How Will Falling Oil Prices Impact Resin Prices?
What Should Resin and Plastic Component Buyers Be Doing to Maximize the Benefit?

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Executive Summary

Crude oil prices have experienced a precipitous fall in the past few months. These falling prices will have a significant impact on resin prices, but the timing and price movement will vary greatly by type and grade of resins and region produced. Buyers of resins and plastic components will be expected by their organizations and customers to take advantage of these lower prices and manage the increased volatility going forward. It is critical that buyers have the right predictive tools and strategies to be successful in this undertaking.

This paper will provide:
I. Crude oil price forecasts and impact on resins
II. As a buyer of resins, how can I take advantage of these lower prices?
III. As a buyer of plastic components, how can I take advantage of these lower prices?
I. Crude Oil Price Forecasts and Impact on Resins:

The petrochemical feedstocks for most plastics resins are produced as by-products of oil and natural gas processing. The rapid decline in crude prices in Q4 2014 has had an impact on the cost of these feedstocks. Crude oil is expected to remain relatively low for a few years. IHS Energy expects that the bottom of the crude oil market will not be reached until Q2 2015 (Figure 1). While news of record numbers of drilling rigs being removed from production in North America is influencing oil prices upward, oil production continues to increase and inventories are still growing, despite increasing refinery runs. With OPEC’s intention to continue production at current levels, we expect the global oversupply of oil in Q2 will pressure prices down further. In the second half of 2015 the effects of slowing oil production will tighten supply enough to support rising prices.

The abundant production of natural gas in North America in recent years led to natural gas prices reaching low levels compared to oil, as shown on figure 2. Comparing the energy prices on a BTU basis, it’s apparent that in 2012 natural gas sold at an 80% discount vs. oil. This made it very attractive for ethylene producers to shift their feedstocks from oil based naphtha to natural gas liquids, ethane, propane and butane. The shift takes advantage of lower prices and the higher ethylene yields. Virtually all producers in North America have made this shift, a win-win for ethylene producers. However, this shift in ethylene feedstocks has reduced the by-product production of propylene, benzene and butadiene that are critical inputs to the plastics materials we are discussing. This adds a supply/demand dynamic to the cost of the plastics, beyond the effects of lower crude oil prices.

While lower crude oil is pushing costs down, each polymer family is influenced by a different set of supply chain and market factors. Figure 3 lists key takeaways from the plastics overview.
II. As a buyer of resins, how can I take advantage of these lower prices?

This section of the paper covers three areas:

i. Conducting a deep dive analysis of your resin spend and segment each major plastic into its various type and family.

ii. Expanding your knowledge base to predict the future by building cost models (or polish off your old ones), following the markets through publications, tracking monthly movement of indices, and networking to gain “market intel”.

iii. Developing a communication cadence with key stakeholders so they are informed and ready to support key initiatives or recalibrate their activities based on the most up to date market information.

Figure 4 shows one way to segment resin spend.

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<tr>
<th>Thermoplastics:</th>
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<th>Plastic Types:</th>
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<tr>
<td>Acrylics</td>
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<td>Cellulose</td>
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<td>Polymers-PET, PBT, Polyolefin-HDPE, LDPE, PP, Polyurethane, Styrenes-ABS, Vinyls</td>
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When you move up the value stream after crude oil is refined, the feedstocks produced are not all equally impacted by the drop in the oil price. Each feedstock has a different correlation factor to oil that is influenced by supply and demand of the feedstock, manufacturing process, and region of the world the product is produced. Not all plastics start with crude oil as their primary building block.

Although all plastics are made from fossil fuels, some are manufactured from natural gas while others start with a crude oil. When the shale gas industry started drilling in North America, the natural gas price began to decline and went through a price drop of its own. Plastics derived from natural gas have most likely already experienced a feedstock price advantage, while the oil derived resins are just starting to see the affect.

Once you are able to understand a plastic’s origin, you can move to predict a feedstock’s price trends. As oil started to drop in in the last half of 2014, the resin feedstock chain looked like they were playing a game of “hot potato”. Each link in the product chain was trying to dump their products as their feedstock prices dropped. In several cases, large trading companies in Asia were actually selling product at lower prices than the raw material cost the product was made.
Figure 5 shows a non-uniform impact on downstream products. For example, regular grade gasoline prices have fallen significantly while premium gasoline have not, at least not in tandem with regular. The impact on plastic prices is similar; some will fall faster and drop more than others.

The Raw Material process flow chart (figure 6) shows which feedstock goes into which downstream product. It does not illustrate the supply/demand impact which pulls the molecules to other plastics making a higher return. Since most base plastics/feedstocks for engineered resins begin comingled with commodity plastics/resins, such as polypropylene, when monitoring the latest market developments, you can adjust your purchasing strategy accordingly.

Tactical/Strategic buying considerations after the Deep Dive Analysis:

- **Understand the price change frequency of each resin by supplier and family within your spend**
  - Can or should the frequency be modified, i.e., annually, quarterly, monthly?

- **Re-examine the correlation between your “buy side” and “sell side” resin prices.**
  - If market prices drop in February, your Customer may expect an immediate price decrease even though your Supplier contract does not require an adjustment until April or even July. This may be an opportune time to re-examine those contracts and synchronize your “buy side” contracts with your “sell side” contracts.

- **Reassess the type of pricing mechanism used to negotiate for resins**
  - Consider different price mechanisms such as negotiated market price, index to resin price, raw material formula price or cost plus, and fixed price/fixed with collar or band.
ii. Cost Models/Publications/Market Intel

In general, most experts predict that oil prices will continue to sell in a lower price band over the next two years versus the last two years. Therefore, it is very important to develop cost models and develop scenarios and predictive modeling. See figure 7 for a basic cost model.

Working with both commodity resins and engineered resins, engineered resins are more difficult to model but it is still possible. Usually these types of models have a stronger correlation to the actual month over month cost movement versus the starting price paid.

Additional considerations when building your cost model:

• Wikipedia is a great source of information to get started.

• Make sure you capture all of the inputs. Engineered Resins can include colorants, modifiers such as talc and glass, enhancers such as flame-retardants and UV. There may be an additional manufacturing step for remixing, extruding and pelletizing.

• The size and scale of a resin manufacturing plant will vary depending upon the year it was built, the integrated feedstocks on site, the technology used and region of the world it is produced.

• Trade publications can be purchased in order to track both historical and current raw material price indices for each resin modeled.

• Industry experts can also be an excellent source to make suggestions on your models or even help build them from scratch.

Tactical/Strategic buying considerations after building Cost Modes for resin family types:

• The price change frequency of each of the resins by supplier and by family, i.e., annually, quarterly, monthly.

  o Reassess the type of pricing mechanism you currently use: market price, index to resin price, raw material formula price or cost plus, and fixed price/fixed with collar or band now that you have models to more accurately predict the outcome.

• Discuss your models with your resin suppliers.

• We all live in a global economy where transparency is becoming the norm. The Asian resin market seems to be driving this trend, and now, you find both resin product cost and margin transparency for most commodity plastics and some engineered resins.
iii. Communicate inside your organization

The knowledge and insight purchasing professionals bring to an organization is even more valuable during conditions of uncertainty, as with the 2014 crude oil price reset, especially the impact to:

- Your marketplace
- Customers
- Resin suppliers
- Transportation suppliers, i.e., bulk truck
- Competitors
- Alternate materials

- Your internal organization:
  - Procurement areas other than resin
  - Finance
  - Supply Chain
  - Commercial

Tactical/Strategic buying considerations when developing your communication plan:

- Finance may also want to consider and manage the buy side/sell side impacts.

- Supply Chain and Finance may decide to adjust and set more optimal inventory levels for On Hand, In-Transit, and Finished Goods inventories based on when the various resin prices will change.

- Senior Management should be updated with cadence on any of the items bulleted in the beginning of Section iii.

Now let's look at the impact of lower prices on plastic components.
III. As a buyer of plastic components, how can I take advantage of these lower prices?

Lower resin prices should translate to lower pricing for plastic components. In most contractual relationships this does not happen automatically. The buyer must initiate action!

This section of the paper covers two key areas:

i. Assessing the impact of your existing supplier contracts on potential savings opportunities.

ii. Understanding the resin content and cost of your plastic parts.

i. Assessing the impact of your existing supplier contracts on potential savings opportunities

Below are results of a recent survey of automotive OEMs and Tier 1 suppliers regarding the types of pricing contracts that they had with their plastics suppliers.

By spend coverage, 42% had Index-Based contracts with automatic adjustments for resin movements and 58% had annual contracts with no automatic adjustments. These annual contracts were primarily firm price contracts with some open to negotiation. Specific to the automatically adjusted contracts, we asked about the frequency of adjustment with the most common being Quarterly at 50%, Semi-Annually at 33% and Monthly at 17%.

Both types of contracts present opportunities for discussion with suppliers in today's environment of falling resin and feedstock prices.

Index-Based Contracts with automatic adjustment for resin price movements.

Positives:
- The contract automatically adjusts component prices with rising or falling resin market prices; this tends to be fairer for both buyer and seller.
- They can be completely neutral for the buyer if synchronized with their Customer’s resin Index on the Sales side.
- It's a simple analysis for Buyer assuming they have access to the index data that's pegged in the contract.

Negatives:
- There can be lost opportunity in periods of rapid and significant resin cost drops.
- If you are pegged to a market price index, you will eventually realize benefits of falling resin prices but the actual industry manufacturing costs may be dropping more rapidly and more significantly.
This presents opportunities as demonstrated in figures 8 & 9 below.

Figure 8: The blue line shows falling market prices and the red line shows manufacturing costs that are falling at a more rapid and significant rate. This can represent an opportunity for a discussion with the plastic part supplier and in turn a discussion they need to have with their resin suppliers.

Figure 9 shows opportunity based on adjustment frequency. As noted earlier the majority of contracts are adjusted quarterly. This is represented by the blue line in the graph while monthly adjustments are shown by the red line. There are areas of opportunity are due to the lag of quarterly adjustments. While we’re not suggesting you go after a formal change in the contract to move to monthly, it is another area for discussion with your supplier.

Also, as a side note, you need to be prepared for these types of discussions with the supplier if costs and prices were to make a big movement upward. While this isn’t predicted for most resins in the near term, this type of discussion can cut both ways.

**Annual contracts with no automatic adjustments**

**Positives**
- Reduced exposure to rising resin prices
- Lower administrative burden on the Buyer due to fewer PO amendments

**Negatives**
- Lost opportunity with falling resin prices/costs

Figure 10 below shows two areas of opportunity. The green line shows your price that will not change through the year unless action is taken. The blue line shows the falling market resin prices and the potential opportunity for reduction and the red line represents the falling industry manufacturing costs with a corresponding further area of opportunity.
Two additional areas to consider: what is your customer’s expectation of price reductions? Understand this before having discussions with your suppliers. Talk to your sales group. Secondly, you must have knowledge of the specific resins in your plastic components and the historical and projected price and cost movements of the raw material.

**ii. Understanding the resin content and cost of your plastic parts**

At APD, we believe that obtaining and using supplier cost breakdown information is fundamental to eliminating cost from the supply chain and arriving at win/win solutions. We use breakdowns and cost models in our client engagements and also teach their use in our training curriculum. Several benefits to using this approach from the buyer viewpoint and for suppliers –

- It is a data driven approach, and if used consistently makes issue resolution easier.

- It can change the tenor of negotiations from positional (win/lose) to less stressful, more collaborative, partnership based negotiations

- It Increases knowledge of operations as well as cost accounting which can benefit the buyer personally.

There are five traditional areas of cost in a typical component, illustrated in figure 11, with material comprising 50-70% of the cost.

The breakdown information templates that APD uses, breaks each of these areas down into greater detail. Focusing on the material breakdown, we obtain the following elements related to material:

- Material Type
- Material Purchase Cost
- Gross, Net Weights of the raw material
- Process Scrap
- Value of Resale/Reuse of Scrap
- Freight cost of material
In preparation for discussions with your key plastic component suppliers, the buyer will want to gather the relevant data.

- From the supplier cost breakdowns, know the resin grades used in your plastic components.
- Use industry publications, e.g., IHS, to understand recent and projected resin prices as well as feedstock/manufacturing costs. The cost information is important as we discussed previously because as market prices are going down, costs to produce resins may be falling even further and more rapidly.
- Also, use this as an opportunity to verify current breakdown information and perhaps challenge any outdated information: material alternatives, part weights, etc.

**Is it feasible to pursue alternate materials?**

- Are there materials that are less expensive or whose prices correlate more with falling oil prices, for example, polycarbonate prices are not expected to fall in line with oil prices; are there substitute grades that will?
- A big consideration is the timing and cost to approve the alternate material, is it feasible to change given the timing and approval cost?

**Are your part weights accurate?**

- Physically weigh parts yourself and compare against quoted weight.
- Compare quoted weight to CAD weight data.

Part weights can change rapidly and frequently through design changes and not always get documented in the cost breakdowns. Use this as an opportunity to weigh your key parts and challenge the current pricing breakdown information where appropriate.

Then use the resin price and cost data and updated weight information to calculate the new “should be” cost.

And finally, communicate opportunities internally with Finance, Material Planning, Sales, & Senior Management to ensure that all of your key stakeholders are aligned with the opportunities.

And most importantly, take action with your suppliers.
About APD, the Purchasing Authority

Advanced Purchasing Dynamics (APD), the Purchasing Authority, provides manufacturers with market-leading solutions to streamline all facets of procurement and purchasing operations. Companies partnering with APD benefit from six service components: SYRE purchasing software, cost engineering, training, placement/recruitment, consulting and Service Delivery & Optimization of purchasing processes. APD's SYRE cloud software solution and precision cost engineering services deliver a real-time assessment of supply chain operations and identify ways to streamline processes and lower costs. Manufacturers gain value through APD by "should be" cost modeling, and automated purchasing analytics and reporting, resulting in improved decision-making. With the Purchasing Authority, enterprises decrease costs and improve bottom lines. Visit apurchasingd.com for more information.

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Paul joined IHS Chemical (legacy CMAI) in 2007 as a Senior Consultant focused on the launch of the Global Engineering Resins market advisory service. Paul has over 30 years of experience in the engineering plastics business.
Prior to joining IHS Chemicals, Paul’s held product management, sales & marketing management and financial management positions at GE Plastics, Clariant, LNP Engineering Plastics and Albis Plastics. Paul began his career with GE in Finance where he held multiple positions, the last of which was Manager Finance, Composite Polymers Operation.

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