preservation, hygiene, traceability and safety are some objectives of packaging management

Executive summary

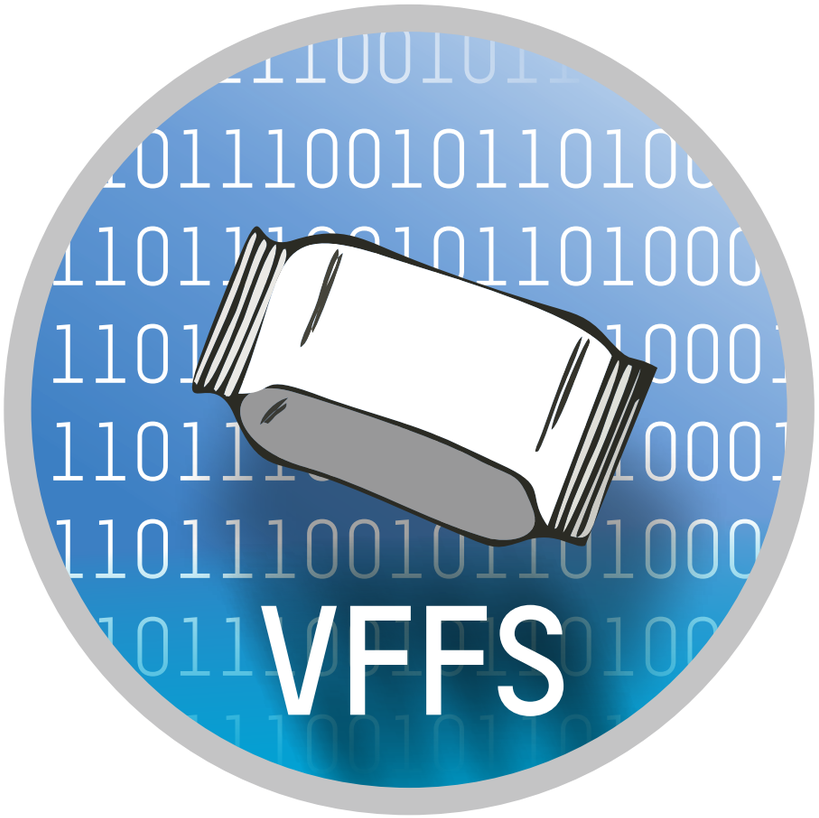
Growth rate of packaging and processing industry is consistently rising year-on-year owing to changing consumer demands and dynamic market landscape. Consumers are pivotal to decisions made by factories. Moreover, the way consumers buy products has changed over the years. Traditional ways of buying loose foods such as pulses, spices, rice or wheat from local stores has changed to buying well-packaged foods from super markets and malls. Today consumer wants products with highest quality, hygiene and accurate weight. This has drastically changed the manufacturing landscape and its impact would be further noticeable in future product packaging methods.

However, while catering to rising consumer needs, factories have to be productive, efficient, and eventually profitable. Flexible packaging lines are replacing conventional packaging lines, owing to demands such as lower production costs, better efficiencies and high quality convenient packaging.

A vertical form, fill and seal (VFFS) machine plays an important role in packaging of goods and food products and is an integral element of such flexible packaging lines. Moreover, a VFFS machine has a quick turnaround time on any machine builder's shop floor. Thus, machine builders (OEMs) have limited time for R&D once an order is received with factories demanding quick machine deliveries. A similar expectation is placed on the entire supply chain for building a VFFS machine, right from smallest of assets, mechanical parts to electronics such as controllers and drives.

The E-book will focus on various challenges machine builders face while building a VFFS machine and various suggestions to overcome these challenges.

Introduction



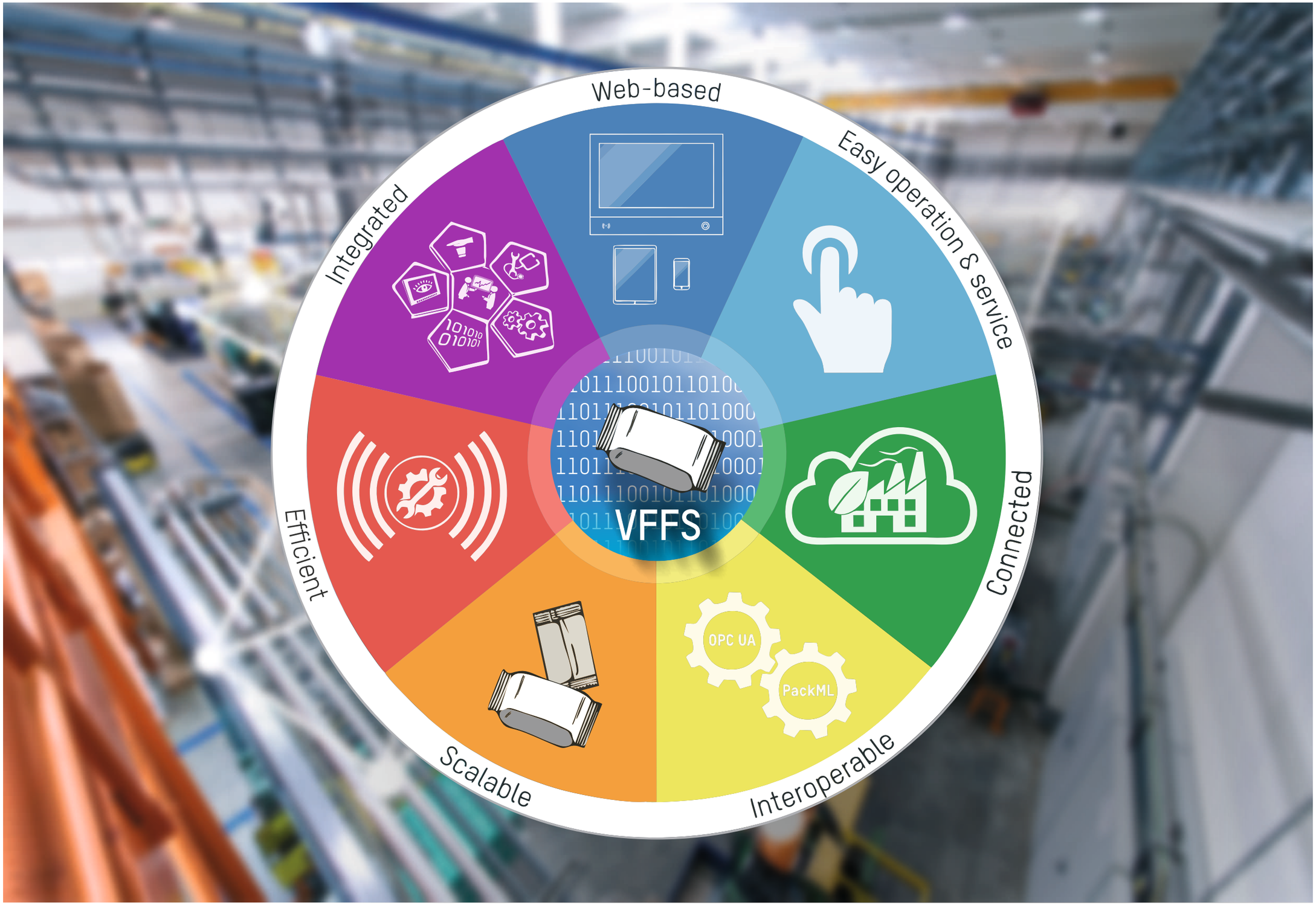
A VFFS machine is ideal for any free flowing, viscous or granular product packaging in various industries such as chemicals, minerals, FMCG, pet food or agriculture. A major concern for manufacturing factories, especially in pharmaceutical, food, and beverage (F&B), is speed and quality of packaging, as this sector struggles with increasing operational costs and growing consumer demand for packaged goods. VFFS machines are an essential element in such packaging lines and a major contributor towards satisfying market demands. The demand for VFFS machine explains how consumer preferences have changed over time and reflects an increased emphasis on sustainability.

Over the past decade, demands for VFFS machine has consistently grown. VFFS machines occupy less floor space and delivers higher speed, accuracy, efficiency and profitability in packaging operations. VFFS machines are suitable for any kind of products such as dry, liquid, granular, powder, semi solid and has possibilities of supporting

numerous pouch sizes and formats. VFFS helps in reducing risk of product contamination and satisfies various standards. Some notable products, which deploy VFFS machine for packaging, are condiments, spices, spreads, soups, chips, pickles, rice, wheat, pulses, lentils and many more.

The VFFS machine prepares vertical pouches from a flat roll of plastic film. This action is synchronous with filling contents into formed pouch and then sealed securely. The VFFS machine is used for both solid, viscous and liquids products. Organizations are looking for flexible packaging machines, which are able to form, fill and seal a wide range of pouches with efficient use of raw materials.

The VFFS machines are fast, efficient and maintain consistency in production by filling exactly the same amount of product in each pouch. Many pouches of consumable goods need to be filled with nitrogen or oxygen before sealing, which helps to extend product's shelf life. The VFFS machines make this possible. Consistency and efficiency of these machines are reasons that factories selects VFFS machines for their packaging lines. Manufacturers prefer VFFS machines as they can produce better packages rapidly and provide best economical solution for packaging.

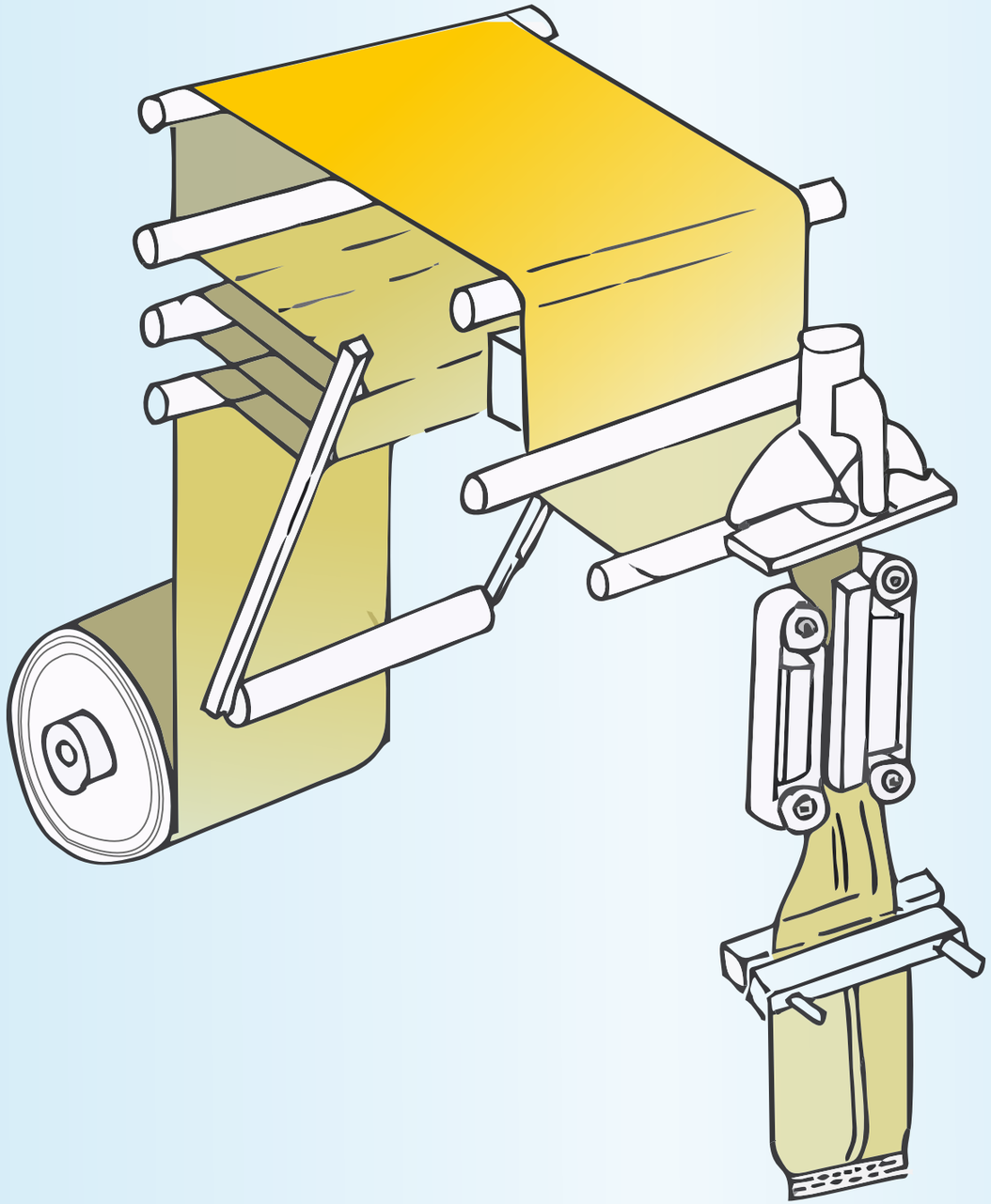

Web-based
Easy operation & service
Connected
Interoperable
Scalable
Efficient
Integrated
VFFS
OPC UA
PackML

Challenges in being ready for Industry 4.0

VFFS machines are no longer just machines or assets on a packaging line. Today, factories are demanding end-to-end connectivity and planning a roadmap for future factories, VFFS machines need to be smart and have added intelligence. Machine builders (OEMs) are now focused on providing intelligent feature balancing between costs and machine features. The main challenge is to provided added feature in machines with minimal or no rise in costs. Moreover, adding features and innovations is time consuming and needs some amount of R&D effort. This hampers the time-to-market for machine builders.

Next generation VFFS machines are required to have modern features such as remote access, condition based maintenance and energy monitoring. In addition, they need to have intuitive HMI designs with multi-touch functionality, providing an interactive HMI design for operators. Machines need to offer a seamless horizontal and vertical connectivity on standard open source communication protocols enabling an IT / OT convergence. Eventually all future machines need to be Industrial IoT and Industry 4.0 ready.

Working principle of VFFS machine



Working principle of VFFS machine

VFFS machines are designed for bottom line improvements and achieving packaging flexibility. With a simple operating principle, a VFFS machine is a continuous motion filling to maximize efficiency and throughput.

Next generation VFFS machines are fully automated and Industrial IoT ready. The systems should be capable of handling a wide range of weights from 10 gms to 10 kg. Key for any future VFFS machine is to adapt to changing requirements without the need for programming.

Machine builders too are moving towards configure more and program less strategy reducing time to market.

Basic working principle for any VFFS machine:

Step 1: Accurate product weighing

VFFS is designed for accurately weighed or volumetric filling of ingredients in pouches.

Step 2: Pouch forming

VFFS machine needs to form pouches from thin plastic films, which is either servo or VFD controlled including unwinder control and diameter measurement.

Step 3: Ingredient filling

After accurately weighing ingredients, they are filled into formed pouches.

Step 4: Sealing and Finishing

Vertical and horizontal sealing are essential elements in pouch forming and ensuring high product packaging quality.

Key requirements and benefits from a brand owner's viewpoint

Speed

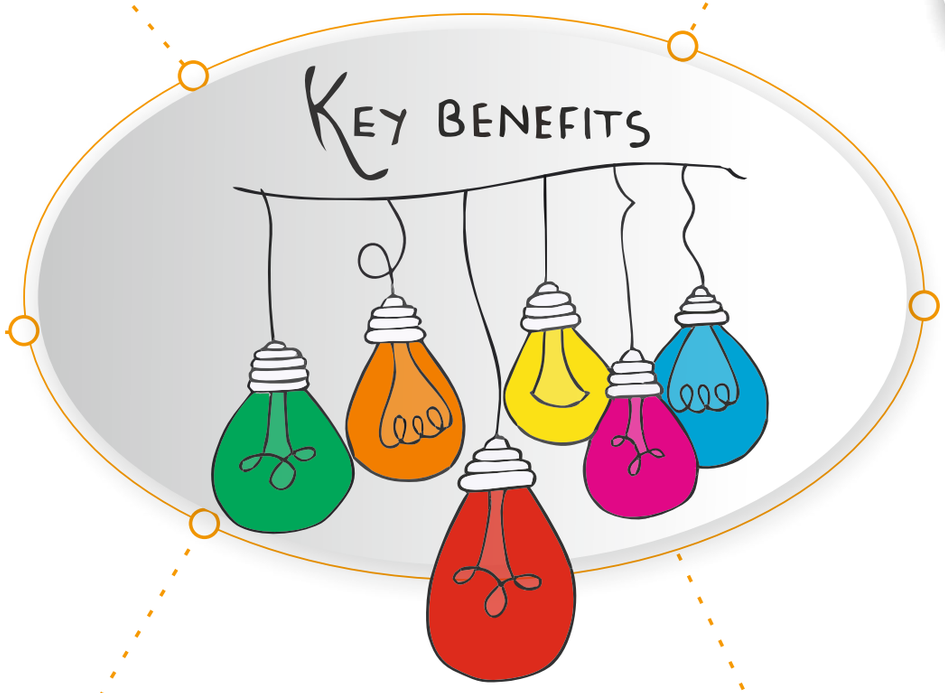
VFFS machines are capable of packaging products at incredibly high speeds, depending on size of package, its contents and machine specification. The main intention for the brand owners is to achieve high speed packaging output with consistency, accuracy, minimum downtimes and losses.

Personalization

The VFFS machine is applicable for various bulk products to be filled into pouches right from 10 gms to 10 kg. In addition, brand owners look at flexibility and achieving easy changeover with minimum stoppages.

Extend product's shelf life

Many consumable products are packed using VFFS machines in a protected atmosphere to extend product shelf life. Brand owners needs such easy adaptability from their machines.



Higher throughput with smaller machine footprint

Compact design of VFFS machines helps with longer packaging runs while achieving high accuracy, throughput with smaller production space and fewer maintenance requirements.

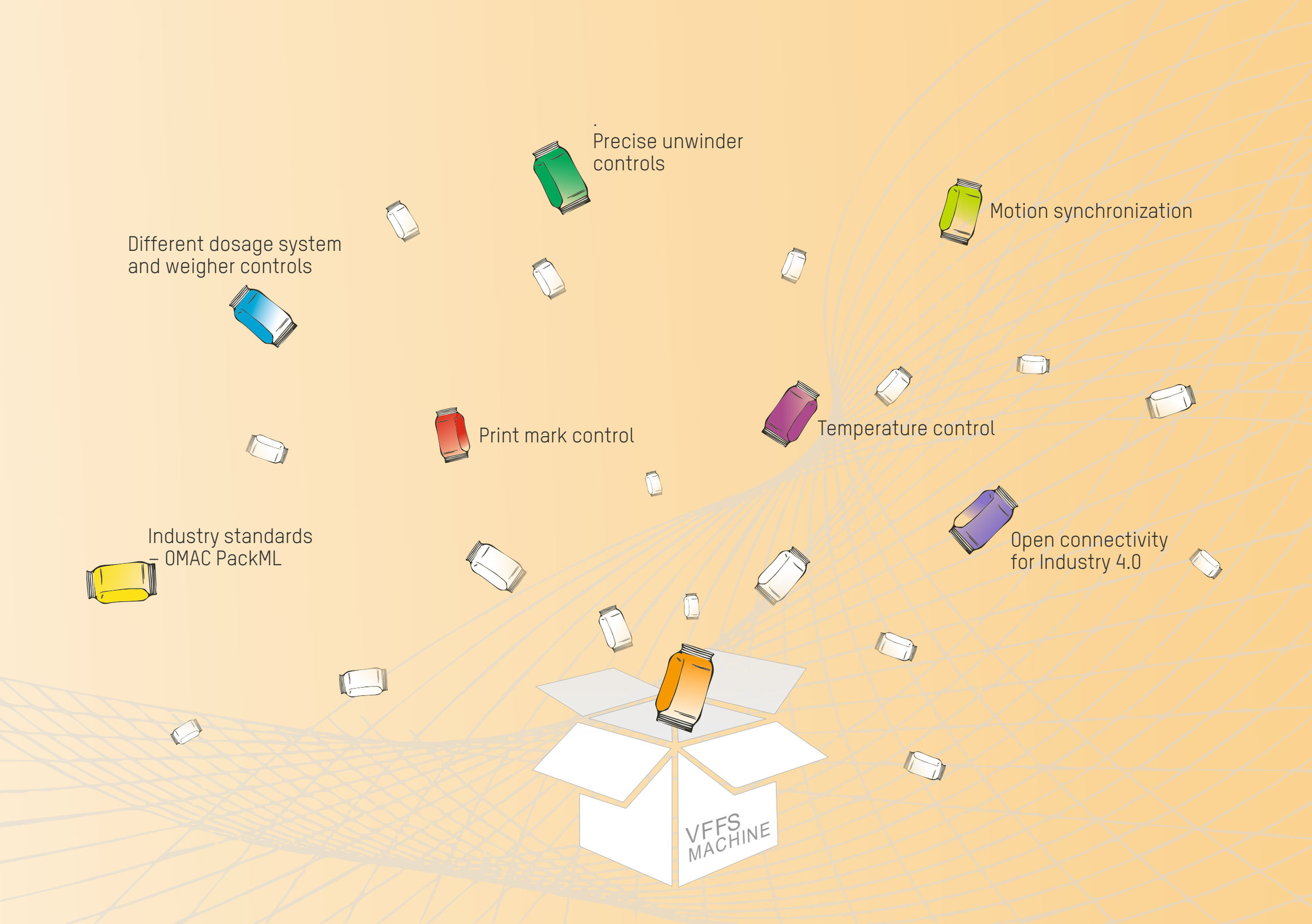
Lower operational costs

With low cost of packaging, VFFS machine helps in optimizing operational costs. Next generation VFFS machine with innovative technology are optimized, having a long lifetime with minimum maintenance cost.

ROI

VFFS machines provide quick RoI by increasing number of packages, which can be filled per minute, compared to other methods of packaging. Together with parameters such as machine OEE, condition based maintenance and energy monitoring; factories have more control over costs, availability and productivity.

Features of advanced VFFS machine


Precise unwinder controls
Motion synchronization
Different dosage system and weigher controls
Print mark control
Temperature control
Industry standards – OMAC PackML
Open connectivity for Industry 4.0
VFFS MACHINE

Choosing your automation partner for VFFS

Choosing the right automation partner for any machine builder is challenging. Technology, innovations, high performance and cost effective products are some parameters, but most importantly, it is essential for choosing a partner and not a mere component supplier. Below enlisted are 7 commandments for choosing the right automation partner forany VFFS machine builder

Product portfolio to cover existing and future requirement

Machine builders look at an automation vendor who is able to satisfy existing needs as well as serve for future unforeseen needs. Thus, one of the basic criteria for a machine builder is to see whether his automation vendor can provide an extensive product portfolio and has everything under one roof. They are looking for a one-stop shop for all their automation needs.

Highlights

- → Superior hardware quality with scalability and modularity
- → Drastic reduction of commissioning time
- → Distributed network architecture
- → IIoT ready machines with cloud connectivity
- → Preventive maintenance: Integrated vibration analysis

Diagnostics and support

Another crucial element for a machine builder is to have simplified and quick commissioning, diagnostics for debugging and maintenance. In addition, after sales service is of importance for any machine builder. This help them offer their customers best in class service and support.

Highlights

- → OPC UA ready for IT and cloud connectivity
- → Quick debugging and reduced maintenance
- → Web based detailed help pages
- → Audit and event logging
- → Secure monitoring of machine data

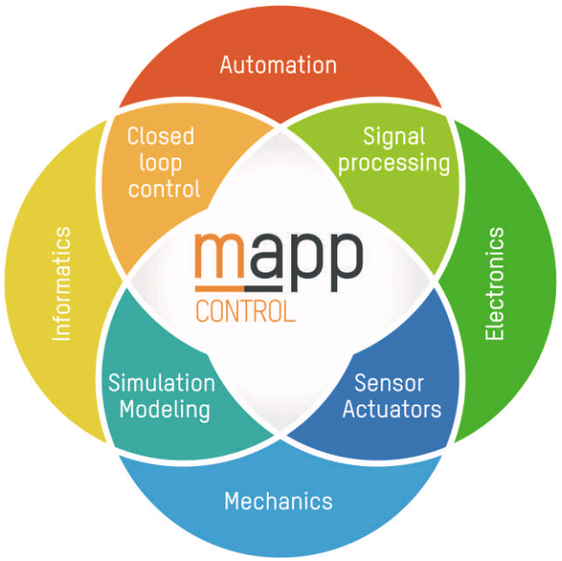
Long term product availability

A complete automation portfolio is one aspect; however having long-term product availability is another. Machine builders do not wish to keep upgrading systems with new hardware owing to various topics such as stock, inventory and tried and tested logic. Thus, long-term availability of products plays a vital role while a machine builder chooses his automation partner.

Highlights

- Industry-grade durability and fully scalable solutions
- Support from start to finish and beyond
- Local long-term, on-site support to OEMs and end-users
- Standard and customer-tailored training modules for all hardware and software
- Better performance and higher availability

Software and functionality – Modular and flexible



Technology and features are rapidly evolving and being demanded by everyone. This puts a huge pressure on software version management. Machine builders would like to have just single tool rather than handling multiple tools for controls, drives and motion. In addition, an automation vendor should be able to provide scalable, modular and flexible software.

Highlights

- → A single tool for programming all machine components
- → Easier and efficient version management
- → Machines built on OMAC PackML standards
- → Web based visualization for intuitive GUI
- → Reduce programming, increase configuration

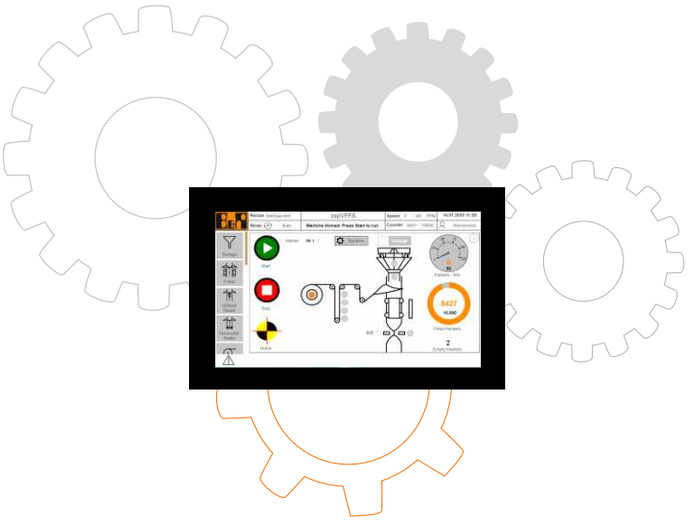
Enhanced productivity with reduced wastage

Machine performance needs to be consistent enabling factories to be productive and profitable. In addition, machines which are productive at the same time efficient, are in high demand from factories. Thus, machine builders need to build efficient, high performing machines.

Highlights

- → A single project for 1 axis to multi axes commissioning
- → Configurable OEE characteristics
- → Software commissioning of first machine reduced to 4 hours
- → Commissioning time for series machine reduced to 30 minutes
- → No time spent in R&D

Flexible - Plug and play hardware and software features



Another aspect of flexibility is to have features such as plug and play solutions, where machine builder does not need to program even a single line of code. A machine builder uses the HMI to configure and commission his machine. Such flexibility is highly demanded for such machine types.

Highlights

- ➔ Faster time-to-market for OEMs
- ➔ Lower machine cost throughout entire life cycle
- ➔ Inbuilt user and recipe management
- ➔ Lower downtime and higher efficiency
- ➔ Single interface for seamless connectivity

Total Cost of Ownership

Finally, it is essential for machine builder to get the best value proposition against price leading to the topic of having a lowest total cost of ownership (TCO). This is not only from the point of view of product and software costs but also from the point of view of service, support and availability.

Highlights

- → High performance
- → Lower cost and maintenance
- → Short commissioning time
- → Ease of support and service
- → Improved OEE

ospVFFS: Helping OEMs overcome challenges

How B&R ospVFFS solution helps machine builders to overcome challenges and meets their rising customer demands?

Machine builders need to focus on various topics right from hardware, software to expertise for seamlessly providing an integrated, technologically advanced and cost-effective VFFS machine with a shortest possible time-to-market. B&R Industrial Automation helps satisfy these requirements with ease providing innovative automation and digitalization solutions to various OEMs.

B&R Industrial Automation, a member of the ABB Group is an innovative automation company and a global leader in industrial automation combining state-of-the-art technology with advanced engineering, providing customers in virtually every industry with complete solutions for machine and factory automation.

B&R India, with its OEM Solution Package for VFFS (ospVFFS) has brought about a revolution in VFFS machine building.

OEMs benefits

- Short time to market
- Quick return on investment (RoI)
- Lowest total cost of ownership (TCO)
- Minimum maintenance
- Cost effective solution

How ospVFFS serves market - benefits to OEM

ospVFFS acts as an effective tool for machine builder to reduce costs and increase performance. Below enlisted are some pointers on how OEMs benefit from this solution.

- Reduce programming, increase configuration
- Reduced software commissioning of first machine to as low as 4 hours
- No time spent in R&D
- OPC UA ready for IT and cloud connectivity
- Quick debugging and reduced maintenance
- Easier and efficient version management
- Machines built on OMAC PackML standards
- Well-tested, robust and bug-free code
- Ready for Industry 4.0
- Reduced commissioning time for series machine as low as 30 minutes
- Superior hardware quality
- IIoT ready machines with cloud connectivity
- Preventative maintenance: Integrated vibration analysis for condition based maintenance
- Web-based diagnostics with an unprecedented level of detail

FAQs

Q: Does solution support Industrial IoT (IIoT) features?

A: Yes. All our controllers are IIoT ready and support open communication platforms such as OPC-UA enabling an IT / OT convergence.

Q: Is torque monitoring for servo axis is possible?

A: Yes. With B&R controls and motion, any machine builder can monitor torque for all our servo axes.

Q: Is user management and recipe management available with B&R PLC?

A: Yes. With mapp Technology, machine builder benefit from user and recipe management.

Q: How quickly I can start the machine?

A: First machine being developed by machine builder (OEM) can be started in dry run in less than 4 hours. This is field proven.

Q: What are the diagnostics features available?

A: B&R System Diagnostic Manager (SDM) helps to do diagnose without any programming software. Together with secure remote maintenance, a machine builder can even securely monitor these parameters from anywhere across the globe.

Q: Can we change machine speed or product length on the fly?

A: Yes. Operators can change machine speed in run time. They can also change product length in runtime avoiding lengthy changeover delays and initializations.

Q: Can we modify auger fill counts during machine running?

A: Yes.

Q: What are the different attachments considered in software?

A: ospVFFS solution allows handling of all standard machine attachments.

Q: Does solution support OMAC PackML?

A: Yes. B&R solutions have PackML inbuilt with ready to use mapp components such as mappPackML. PackML is an automation standard developed by the Organization for Machine Automation and Control. The standard makes it easy to transfer and retrieve consistent machine data. PackML also ensures interoperability, which enables factories to easily integrate packaging machines and lines. Over time, it has evolved into a powerful programming architecture delivering numerous advantages for industrial automation.

Q: Does B&R solution have print mark control built in?

A: Yes, Print mark control solution is available on board.

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