



AMBIENTA

Environmental Investments



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Packaging: a consumer journey and a material issue

In 2010 divers discovered 168 bottles of 170 years old Veuve Clicquot champagne while exploring a shipwreck in the Baltic sea. These bottles, recovered 5 years later, proved to be a perfectly effective packaging. Only 1 was contaminated by sea water, while the others, perfectly sealed, allowed a remarkable preservation of the product according to analysis. Researchers even determined it was much more sugary than today to appeal Russian taste at the time.

From the mid 19th century when those bottles sank, packaging has changed and spread far beyond what anyone could have thought of. Today it is hard to think of any food or product that is not packaged. Even fresh

tomatoes bought from a farm shop will be wrapped in at least a paper sheet or bag. The extent that packaging has been rooted into our society is impressive. That same bottle of champagne has to fulfill today many more requirements than purely conservation and protection. Packaging reflects desires, aspirations, trends and changes in society as very few other things we can think about. The evidence is clear all around: from the seabed of the Baltic Sea to the last e-commerce purchase we made or on the supermarkets' shelves. In this newsletter we will guide you through the quintessential display of modern society, its environmental drawbacks and the related investment opportunities.

Winners of the 2016 DuPont Awards for Packaging Innovation, that celebrates Innovation, Sustainability and Cost/Waste Reduction

The rise of packaging is the rise of consumer

Humans have been developing packaging solutions in order to handle, protect, preserve and ship goods since a very long time ago. Failure in food conservation was a risk to household survival during harsh winters and a threat to health due to food poisoning. Packaging was created by a need to trade goods. Over thousands of years we have been very successful in building effective packaging. In the Mediterranean sea we have found 2,000 years old roman amphoras containing intact food. Ceramic, glass, wood and later paper were common materials which met the practical requirements of the time. This basic need of preserving food was by far the major contributor to packaging technology developments until the beginning of the 19th century. For example the invention of canning, a process that can boost food conservation for up to 30 years, is due to the need of the French army during the Napoleonic wars to provide healthy food during long military campaigns. The French government offered a hefty 12,000 francs award to the inventor who had come up with a solution to this food conservation issue. Nicolas Appert, a French brewer, came up with the invention of the canning process

especially in developing economies where modern food value chains are currently under construction. Given the amount of resources consumed during food or pharma production, it is clear that any packaging that improves its useful life, also significantly contributes to global sustainability efforts.

Preservation stopped being the primary driver of innovation in packaging during the 19th century with the rising of the middle class in Europe and the industrial revolution. The 6th of September of 1916 can be considered the symbolic date when packaging became something more than just functional. On that day Clarence Saunders opened the first ever self-service grocery store, named Piggly Wiggly, in Memphis, Tennessee. Until then customers in grocery stores were handing a shopping list to the sales assistant who would collect the goods from the warehouse on their behalf. This small change determined the development of the industry we know today. Customers could make their own choice. They could see things and desire things beyond their basic needs or their previous experience. They could select, differentiate products and remember brands beyond the simple product. A Campbell Soup, not just a soup. Packaging had become the so called “silent salesman”.

More materials emerged and progressively gained relevance during the industrial revolution and later: metals, tin and the particularly light and workable aluminum, cardboard, and from the 50's the diffusion of plastics opened a new world of possibilities. Colors, shapes and communication features expanded and were leveraged to boost the products' attractiveness.

Packaging features now fulfill different requirements beyond protection and deliverability, which can be driven by customers, by producers or even by regulators:

- **Customers driven features:** customers influence packaging features through purchase decisions. Anything from shape to material

1928 Piggly Wiggly commercial



and won the prize. These few examples highlight an undebatable, but fairly neglected feature embedded into most, if not all, packaging solutions: the ability to increase the shelf life and the useful life of products and thus improving resource efficiencies through multiple value chains. This issue is particularly relevant for food or pharma products that deteriorate quickly. Packaging can contribute significantly to reduce global food wastage that accounts to 57% of global production,



or colors is influenced. For example the emerging trend of healthy nutrition or single households have reinforced the need for modified atmosphere packaging for enhanced fresh food conservation or more convenient food packaging. If we consider luxury goods, packaging goes far beyond its function, to improve the customer experience. In parallel customers have increasingly required information to be shown on products, like nutrition facts.

- **Producer driven features:** producers competing for customers want packaging to be recognizable, usable and informative. Attracting customers is the first purpose, but for established products, it goes far beyond that: memorability to induce direct association to the product or the brand. The Coca-Cola bottle is iconic in this respect: tests showed that even with their eyes closed, most people recognize it. Producers introduce handling features that simplify transport and work continuously to reduce cost and improve recyclability.
- **Regulator driven features:** in the last 60-70 years, a wave of regulation meant to protect consumers, instigated by lobbyists or the society as a whole, have requested the

packaging industry to abandon hazardous materials, introduce end-of-life information or allergenic content information. As means to combat packaging waste, the EU introduced the Packaging and Packaging Waste Directive in 1994 which primarily targets the recyclability of packaging waste.

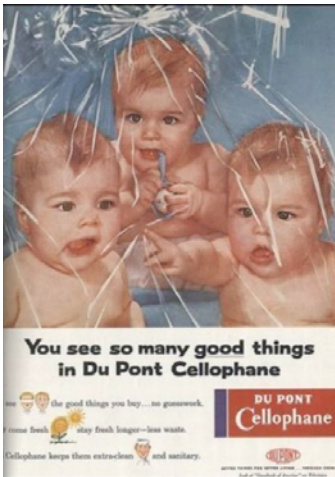
Food application is an effective good demonstration of packaging features effects: from very little relevance one century ago, today packaged food represents 31% more food volumes than fresh food and 80% of all food industry profits. In order to fulfill all of these different requirements, packaging solutions have become more sophisticated and extremely product or function specific. There are infinite packaging solutions: standing pouches for beverages are a recent innovation that enhance product convenience and brand visibility or blisters introduction in the 60's improved patient compliance to treatments. The technological implications of delivering to mass markets have resulted in such a variety of solutions, enormous and almost invisible to final users: materials science, printing chemistry and industrial automation are just the first three that come to mind.

Packaging: far more than you think but still less than it could be

Large share of world population still see low (but anyway some) packaging penetration

While consumer habits started to change at the beginning of the 20th century, the packaging industry boomed after Second World War, with the growth of the population and the rise of the middle class. Since the 50s the global population has grown three fold from 2.5 billion people to more than 7 billion people today and consumers grew by 2 billion people. In the same period of time the packaging industry reached \$800 billion in value, including several tens of billions of dollars dedicated to machinery each year. Every year 4,500 billion units of bottles, folding cartons and cans are used. Today in Germany,





1950s DuPont advertisements feature cellophane, a product they state "inaugurated a consumer revolution"

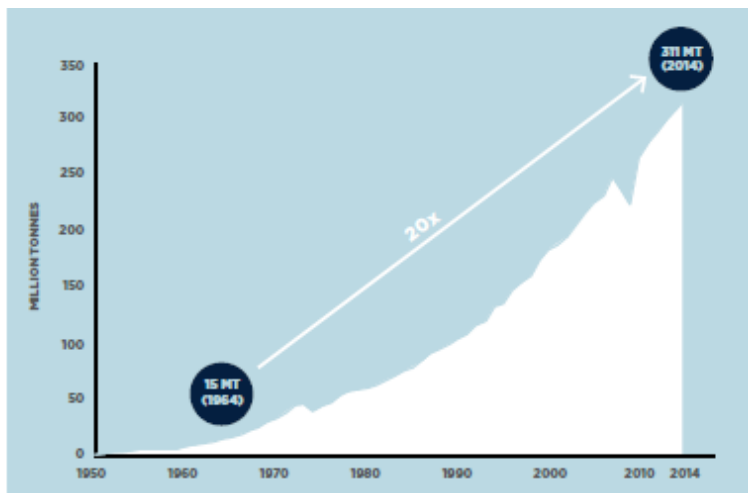
Switzerland and Austria alone there are 500 thousands people employed in the packaging industry.

The industry can be analyzed from different angles, but probably the most significant one for an environmentally focused investor is from a materials perspective. Plastic has taken the largest share of these products and today 26% of total plastic production (311 million tonnes) is used for packaging purposes. Plastics represents around 25% of total packaging materials weight, up from 17% in 2000. On the contrary, glass, paper and metal usage has progressively declined. Plastic introduction reshaped the industry because of its low cost, lightness and the design freedom it provides.

However the use of plastic has significant drawbacks: its pervasive contribution to waste generation and pollution.

First let's look at the basics. Packaging is a primary source of waste. Packaging represents more than 50% of household waste in the US, and more than 30% in European countries. This share is growing, even in stagnant economies like the EU driven by urbanization, increased use of prepackaged convenience food, growth of single households and mono-portions, home delivery and e-commerce. Everything points to continued growth in packaging needs, especially at a B2C level. From this point of view most packaging solutions share the same drawback: they are supposed to be temporary enclosures of a consumer good that gets consumed in

Global plastic production growth 1950-2014", Source: Plastic Europe



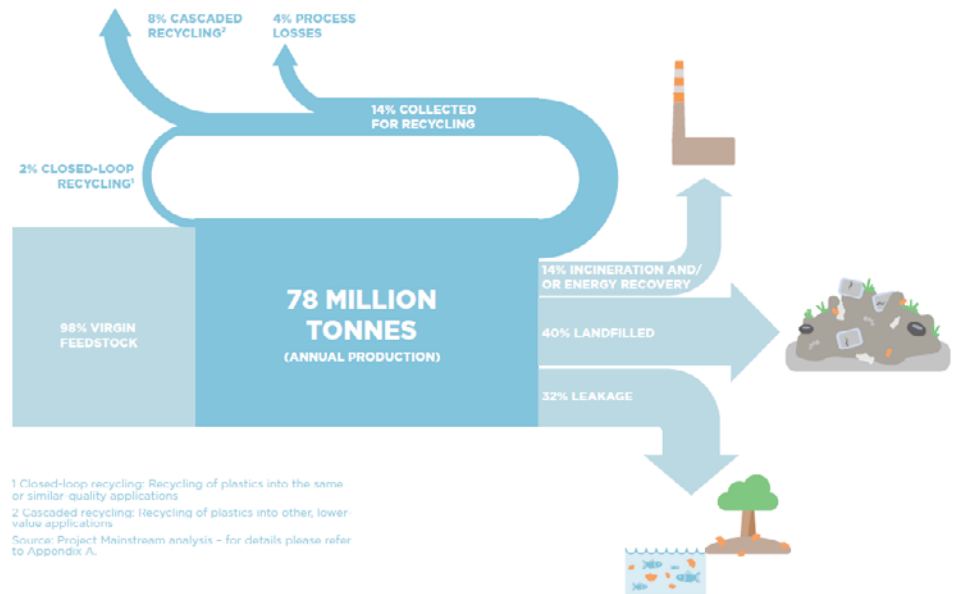
anything from a few days up to a couple of decades but they are far more durable than the average good they protect. This durability results in waste build up and as litter across the land and sea.

Various packaging materials have a different environmental impact: aluminum degrades in centuries, glass has essentially an infinite life span and the plastic life span can vary significantly from hundreds to thousands of years. Aluminum and glass do exist in nature and in the very long run will be reintegrated in Earth's crust. On the contrary plastic does not exist in nature and even if it disappears, it usually leaves traces. It cannot be biodegraded and can only be partially photodegraded by the sun's UV rays. Therefore geologists considers plastic residues as one of the enduring elements that will mark geologic layers from the 50's and will forever identify the so called Anthropocene era, or the era of ever lasting memories of human activity. Moreover several packaging materials get through recycling in high percentages because of price competitiveness of recycled materials (i.e. aluminum) or simple and clear separation chain (i.e. glass and paper) while plastic is hard to recycle: there are too many different plastics, mixed with any type of material and it is a very poor material.

MBA Polymers, Ambienta's portfolio company, has successfully tackled this same challenge in the recycling of plastic waste streams from electronic waste and end-of-life vehicles. Nonetheless, plastic packaging is the fastest growing segment of packaging materials and reached over 30% share of total packaging items in less than 70 years.

Of the 311 million tonnes of plastic produced today, 78 million tonnes (around 400 times the weight of the Empire State Building) are used in packaging every year. This volume will double in 15 years and quadruple by 2050. Of this quantity only 14% of plastic packaging material gets into recycling and only 2% is effectively recycled. 72% ends up in landfill or leaked in the environment and at least 8 million tonnes is leaked every year into the oceans, approximately

Global flow of plastic packaging materials in 2013", Source: The New Plastic Economy, by Ellen McArthur Foundation, McKinsey and World Economic Forum



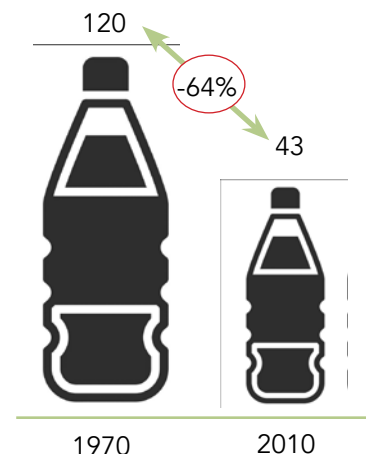
one garbage truck per minute. Today there is already 1 kg of plastic for every 5 kgs of fish in the oceans and by 2050 with current growth rates plastic will overtake fish.

Some trends are favoring the more old fashioned cardboard and glass. Cardboard usage is benefiting from the growth of internet shopping which increases demand for secondary packaging, since each individual item requires secondary packaging to be shipped. On the other hand, due to its natural attitude toward cost control, e-commerce players promoted the development (by an Italian machine manufacturer!) of packaging machines able to minimize packaging size and adapting it to every single different item, which provide significant resource efficiencies.

Glass leverages its superior recyclability features. Glass can be easily separated from other waste streams with types of glass being separated by color. Moreover its recycling process is extremely simple and well known. Some countries, like Germany, even require households to separate glass by color before disposing of it. It is a preferred packaging material from a waste management perspective. Because of this, some high end products are now adopting glass which fulfills both the sensation of a more sustainable material and its premium appearance versus plastics. This is particularly relevant for short supply chain products, like for example biological dairy products, where short logistics

reduces the relevance of costs associated with increased weight.

One trend is common to all materials which is a sustainability trend: weight reduction. Lightweight materials simplify product handling, reduce packaging and freight costs and contribute to reduce emissions of logistic services. Therefore packaging manufacturers progressively reduce the weight of packaging products with constant mechanical performances or introduction of lighter packaging solutions to replace heavier ones. Through material engineering, plastic bottles have become 64% lighter in 40 years. The average weight of cardboard in Western Europe has decreased by 5 gsm in just 3 years from 2009 to 2012. Heavyweight cardboard, despite being the heaviest of its genre, replaced heavier wooden packaging used for fresh fruit boxes.



Weight decrease of a 1 litre detergent bottle, grams. Source: British Plastic Federation.

In conclusion, despite being a wide contributor to the increasing waste and pollution issue, the packaging industry has several features embedded that makes it a strategic partner to the global goal of building a sustainable economy.



The opportunity for sustainability driven investors

The pervasive attitude of the packaging industry towards material efficiency and cost as well as innovative environmentally friendly solutions have been a continuous driver in the industry. Therefore resource efficiency and pollution control, the two underlying trends that characterize Ambienta's investment strategy, are naturally embedded in the industry. Moreover, there are at least two additional factors that make this industry attractive for sustainability driven investors.

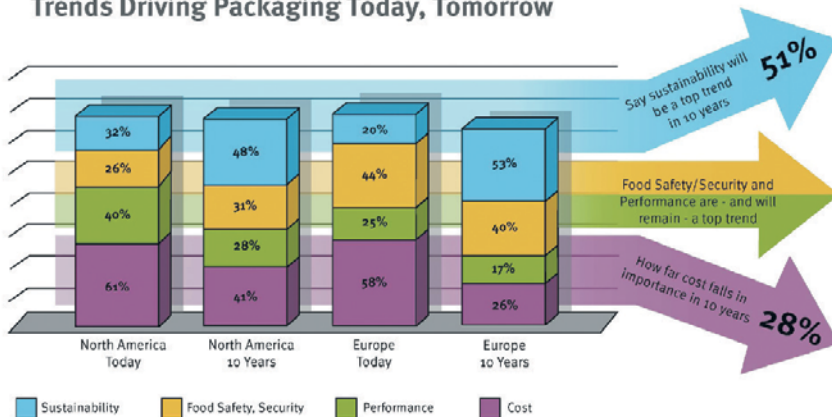
The first resides around the role of consumers. Consumers have been a driving force of the industry through evolving habits, desires and interests. Today industry experts agree that there are two global consumer trends prevailing in packaging: consumer's awareness of health and wellness and the growing concern of environmental and sustainability impact of packaging. Hence any consumer driven investor

has to incorporate into its investment decisions the positive and negative implications of these two relatively recent trends.

The second resides in the industry structure. Packaging products are low value items characterized by a high degree of customization of the end product. All this is particularly true in the plastic packaging value chain where the high degrees of flexibility of the materials allow for even greater customization and thus drive continuous R&D. As a matter of fact around 90% of plastic packaging manufacturers are mid-market companies and 86% run their own R&D department. Companies therefore strive to find and build their own niches where they maintain a balance between capital expenditures (required to remain competitive both on cost and product development) and margins. This situation determines the continuous emergence of hidden champions and contribute to fuel M&A activity for different purposes: consolidate markets or segments in search of market share, enter new geographies to serve the same clients, acquire innovative companies or products or even integrate the value chain upwards or downwards in a relentless effort to improve margins. For instance B+ Equipment (Table I), a French packaging machine manufacturer, was recently acquired by Sealed Air, a global leader of packaging solutions, for its specialization on packaging solutions for order fulfillment and distribution, a segment that has become increasingly interesting due to ecommerce growth. Constantia Flexibles on the other hand represents a successful organic and M&A driven growth story (10% annual sales growth for 10 years) in the flexible film packaging segment.

2012 Dupont's research confirm increasing role of sustainability as a driving force; Source: Dupont

Trends Driving Packaging Today, Tomorrow



Source: 2012 Packaging World, DuPont survey of Future Trends. Based on 504 responses: Please select the 2 key trends that most impact your packaging work today and the 2 trends you think will most impact the packaging industry 10 years from now. The number in the arrow reflects a combination of North America and Europe.



Table I.
Reference Transactions,
Source: press and
web research

Target company	Description	Buyer	Year	EV (\$m)	EV/ Revenues	EV/ EBITDA
Clondalkin Flexible Packaging Group	Manufacturer of high value added flexible packaging solutions	Egeria Private Equity	2016	n.a.	n.a.	n.a.
Mega Airless (GER)	Manufacturer of airless dispensing systems	AptarGroup	2016	218	3,3x	11,0x
Fiamo (CZE)	Manufacturer of flexible foils and labels	Huhtamaki	2016	28	1,3x	n.a.
Delta Print &Packaging (UK)	Manufacturer of folding cartons	Huhtamaki	2016	105	1,9x	12,0x
AR Packaging Group (SWE)	Manufacturer of folding cartons and flexible packaging	CVC Capital Parnters	2016	500	0,9x	7,3x
Plastico Castella (ESP)	Producer of packaging and container injection moulds	Nypro	2015	n.a.	1,4x	7,0x
Verallia (FRA)	Glass bottles and jars manufacturer	Apollo Global Mgmt	2015	2.500	1,2x	7,4x
Weener Plastic Packaging group (NL)	Plastic packaging manufacturer for the personal care and food&beverage sectors	3i Group	2015	277	1,3x	8,2x
B+ Equipment (FRA)	Manufacturer and service provider of automated packaging equipment for order fulfillment operations	Sealed Air	2015	n.a.	n.a.	n.a.
Constantia Flexibles (AUS)	Flexible Packaging specialist	Wendel	2014	2.816	1,3x	9,3x
Maynard&Harris Group Ltd (UK)	Manufacturer of blow and anjection molded plastic packaging solutions	RPC Group Plc	2013	170,0	n.a.	6,7x
Median				247,5	1,3x	7,8x
Average				826,8	1,6x	8,6x

It has built its success around customer driven innovation and vertical integration under both PE and industrial ownership.

The packaging industry is therefore a very active sector to transact in with both financial and trade buyers. From ambitious small niche leaders, to mid-market players up to the large conglomerates like Amcor, every company can find interest in buying a smaller one.

According to William Blair, since the early 2000s to 2014, the packaging industry recorded a median number of 256 transactions a year (of which nearly half is usually in Europe)

with a total transaction value of \$20 billion (\$31 billion in 2014). The median transaction multiple has moved in a narrow range around 8x EV/EBITDA for 12 years showing a strong sector resilience across economic downturns. Despite a relatively high amount of capital expenditure required and relatively low margin compared to other industries, financial sponsors represent between 20-35% of the total packaging transactions (up to 100 transactions a year). This is due to the high fragmentation of the market that allows successful buy and build projects, as Constantia Flexibles, and the continuous appearance of high margin niche leaders due to the almost infinite degrees of product differentiation. Interestingly an even larger share of these transactions hold strong sustainability credentials because their innovation efforts aiming to reduce packaging weight, to enhance shelf life and to substitute non-recyclable materials with recyclable ones.

The hidden champions of tomorrow stand out through innovation and sustainability credentials across a broad range of applications and features, creating smart solutions for a range of packaging needs.



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Naturally Clicquot 2, an eco-packaging design solution made for champagne producer Veuve Clicquot from PaperFoam. PaperFoam is biodegradable and home compostable biopolymer based on industrial starch derived from potatoes or tapioca and cellulose fibers

- **Extended shelf life of products:** product innovations in recent years have led to the development of several solutions to extend life time and therefore reduce wastage of products, particularly food and other consumer goods such as cosmetics, like barrier films made of high performance materials. In this area we find full packaging solutions manufacturers, plastic film extruders, resins producers that develop raw material properties or even machines manufacturer that could be critical to achieve desired functional performances.
- **Weight reduction of packaging:** hidden champions can be both machine manufacturers and packaging manufacturers. New products, new materials or improved process manufacturing with new machines can deliver significant weight reduction at constant functional performances. Companies that can fulfill customers required performance without anchoring the sale to product thickness (which is the industry rule of thumb) can at the same time contribute heavily to sustainability and enjoy substantial margin upsides.
- **Advanced engineering machines:** packaging factories tend to work on a continuous basis and processes are rather energy intense as they often include melting and drying of the material. Any engineering activities that promote higher material or energy efficiency within packaging machinery can therefore represent a competitive advantage.
- **Advanced functionalities:** packaging can provide several enhanced functionalities that can reduce waste at a consumer level. Sealable packaging can boost durability of products and thus reduce wastage. Standing pouches can provide better dosing and as a result can be more appealing to consumers. There is practically infinite room for innovation.

- **Security packaging:** packaging that prevents contamination of products for both health and pollution purposes. Typical application can be related to hazardous materials handling, healthcare application or simply to protect children.
- **Biodegradable materials:** innovative materials that can have a neutral environmental impact represent a sector by itself. Despite a clear gap in terms of performances of these materials versus alternatives, the growth of this segment is already clear. Machines and chemistry progresses will increase the applicability range and companies able to apply them to a certain product will benefit from growing consumer preference for eco-friendly solutions.

As packaging solutions continue to evolve, even Veuve Clicquot has moved to a bottle packaged in a 100% bio-based and compostable material made of industrial starch. Moreover, it stays perfectly cooled for two hours, even if it doesn't sink in the Baltic sea.

We at Ambienta are committed to support European packaging companies that offer products or services, which help control pollution and/or improve efficiency across a broad spectrum of packaging solutions, be it in food & beverage, cosmetics, healthcare, detergents, logistics or different packaging materials. We are convinced that medium-sized packaging companies throughout Europe will make a considerable contribution in combating the ever-increasing packaging waste through smart solutions and innovations. Ambienta is there to support these companies in becoming global champions in their respective market segments.


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AMBIENTA is a leading European private equity fund operating out of Milan, Dusseldorf and London, focused on industrial growth investing in companies driven by environmental trends. With funds under management of over €500 million, the world largest capital pool for this strategy, Ambienta has completed twenty three investments to date (primary investments plus add on), in the areas of resource efficiency and pollution control. Ambienta contributes actively to the development of its portfolio companies, offering industrial and managerial expertise and global connectivity. For further information please visit www.ambientasgr.com