Adoption of Uniform Standards in Testing Plastics for Global Competitiveness – By Dr. Ranganath K. Shastri

Once a collection of regional markets served by local and regional suppliers, the world is on a fast track to become a single - global - marketplace. The recent pacts among countries involved in major international trade accords like the World Trade Organization (WTO), North American Free Trade Agreement (NAFTA), the European Union (EU), Asia Pacific Economic Cooperation (APEC), and MERCOSUR (a treaty group of South American countries) clearly support this outlook. Elimination of trade barriers around the world facilitated by these trade accords is seen to offer a favorable business climate for attractive growth opportunities and investment in many emerging countries[1-2] by leveraging the favorable economics of manufacturing, shipping, distribution, and labor costs in some of the regions. Many original equipment manufacturers (OEMs) and a large number of their suppliers are seizing this opportunity to establish global presence. Many US-based companies already have multinational operations making common products with common raw materials in different parts of the world and view their global presence as an essential part of their strategic growth plans.

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ISO protocols for testing plastics gives us greater control over policy for product quality worldwide and provide a common technical reference that lets us communicate more efficiently between countries. The protocols will facilitate savings through efficiencies in volume purchases, and will speed time to market by significantly reducing the need to qualify resins and test molded parts. As a replacement for multiple standards, ISO test methods simplify our corporate procedures and test protocols to reduce costs and facilitate exports.

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For the U.S. plastics industry - resin suppliers, OEMs, and plastics processors - facilitating procurement of materials against a single specification regardless of where in the world a product is manufactured is essential for success in the emerging global marketplace. The wide latitude for variability allowed under current practice makes it extremely difficult to compare resins from different suppliers or sourced from different manufacturing sites of a single supplier. This incomparability issue can be resolved by adoption of a single set of test standards for an "apples-to-apples" basis for comparison. Business leaders have come to recognize the strategic importance of international standards and their implications in world trade to efficiently design, manufacture, and deliver the same products to virtually any location in the world[3-6]. There is a growing realization of the competitive disadvantage facing the US plastics industry unless they adapt to the wave of global changes. Even small companies whose business interests are focused primarily on domestic markets are not immune from foreign competition.

Most industrialized nations around the world have adopted ISO/IEC test methods outright or are using them as the basis for their national standards. In the EU and most other European nations, these universal test standards, where they exist, are being adopted as common European standards by the European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (CENELEC) to meet their needs for non-biased standards. All major European standards organizations, such as Deutsch Institut fur Normung (DIN), British Standards Institution (BSI), Association Francaise de Normalisation (AFNOR) are accepting these international standards as their national standards or basis for CEN and CENELEC standards as mandated by the Vienna agreement between ISO and CEN and the Lugano agreement

between IEC and CENELEC.

In response to the decision by the Japanese government to accelerate its commitment to trade deregulation policy, Japan Plastics Industry Federation (JPIF) is leading an aggressive three year project to harmonize Japanese Industrial Standards (JIS) with ISO/JEC standards[7-8]. This ambitious effort involved translating over 180 ISO standards into Japanese and carefully reviewing the documents for harmonization consistent with ISO Guide 21. By the year-end 1996, 24 JIS standards had been harmonized with ISO standards with harmonization of remaining 156 standards planned to be completed by the year-end 1998[8]. Although this goal has not materialized due to the extensive deliberations involved in this process, Japan's serious commitment to adoption of ISO/IEC methods is underscored by its target of completing the harmonization by April 2001.

Though the US automotive industry has long maintained a global focus, only recently has "globalization" gained a new meaning with the concept of a "world car" as a leading example. The recent drive by Detroit's Big Three automakers towards globalizing their product development process, relying on global sourcing, and the sharing of resources across the continents impacts all suppliers to the automotive industry. With annual sales of over 2.0 MM metric tons of plastics[9] at stake, North American resin suppliers have a significant interest to ensure staying competitive in a global economy.

Major automotive OEMs embraced the strategic significance of the ISO/IEC standards and have been aggressively preparing for its adoption since 1989. To achieve greater uniformity in their global operations, the Big Three U.S. automakers - General Motors Corporation, Ford Motor Company, and Daimler Chrysler Corporation – have jointly taken the initiative of strategic standardization through the United States Council for Automotive Research (USCAR) consortium to develop plastics material specifications based on ISO methodology that focus on their specific needs.

In December 1995, US CAR sent a letter which

Table 1. USCAR Timetable for ISO conversion[13]

January 1996	June 1996	June 1997	January 1998	June 1998
PA11	**PBT**	**TEEE**	**PMMA**	**PS**
PA12	**PBT + PET**	**TEEE + PBT**	**PE**	**PVC**
A46	**PC + PBT**	**ABS**	**TEO**	
PA6	**PC + PET**	**ABS + PC**	**PC**	
PA610	**PC + PCTG**	**ASA**	**PC + SMA**	
PA612	**PCT**	**PP**	**PPE**	
PA66		**POM**	**SMA**	
PA66/6		**PPS**	**TPU**	
PPA		**PA66 + PPE**	**ABS + PA**	
		PEI	**ASA + PC**	
		PES	**ASA + PVC**	
			CPVC	
			FEP	
			PSU	
			SAN	

Manufacturers who are now marketing only in the US should not be thinking only on a short-term basis. It is inevitable that at some point in the future, they will have to interact with global manufacturing. That means that the language of commerce must be international and based on uniform global test standards.

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emphasized the intention of the Big Three regarding implementation of the ISO test methods[12] to all resin suppliers which was immediately followed with a letter detailing a proposed timetable for conversion[13] (see Table 1). Their commitment was highlighted by references to the statement that all materials with current automotive usage must be approved/re-approved with ISO test methods and a company may forfeit its production approved status for each compound that is not approved/re-approved with ISO test methods by each automotive company.

The implication of this commitment from the Big Three automakers is that anyone supplying materials to the automotive industry risks losing their approved status for their products unless they begin reporting data based on ISO methodology. The recently published SAE specifications SAE J1639[14] for nylon, and J1685[15] for ABS and ABS+PC, are the first two in a series of documents that are being adopted by the Big Three automakers. Currently in development are 11 new SAE specifications (Table 2).

Xerox Corporation has long instituted multinational material specifications based on ISO/IEC test methods. Customers in the information technology, healthcare, electronics, and appliance industries and multinationals, who prefer to reduce the amount of resources and effort allocated for dual testing (separate testing by ISO/IEC and ASTM standards), are continuing to indicate an interest in ISO test methods[16-17] Even the US government, particularly the Department of Commerce, continues to encourage adoption of ISO test methods. The US government's standards policy to encourage the development of standards in recognized organizations such as ISO and IEC, and the subsequent use of resulting standards in the US is unchanged[18].

Table 2. SAE Material Specifications Currently in Development

SAE Standard	Title
J1538	Classification System for Automotive Syndiotactic Polystyrene (PS-SY)
J1686	Classification System for Automotive Polypropylene (PP) Plastics
J1687	Classification System for Automotive Thermoplastics Elastomeric Olefins (TEO)
J2250	Classification System for Automotive Poly Methyl Methacrylate (PMMA) Plastics
J2273	Classification System for Automotive Polyester Plastics
J2274	Classification System for Automotive Acetal (POM) Plastics
J2323	Classification System for Automotive Polycarbonate Plastics
J2324	Classification System for Automotive Polyethylene Plastics
J2325	Classification System for Automotive Poly Phenylene Ether (PPE) Plastics
J2326	Classification System for Automotive Styrene-Maleic Anhydride (S/MA) Plastics
J2327	Classification System for Automotive Poly Vinyl Chloride (PCV) Plastics

September 1995

The U.S. government, in the person of the Office of the U.S. Trade Representative, has taken the understandable view that if standards are developed in international organizations, they will represent an international consensus, and they will facilitate trade. Accordingly, the U. S. government's standards policy is to encourage the development of standards in recognized international organizations such as ISO and IEC, and to encourage use of the resulting standards in the United States.

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RESPONSE BY THE US PLASTICS INDUSTRY

To enhance the global competitiveness of its membership base The Society of the Plastics Industry, Inc (SPI)'s International Trade Advisory Committee (ITAC) began developing innovative programs on:

- Awareness of international trade issues
- Development of tools to improve international business

- Networking among leaders in the US plastics industry already involved in international trade
- Development of policy on trade issues that impact the US plastics industry.

At the same time, SPI's Polymeric Material Producers Division (PMPD) recommended[19] that its member companies:

1. During 1993, begin the conversion to the use of internationally accepted standards developed by ISO and IEC for determining the properties of plastics from the current practice of using methods developed by ASTM.
2. By June 1994, routinely supply data on product data sheets and advertisements using the preferred ISO/IEC standards.

This strategic move was in response to the growing needs of various market segments. Recognizing the considerable amount of confusion created by the conflicting messages and general misinformation that appeared in the literature[20-25] regarding the debate over preference for international standards in global trade, SPI formed an ad hoc ISO communications committee under the auspices of the International Technical and Standards Advisory Committee (ITSAC) in November 1993 to provide a formal, coordinated response that adequately represents the interests of the resin producers and customers within the US plastics industry. The main charter of this committee is to help SPI lead an industry-wide effort to promote and educate the US plastics industry on those issues surrounding the implementation of ISO/IEC test standards in accordance with the above resolution.

During NPE '94, the ISO committee organized an industry forum with a roundtable panel discussion and issuing a call for uniform global testing standards for resins[26-27]. In early 1996, the committee also developed a technical primer[28] illustrating the similarities and differences between the ISO/IEC test methods and current US practices to educate the technical community in the plastics industry. This detailed primer also includes the essential steps involved in the conversion to ISO/IEC test methods. By mid-1996, the committee developed a management primer[29] to promote the benefits of converting to uniform global testing standards among the industry leaders.

Having completed this suite of educational material, the ISO communications committee began to focus its effort on an education/outreach program to share the information with the key industry groups. The main theme of the SAE presentation at International Congress[30-31] was to report to the automotive industry the effort being made by the resin suppliers in response to the call by US CAR. The thrust of the presentation at the Structural Plastics '96 conference[32] was the emphasis on the impact of adopting ISO/IEC standards by OEMs, molders, and designers. In addition, the ISO communications committee also hosted two one-day workshops. The first one held on June 26, 1996 in Houston, TX was tailored to educate resin suppliers and compounders on the impact of global testing standards on producers[33]. This workshop attracted over 45 attendees interested in learning about the growing trend and how to implement the conversion to ISO test methods. A second workshop cosponsored by USCAR and SPI held in Troy, MI on August27, 1996 also addressed the implementations at GM, Chrysler, and Ford[34]. This session attracted over 150 attendees, including major automakers (GM, Saturn Corporation, Nissan, and Toyota), Tier I suppliers as well as the trade press in addition to resin suppliers, compounders, and molders. Recognizing the difficulty to access ISO/IEC test standards and the unusually high costs associated with each document as the main barrier to acceptance of ISO/IEC standards, the D20.61 subcommittee worked hard and diligently to remedy this situation. Following successful negotiations with ISO and ANSI to make relevant ISO/IEC standards more readily accessible to the users, a compilation of the latest 28 ISO standards and 4 IEC standards most frequently used by the plastics industry[35] was published by ASTM in 1996. Due to popular demand, a second edition of the compilation[36] that includes 86 selected ISO test standards and 4 IEC standards was recently published by ASTM.

RECENT GM INITIATIVE

Following the ambitious timeline for conversion to ISO/IEC test methods proposed by USCAR, all the Engineering Thermoplastics (ETP) and PP producers were expected to routinely report ISO test data[37-38]. Due to the complexity of the issues involved with the conversion, the effort by the US plastics industry fell well short of meeting the ambitious timeline proposed by USCAR in 1996. Recognizing the lapses in momentum, the North American Operations of General Motors Corporation sent a letter to all

plastics suppliers to GM in March 1999, reiterating its commitment to conversion to ISO test methods with a revised timetable[39] (Table 3). The letter stated that GM reserves the right to remove suppliers from the Approved Source list for failure to submit ISO data. Also, for those materials outlined on the table. GM will no longer accept ASTM data (except where specified on the latest template) for GMPs after 5/1/99.

The latest GM initiative has forced many resin suppliers to rethink their options to comply or risk losing the approved supplier recognition. At least nine leading resin suppliers - Ticona LLC, Du Pont Engineering Polymers, The Dow Chemical Company, BASF Corporation, Bayer Corporation, Honeywell Engineered Solutions & Applications, Eastman Chemical Company, Montell Polyolefins, and BP/Amoco - believe that the long term benefits outweigh the initial investment and are in various stages of conversion to ISO/IEC test standards from current practices.

MAIN BARRIERS TO ADOPTION OF ISO/IEC STANDARDS IN THE US

A number of specific issues including the costs associated with conversion, difficulty in ready access to ISO/IEC standards, the availability of molds for ISO test specimens, and test equipment for performing testing in accordance with ISO/IEC test protocols were initially identified as the main barriers to acceptance of ISO/IEC test standards in the US[26]. Today some of these have been satisfactorily resolved. Publication of the compilation of selected ISO/IEC standards has solved the accessibility issue adequately while availability of ISO multipurpose test specimen molds and test equipment modified to suit ISO test protocols do not seem to be major issues any more. Currently, at least three sources in the US offer the ISO molds[40].

Yet, some of the barriers still remain. First, there is the cost issue that may involve a substantial initial financial commitment. This may include the cost of purchasing the ISO multipurpose test specimen mold and other mold inserts. In addition, the strict guidelines imposed on molding conditions may require an upgrade of molding equipment and/or suitable instrumentation and controls. Also involved may be modifications to test equipment, such as shorter support spans to facilitate flat-wise testing for Deflection Temperature Under Load (DTUL) and new hammers for Charpy impact tests. There maybe additional costs associated with training personnel and in retesting resins according to ISO protocols. A greater and more broadly placed understanding will aid in accepting the costs of conversion to ISO/IEC test methods. Even though the initial cost for conversion may appear to be significant, sometimes the fact that these costs would occur over time with or without a transition to global standards, due to general wear and obsolescence of molds/molding machines, as well as revisions to existing ASTM standards is largely ignored.

The concern about discarding an established historical properties database in the conversion to ISO/IEC test standards still prevails. Though the concern is genuine, the resin suppliers do recognize the conversion to ISO/IEC test methods will not occur overnight and that it will take time to build an historical database with sufficient ISO/IEC test data. They fully expect that ASTM standards will continue to be used for many years by many customers, particularly in the case of finished products like films, sheet, pipe, and profiles. Although separate testing to ASTM and ISO standards during the transition period

Table 3. New Timetable for GM NAO Plastics Conversion to ISO[39]

Polymer family	Original target	GM target	# of specs
Polyetherester block copolymer	June 1996	June 1996	12
Polyamides	January 1996	July 1997	137
Polyesters and PC+Polyester	June 1996	November 1997	58
PP	June 1997	July 1998	67
ABS; PC+ABS; ASA; ASA+PC; POM	June 1997	June 1999	77
PC; PC+SMA; PMMA; PPE; SMA; Phenolics	January 1998	June 1999	61
PS	June 1998	June 1999	5
Polyurea; Polyurethane; SMC	June 1998	January 2000	50

and the considerable cost of developing a new reliable database is putting a significant cost burden on them, many resin suppliers recognize the importance of providing this option until customer understanding and confidence in the data generated by ISO/IEC standards are attained. Today, most resin suppliers are compelled to perform dual testing as customer confidence is still elusive and a reliable database with multi-lot data is not ready yet.

There have been no major breakthroughs with respect to the US industry's unfamiliarity with S.I. units and reluctance to understand the new language of S.I. units, which is still a formidable barrier to acceptance of ISO test standards. Today, although over 90% of ASTM D20 standards specify reporting the data in S.I. units, many suppliers continue to publish their data with the inch-pound system. It will take time for the industry to get used to the "new values" involved.

It is clear that segments of the plastics industry associated with manufacturing durable goods, such as automobiles, computers, and business machines, have a keen interest in conversion to ISO/IEC methods because of the global nature of their businesses. Such multinational customers and the producers of engineering resins that serve them have good reasons to support the conversion to uniform methods based on ISO test standards. However, manufacturers of packaging-related products and their resin suppliers - typically, the producers of commodity resins - primarily catering to a domestic market, still maintain the position that a speedy conversion to ISO/IEC test standards is well ahead of the desire to switch by their customers. They believe that most customers will continue to use ASTM standards with "soft" conversion to S.I. units, for some time. Where there has been the desire to undergo a conversion to an ISO standard, the conversion has often been less complete and less vigorously paced.

SUMMARY

The elimination of trade barriers around the globe has opened the door for many OEMs and multinationals for entry into the emerging world marketplace. To be competitive in a global market, facilitating procurement of materials against a single specification regardless of where in the world they are manufactured is critical for success. For the plastics industry - resin suppliers, OEMs, and plastics processors - the strategic importance of international standards and their implications in world trade to efficiently design, manufacture, and deliver the same products to virtually any location in the world is hard to ignore.

With the adoption of ISO/IEC test methods for plastics well underway in Europe, Japan, and other industrialized nations around the world, conversion from current practices to uniform global test standards based on ISO/IEC methodology in the U.S. is inevitable. It is not a matter of "whether" but rather "when" and "how". Resin suppliers serving the automotive, information technology, healthcare, and appliance segments, and multinational OEMs clearly feel the pressure to respond to the needs of their global customers and are responding by moving systematically towards conversion to ISO/IEC methods. On the other hand, commodity resin suppliers serving the mainly domestic market do not see the urgency for conversion and are not convinced that conversion at a rapid pace is justified. Material producers and application sectors that may have not been affected yet by the global shift should be proactive in preparing for the inevitable changes in the future. For the US to remain competitive in a global market, taking a proactive approach in adopting international standards is crucial. The challenge facing the US plastics industry today is to overcome the remaining barriers for conversion to uniform global test standards without overlooking the needs of their customer base whose business interests remain firmly within domestic boundaries.

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