

# Report on Raw Materials Shortages In the U.S. Pavement Markings Industry

The American Traffic Safety Services Association (ATSSA)  
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A close-up photograph of a person's hands in a laboratory or workshop setting. The person is using a clear plastic syringe to add a small amount of a yellowish substance into a silver metal paint can. The can is mounted on a workbench and has some numbers, '01' and '12', written on it. In the background, there is a large blue container and various mechanical parts of a testing apparatus. The overall scene suggests a scientific or technical experiment related to paint or coatings.

This report was produced by the American Traffic Safety Services Association (ATSSA), Fredericksburg, Va. The industry survey and resulting tables included in this report were conducted June 10 - 14, 2010. ATSSA is grateful to those companies who participated in the survey and to those members of the association who contributed to its development, as well as to the staff of the Federal Highway Administration (FHWA) who reviewed our draft report and provided expert commentary.

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*Cover photography courtesy Ennis Paint*

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# REPORT ON RAW MATERIALS SHORTAGES IN THE U.S. PAVEMENT MARKINGS INDUSTRY

## Introduction

As of the date of preparation of this report, June 2010, the roadway markings industry in the United States faces a critical shortage of raw materials used in the production of paint, epoxy and thermoplastic markings. Indeed, this problem is global in nature with parallel shortages being reported in the United Kingdom<sup>1</sup> and elsewhere.

The raw material shortages are a result of the limited availability of certain resins and rosins that are used as binders in the production of some road marking materials as well as a shortage of Titanium Dioxide which is a white pigment with a high coefficient of reflection used in the production of paint, in this case both white and yellow roadway markings. The shortages are exacerbated by the fact that these raw materials have other uses, some of which have historically brought higher prices.

As a result of these shortages, virtually every pavement marking manufacturer is running below capacity. There is a significant concern that as inventories are drawn down, there could be an adverse effect on safety, particularly for resurfacing projects which require new centerline, edge line and lane markings. Indeed this could adversely affect project completion.

The further result of reduced production is that roadway marking contractors who have contractual obligations as subcontractors to general contractors or as direct contractors to state and local governments to mark roadways may very well be unable to deliver their product within the timeframe and cost structure of the original project plan. It is typical in the industry to include liquidated damage clauses in these types of contracts. However, the imposition of liquidated damages or other penalties on markings contractors, most of whom are small businesses, would more than likely result in bankruptcies and layoffs, thereby possibly reducing competition in the future when the marketplace “normalizes” and also adversely affecting the nation’s economic recovery.

In order to assist in avoiding or mitigating these rather dire consequences, the American Traffic Safety Services Association has produced this brief report in the hope that project owners, manufacturers, contractors and the general public may develop a deeper understanding of the issues and that alternative resolutions may be explored.

First, we will take a look at what specific raw materials are in short supply and some of the general causes for those shortages. We will then present the results of a brief survey that ATSSA conducted of pavement marking materials manufacturers, followed by a discussion of alternative courses of action that might be taken to mitigate the effects of the shortages. Attachment A presents definitions and explanations of the various raw materials.

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<sup>1</sup> See *Impacts of raw material shortages and rising material costs in the Road Marking and High Friction Surfacing sector*. Road Safety Marking Association, May 2010.

## Overview of How the Shortages Developed

The manufacturing of the three primary pavement marking materials – paint, epoxy and thermoplastic – requires raw materials whose purposes include color, brightness and binding into the overall finished product. These materials differ for each product and include *Acrylic Resin, Rosin Esters, Liquid Epoxy Resin and Titanium Dioxide (TiO<sub>2</sub>)*<sup>2</sup>.

Each of the above raw materials is used in other products; some are very widely used. For example, a Greek wine, Retsina, derives its unique aroma and flavor from the addition of a small amount of pine resin. Titanium Dioxide is the pigment that makes white and yellow traffic markings bright. It is used in virtually every industry imaginable from coatings to medical products to foods. It is even used in tooth paste!

Several global events have contributed to the shortage of raw materials that we see today. In fact, shortages of several of these products developed almost simultaneously in what might be described as “a perfect storm.” The chemical industry as a whole has endured the global economic downturn along with every other business sector and was forced to reduce production in order to maintain profitability.

Two key components of Acrylic Resin, propylene and acrylic monomers, are in short supply. Likewise, Liquid Epoxy Resin and Converted Epoxy Resin are also in short supply due to the loss of production of a critical raw material, phenol, which is produced in a major chemical manufacturing company’s plant in Oyster Creek, Texas.

As a result of the interruption of the supply of phenol, on March 15, 2010, The Dow Chemical Company issued a “Notification of Force Majeure for Liquid Epoxy Resin (LER) and Converted Epoxy Resin (CER) in the Americas.” Dow sent a letter to its customers announcing this declaration on that same date.<sup>3</sup> In that letter, Dow announced that it was developing an allocation plan. ATSSA can confirm that in conducting a survey of manufacturers, the results of which are presented in the next section, virtually all affected manufacturers cited the allocation of raw materials as a primary constraint on their production capability.

Resins and Rosin Esters are key components in the resin system for Thermoplastic. Resins are derived from gum rosin or pine tree sap. While there is some production here in the United States, primarily in the southeast, significant amounts are imported from China and countries along the equator. Apparently, three things happened almost simultaneously. First, there was an incredibly poor harvest of gum rosin along the equator and in China in 2009. Secondly, the Chinese have ramped up roadway construction overall, thereby consuming more of their own product domestically and exporting less. Thirdly, the largest domestic manufacturer of rosin esters shuttered one of its three production facilities, presumably due to lack of profitability, effectively removing one-third of the available production.

Additionally, the global leader in the refining of Titanium Dioxide was forced to pull back production due to the economic downturn, resulting in current shortages for all users of this pigment. Additionally, there was a fatal explosion at a production facility in Grimsby in the UK which resulted in a six week closure of that plant in

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<sup>2</sup> See Attachment 1 for definitions of these raw materials.

<sup>3</sup> The Dow Chemical Company, Letter to customers dated March 15, 2010, signed by Joan Schuller, General Manager, Dow Coatings and Materials North America.

February/March.<sup>4</sup> While TiO<sub>2</sub> from this plant was not typically shipped to the U.S., having the plant off-line may have further contributed to the worldwide shortage of this important material.

These events have had a devastating impact on U.S. production of roadway marking materials. Since most manufacturers of these materials are on allocation of raw materials, they in turn have placed their customers (i.e. striping contractors) on allocation as well. The exceptions to this statement as of the date of production of this report are one producer of Epoxy and a couple of manufacturers who had amassed a supply of TiO<sub>2</sub>. However, it does not appear that those manufacturers are able to replace their supplies as quickly as they are using them.

Another effect on the marketplace is that the upstream impact of significant increases in the costs of raw materials are beginning to be felt downstream in the form of price increases. Major manufacturers announced product price increases in late April.<sup>5</sup>

Now as the economy has begun to improve, overall demand has increased, but full production has not returned, thereby exacerbating the shortages. The pavement marking industry has in the past been one of the lowest priced and least profitable industries for the suppliers of resins and pigments. However, as a result of these shortages, the pavement marking industry now has to compete with other more profitable industries in order to maintain allotted supplies, resulting in higher production costs.

In order to ascertain the direction of the marketplace and the probable availability of roadway marking materials in the coming months, ATSSA conducted a brief telephone survey of manufacturers between June 10 and June 14. The results of this survey are presented in the following section.

## Results of Pavement Marking Materials Manufacturers Survey

ATSSA staff surveyed both national and regional manufacturers of paint, thermoplastic and epoxy. It is important to note that not every company manufactures all three products, so that both numerical and percentage responses may vary below. For questions that were posed regarding the percent of product currently being delivered and anticipated to be delivered in the near future as compared to past delivery levels, we report the median and the mean. In order to ensure the confidentiality of corporate data, in no instance is individual company information provided.

Seventy-eight percent (78%) of manufacturers reported that they were having difficulty obtaining resins / binders to produce pavement marking materials, while 56% reported difficulty in obtaining Titanium Dioxide. As mentioned in the previous sections, Titanium Dioxide is a widely used product. Of those that reported little or no difficulty in obtaining TiO<sub>2</sub>, it was *generally* due to the fact that they had either stockpiled product in anticipation of a shortage or had located product in the marketplace at much higher costs than historically had been the case. Some who responded “No” to this question had as little as two weeks supply remaining and indicated that if they were asked this question in the near future their response would likely be “Yes.”

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4 See *Impacts of raw material shortages and rising material costs in the Road Marking and High Friction Surfacing sector*. Road Safety Marking Association, May 2010.

5 Letters were sent to customers by Ennis Paint on April 23, and by Crown Technology LLC and Sherwin-Williams on April 26

When asked at what percent of normal production they were running as of the date of the survey, responses resulted in the following median and mean groupings:

<b>TABLE 1</b> <b>CURRENT PRODUCTION VS. NORMAL PRODUCTION</b>		
PRODUCT	MEDIAN	MEAN
Paint	50%	50%
Thermoplastic	50%	43%
Epoxy	65%	78%

When asked if their timeframe for delivery of pavement marking products *has increased* when compared to the average of the last three years, 100% of respondents answered yes. However, when asked what that average delivery time is, responses varied widely (Table 2). Although it was not a formal question in the survey, anecdotally, almost all manufacturers indicated that the timeframes they quoted were for existing customers, *and that they were not able to serve new customers at this time.*

<b>TABLE 2</b> <b>AVERAGE DELIVERY TIME PROMISED</b> <b>(DAYS)</b>			
PRODUCT	MEDIAN	MEAN	RANGE
Paint	60	55	7 - 90
Thermoplastic	60	59	0 - 90
Epoxy	15	24	3 - 56

In order to ascertain the future direction of the marketplace, we then asked generally what level of demand pavement marking manufacturers anticipated that they could meet in the coming months. The median and means are reported below. While a couple of manufacturers were optimistic about returning to full production capacity in the fall, a significant majority felt that it would take some time to fulfill back orders. Again, although it was not part of the prepared survey questions, when asked about when they thought that production and demand would return to balance, estimates ranged from October at the earliest to the “spring striping season” of 2011.

<b>TABLE 3</b> <b>PROJECTED CAPACITY VS. DEMAND</b> <b>SELECT TIME PERIODS</b>		
PERIOD ENDING	MEDIAN	MEAN
June 30	55%	54%
July 31	70%	60%
August 30	70%	65%
September 30	70%	65%

Finally, we posed two carefully worded questions to ascertain the effect of current shortages of raw materials on production costs and on future downstream costs. We wanted to know if producers anticipated a decrease in current price fluctuations as supplies “normalized” and attempted to obtain this information while staying well within the boundaries of antitrust requirements. We found that all of the producers that we surveyed anticipated that raw materials prices would be higher in the future when compared to a year ago, even if supplies normalized or increased, due in part to increased demand, including on an international basis. For example, China, India and other countries are developing significant new roadway systems. We should emphasize that an increase in supply of raw materials is not a certainty, as some of the basic causes discussed in the previous section such as poor crop harvest could be repeated.

In looking at the effect of raw material cost increases on finished product prices in the marketplace, virtually every manufacturer anticipated an increase when compared to a year ago. It should be noted that in conducting this survey and posing this question, *we did not differentiate by product type.*

## Alternative Courses of Action

In the absence of pavement marking product availability at any cost, project owners might want to consider both temporary and permanent alternatives until supplies normalize. This would be true for both resurfacing and maintenance projects in order to ensure that safety is not compromised. ATSSA is aware that there have been meetings between project owners and contractors in several states, and that some states have begun to specify and implement alternatives until such time as the raw materials crisis is over. While many states have specific product specifications and formulations, here are some general ideas that could be adapted at the state or local levels:

1. Anecdotal evidence suggests that some manufacturers have “primary” contracts with state DOTs for maintenance purposes and are apparently fulfilling those contracts prior to supplying contractors, while in other instances “Force Majeure” has been declared and full supplies are not being delivered. States which do have available supplies of striping material for maintenance purposes could “lend” that product to contractors on resurfacing projects, with the contractor obligated to “repay” the loan with the same product in a specified time frame.
2. Temporary markers or flexible delineators / channelizers could be used as an alternative to markings in some instances; for example, work zones. RPMs can be used to substitute for striped lines if they are applied with the spacing mandated in Section 3B.14. Flexible channelizers can supplement, but not replace, longitudinal lines per Section 3H.01.
3. Centerlines could be striped and rumble strips used for edge delineation. This would be allowed only where a striped edge line is not mandatory in the MUTCD. Section 3B.07 mandates that edge lines shall be used on all freeways and expressways, and on all rural arterials having a traveled way width of 20 feet or more and ADT of 6,000 or greater. When product becomes available, the rumble strips could be converted to rumble stripes. Several states have reported significant safety benefits from rumble stripes.
4. The shortage of raw materials has not affected tape, so inlay tape could be substituted on new asphalt.
5. Temporary markers could be used for centerlines per Section 3B.14 of the MUTCD.

6. Information sources suggest that many intersections and RR crossings have either paint or thermoplastic markings. In these instances, pre-formed thermoplastic could be substituted. (Note: It is our understanding that pre-formed thermoplastic requires different resins and does not suffer from a raw materials shortage.)
7. Skip lines could be shortened for an interim period and “completed” when additional product becomes available. The MUTCD provides Guidance that a 10 foot line segment / 30 foot gap be used. Shorter line segments, within a 40 foot overall cycle, could be used if engineering judgment indicates a necessity to do so based on paint shortages and the lack of another viable option.

As project owners address the issue of product shortages, they may develop additional alternative courses of action. ATSSA would be pleased to post these and other alternatives that do not adversely affect safety on [www.ATSSA.com](http://www.ATSSA.com). Please send your ideas to James Baron, Director of Public Affairs, at [James.Baron@ATSSA.com](mailto:James.Baron@ATSSA.com).

## ATTACHMENT 1: DEFINITIONS

**Acrylic Resin** is the backbone or glue that holds all of the other raw materials together to make finished *water based* paint, including colored traffic paint. This resin and its derivatives are used in just about every water based paint including house paints.

**Rosin Esters** are the main component in the resin system for Alkyd Thermoplastic. They are derived from gum rosin or pine tree sap. Rosin Esters are used in many other applications such as adhesives, inks and coatings and even food products such as chewing gum and soft drinks.

**Liquid Epoxy Resin (LER)** is the backbone or glue for *epoxy* paint. It is a petroleum derivative that is manufactured in chemical reactors by several large chemical companies around the world. LER is used in hundreds of applications in many different industries from floor coatings to waterproofing coatings.

**Titanium Dioxide (TiO<sub>2</sub>)** is refined from Titanium which is a mined ore. TiO<sub>2</sub> is the pigment that makes traffic markings opaque and white and yellow markings bright. TiO<sub>2</sub> is used in virtually every industry imaginable from coatings to medical to foods and other products like tooth paste.



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15 Riverside Parkway, Suite 100  
Fredericksburg, Va. 22406