

100 Events that shaped plastics in the 20th Century

The production of plastics began in 1869 when John Wesley Hyatt developed celluloid. The plastics industry, however, is almost entirely a 20th century phenomenon. Its growth, developments, applications and impact on society and the economy took place in the past 100 years; barely a heartbeat in the history of civilization and materials fabrication. As brief as the history of the industry is, its development was shaped by myriad influences throughout the 1900s. Here is our list of the 100 events that shaped the plastics industry into what it is today.

- 1) World War II (1939-1945): This is the demarcation point between the early thermoset-dominated materials and fabrication era of plastics and the thermoplastics age that developed from it. The buildup in materials technology and processing for the war laid the foundation for advances in formulations and applications that continue to this day. Rarely has one manufacturing culture changed as rapidly as did plastics in the post-war years.
- 2) The Global Economy: Buildup of international trade created exposure to and markets for a range of plastics goods and relevant process technologies. The crosspollination of ideas and applications in markets worldwide made plastics one of the most dynamic and innovative businesses of the century.
- 3) Oil shocks of the 1970s: Embargoes and reduced output orchestrated by OPEC focused attention in developed countries on the tenuous link between prosperity and energy supply, and on the need to use fuel and other resources more efficiently. Oil shortages helped to promote plastics use in light-weighting and other resource-conservation roles.
- 4) Computer Automation: This set the stage for innumerable developments that have had far reaching impact on the design, economy, versatility, and application of plastics.
- 5) The Internet: A decade ago most plastics firms had barely heard of this; now they are figuring how best to capitalize on the opportunities it offers for business and communication. Use of the Internet as a sales and information tool can only grow and change how the industry does business.
- 6) Development of Bakelite phenol-formaldehyde synthetic resin; synthetic resin and brand name.
- 7) Invention of the injection molding machine; need we say more?
- 8) Hermann Staudinger's work on macromolecule theory; basis for most resin developments, including polyamide.
- 9) Use of Ziegler-Natta catalysts in polyolefin polymerization; spawned formulation revolution that's still underway.
- 10) Auto industry's use of plastics in car production; impact on demand, technology, and productivity is huge.
- 11) Development of polyamide; resin that launched consumer awareness of how plastics can improve life.
- 12) Invention of polyethylene; technical curiosity and wartime mainstay became a cornerstone of consumer goods and the disposable society.
- 13) Plasticization of polyvinyl chloride; by making PVC functional it created huge demand worldwide.
- 14) Development of polypropylene; a key commodity resin that finds new and wider use every decade.
- 15) Development of polypropylene; a mainstay of applications and formulation technologies.
- 16) Development of polyurethane; applications are almost too numberable to mention.
- 17) Invention of the reciprocating screw; an ingenious device without which injection molding as now known is inconceivable.
- 18) Commercialization of the single-screw extruder; basic to most processes.
- 19) Development of blown film extrusion; makes possible diverse flexible applications.
- 20) Development of the PET beverage bottle; brought an entirely new dimension to, and awareness of, plastics packaging.

- 21) Growth of compounding; makes possible infinite range of tailored grades.
- 22) Development of acrylonitrile-butadienestyrene; among the first of the popular engineering resins.
- 23) Development of polycarbonate; raised resin performance and applications potential to new levels.
- 24) Polymerization of methacrylate; led to development of Plexiglas brand; World War II use helped spawn contact lens business.
- 25) Cast film and sheet; high-speed process raises capabilities of flexible web production.
- 26) Container blow molding; created major volume markets for diverse resins.
- 27) Window profile extrusion; early success in assault by plastics on traditional construction materials.
- 28) Neck-ring calibration during blow molding; major productivity and quality gain for high-volume market.
- 29) Development of form/fill/seal packaging lines; online process demonstrates plastics production flexibility.
- 30) PVC blow molding; created huge market that continues to be strong in many parts of the world.
- 31) Film orientation; mono or biaxial orientation expands properties and applications of numerous products.
- 32) Development of synthetic elastomer; crucial to expanding the versatility of various grades of plastics.
- 33) Counterrotating twin-screw extrusion; a boon to output and quality.
- 34) Blow molded fuel tanks; created a huge market for plastics and for recycle.
- 35) Coextrusion technology; makes possible applications ranging from barrier packaging to use of recycle.
- 36) Acceptance of HDPE as milk container; in the U.S. especially, this solidified HDPE as a major commodity resin.
- 37) Development of low-density polyethelene; broadened appeal, reach, and economics of PE, especially in film.
- 38) Development of linear LDPE; another giant leap for PE technology – once all the wrinkles were ironed out of the process.
- 39) Polyolefins Renaissance: Upgrading PE and PP via catalysis; single-site, metallocene, and enhanced Ziegler-Natta are among catalysts remaking polyolefins.
- 40) PVC use in blood bags; many view this as one of the best proofs of vinyl's benefit.
- 41) Extrusion of vinyl siding; huge market that reinforced PVC's place in construction.
- 42) Inline compounding; a critical route for economical productions of tailored products – for processors with sufficient expertise.
- 43) Inline bagmaking; key breakthrough in the productivity and economy of the market.
- 44) Online film and sheet quality control; dramatically increased efficiency and economy of webs.
- 45) Grooved-feed extruder barrel; major benefit to throughput.
- 46) Development of cold-cure unsaturated polyester resin; start of the modern composites business.
- 47) Development of laminated thermoplastic sheet; proved as far back as the 1920s the versatility and esthetics of plastics.
- 48) Development of fluoropolymers; breakthrough in high-performance materials.
- 49) Growth of electronics and telecommunications markets; practical only with plastics.
- 50) Full automation of extrusion lines; definitely met the need for speed.

- 51) Injection stretch blow molding; improves economy; quality, throughout of bottles and other containers.
- 52) Barr Energy Transfer injection screw design; one of the most popular general-purpose designs ever.
- 53) Hot-runner molding; not a process with flash, but that's the idea.
- 54) PUR high-pressure technology and impingement mixing; this equipment opened the door to an array of applications.
- 55) Process machinery for flexible PUR slab-stock; among other things it helped to create the market for furniture foam.
- 56) Robotics; they work round the clock, don't complain of file lawsuits, and do a better job than humans.
- 57) All-electric injection machine; sets the standard for precision, energy savings, and cleanliness versus most hydraulics.
- 58) All-electric blow moulding machine; ditto, ditto, and ditto.
- 59) Industry associations; ipso facto.
- 60) Tupperware; PE kitchenware was one of the single biggest influences in alerting consumers to the benefits of plastics.
- 61) Living-hinge design; inherent property of PP and PET is textbook example of plastics' design flexibility.
- 62) Calendering; process makes possible such applications as PVC floor covering.
- 63) Development epoxy; versatile material for molding, encapsulation, adhesives, and other markets.
- 64) Universal masterbatch; not totally universal, of course but enough to economically meet the needs of most processors.
- 65) Twin-station blow molding machine; straightforward way to increase productivity, especially with large parts.
- 66) Development of silicone; versatile material with diverse uses; critical to many medical applications
- 67) Development of thermoplastic elastomers; developments in formulation and applications technology mean they are not just for rubber replacement.
- 68) Use of glass fiber in boats; this created, with thermoset polyester, one of the biggest of composites markets.
- 69) Commercialization of pultrusion; helped to bring composites into more mundane products, like ladders and fishing rods.
- 70) Development of cellulose acetate; major advance in safety over the highly combustible celluloid, and a component of early safety films.
- 71) Development of Cellophane from viscous pulp; material was the first transparent film.
- 72) Ultrasonic welding and vibration welding; processes advanced plastics joining.
- 73) Tiebarless injection molding; an easy reach for many molders.
- 74) Development of the Banbury Mixer; patented in 1916, this machine helped elevate early compounding technology.
- 75) Chrysler specifies acrylic for auto taillights; application solidifies plastics' use in key end-use market.
- 76) PUR slabstock sold as cooling insulation; important breakthrough for PUR – and plastics generally – in appliances.
- 77) Commercialization by Dow of Saran PVdC food wrap; a major milestone in the use of plastics with food.
- 78) General Motors specifies composites body for Corvette sports car; 1953 model is among first production cars to make use of the lightweight material.

- 79) Structural foam molding; low-pressure process makes injection molding a viable option for fabrication of large parts.
- 80) IBM in 1986 installs computer-integrated manufacturing at North Carolina injection molding plant; among first steps to "lights-out" production.
- 81) Development of aramid fibers; high strength materials expand performance capabilities of plastics.
- 82) Rise of the "Green Movement" in Europe; environmental laws like Germany's "Green Dot" programme challenge plastics designers with post-use-considerations.
- 83) Phase out of chlorofluorocarbon blowing agents; controversial move forces foam industry to find alternatives.
- 84) 3D blow molding; technique expands design capabilities of process.
- 85) Organisation of the K show; triennial expo, in Düsseldorf, becomes world's largest plastics showcase and a truly global venue.
- 86) Micromolding, recent advances extend miniature part capabilities.
- 87) McDonald's fast-food chain bans EPS clamshells in U.S.; perception counts more than fact; score one for the "greens".
- 88) Development of nanocomposites; microscopic reinforcements have major potential in improving performance and efficiency.
- 89) Modularity; whether in primary or auxiliary machines or other products, trend gives processors greater flexibility in machine specification, upgrading, and operation.
- 90) Global Quality Standards ISO, CE, QS, and others formalize quality procedures and give processors ways to qualify their capabilities to customers.
- 91) End of the Cold War; reunification of Germany and restructuring of Eastern Europe creates opportunities and challenges for plastics throughout the continent.
- 92) Southeast Asian Financial Crisis; 1997 crash ends double-digit growth for several countries and affects trade in other regions as well, a sign of global economy is real.
- 93) Introduction of the euro in 1999; single currency for Europe could make many in the industry more competitive with currency fluctuations eliminated.
- 94) Establishment of the IKV; Germany's leading institute for plastics processing contributes numerous technical innovations.
- 95) Organization of the NPE; triennial event, second largest plastics show in the world is North America's largest.
- 96) Thermoformed blister pack for medical; debut from Becton Dickinson in 1942 moves plastics further into this lucrative market.
- 97) Commercialization of filament Winding; composite process proves a boon to large vessels requiring high strength.
- 98) Development of corona and plasma treatments; surface-modification techniques upgrade esthetics of film and molded parts.
- 99) Retortable packaging; containers and pouches emerge as non-refrigerated options to frozen foods.
- 100) Futures Pricing; technique for resin buying can protect processors from price swings; puts hedge bets on resin prices.

Reference book:

Indian Plastics Industry
Moulding the Future,
Plastic India 2003