

August 14, 2024

2024 Paints, Coatings, Adhesives: Tepid Macro with Bright Spots

We were pleased to host the **ChemQuest Group** for our 25th annual *Paints, Coatings, & Adhesives* conference call. **CEO Dan Murad** once again provided insights into the ~\$197B coatings industry (up from ~\$192B in 2022), including an overview of market conditions, trends, and forecasts. During our 2022 call, the raw material suppliers had the upper hand with shortages and rapidly rising prices. During our 2023 call, the discussion turned to elevated inventories and destocking, presenting margin expansion opportunities for the coatings producers. Today, it feels like raw materials have largely stabilized but the main missing piece for a revamped industry is tied to more tepid global economic growth and domestic construction activity, with elements of “stagflation” coming to the fore. Price increases are also moderating from the most recent double-digit increase levels.

Among the key highlights is ChemQuest’s tracking of ~20 raw materials with its CQMI index (**Figure 2**). The patterns are clear with deflation during the initial stages of Covid, only to begin an upward tilt as we entered the fall of 2020 sparking a rise that lasted into the middle of 2022 (CQ estimates that a \$10 change in oil results in a 3% variance in raws for coatings/adhesives manufacturers with a 0.71 correlation). In total, Dan expects to see a modest ~2% reduction in coatings raw materials for 2024, following the ~8% decline in 2023; a sheer contrast to the double-digit inflation seen in 2022.

On **M&A**, Dan detailed that “higher interest rates dented M&A activity” with many companies who were planning to sell delaying deals. CQ noted that following the three-year period of 2020 to 2022 where at least 20 “mega” coatings M&A deals took place each year, 2023 saw a material slowdown to just 4 transactions. **PPG’s** announcement regarding its strategic review of its U.S. and Canadian architectural paints business was a prime topic for the Q&A. Given the global consolidation that has taken place, Dan expects that any transaction that might occur would more likely involve a financial sponsor rather than strategic. He further opined that given the differences in profitability by region among the company-owned stores, a potential transaction could be on a geography-by-geography basis.

Global coatings value is expected to top **\$200B** in 2024, but only grow 1.8% vs. 2023, though expected to average ~7% CAGR between 2024 – 2027. CQ estimates the overall U.S. coatings market saw volumes down 1.8% in 2023, while pricing increased 5.1% in an attempt to offset raws. 2024 is forecast to see total U.S. volumes increase 2.6% (a reduction from earlier expectations), while pricing is trending up 2.3%.

Within **Architectural Coatings**, (~60% of the domestic market), we appreciated Dan coining the “trifecta of headwinds” of the housing market/affordability crisis consisting of high mortgage rates, elevated home prices and constrained housing inventory. For 2024, new homes sales are forecast to be down 4% and existing home sales are projected up 1%, while remodel/refinish activity is expected to decline. Following a 1% decline in 2023, 2024 is forecast to see volumes up 2.7% and pricing up 2.1%.

For **Industrial OEM**, the slowdown in durable goods is having a dampening effect as it accounts for 2/3 of the segment. Auto OEM is another ~13%, which is showing the moderating impacts from a lower EV outlook. Following a 7% increase in 2023, 2024 is forecast to see volumes up 2.3% and pricing up 2.7%. For **Special Purpose**, Dan was very upbeat on the protective coatings outlook, largely from spending in the on and off-shore energy space. Auto refinish is among the highest value segments. Following an 8% increase in 2023, 2024 is forecast to see volumes up 2.4% and pricing up 2.6%.

Frank Mitsch
Senior Analyst /
frank@fermiumresearch.com

Aziza Gazieva
Vice President /
aziza@fermiumresearch.com
(917) 810-5377

Chem  Quest

Chem  Quest
TECHNOLOGY INSTITUTE

Chem  Quest
POWDER COATING RESEARCH

The ChemQuest Group
One Waterstone Place
9435 Waterstone Blvd., Suite 270
Cincinnati, OH 45249
513-469-7555
chemquest.com

Table of Contents

Paints and Coatings	3
Market Overview	3
Leading Producers	5
Margins and Raw Materials	9
Architectural Coatings	12
Industrial OEM Coatings	16
Special Purpose Coatings	20
Adhesives and Sealants	23
Market Overview	23
Industry Margin	25
Macroeconomic Backdrop	27

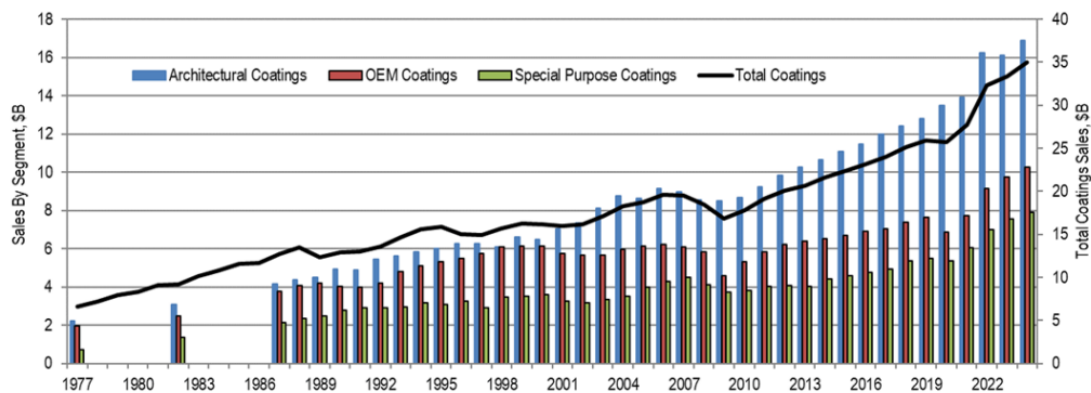
Thank you to our summer intern, Noah Goldberg, for his notable contributions to this report!

Paints and Coatings

Market Overview

Since the turn of the century (actually, millennium!), coatings have shown relatively steady growth, at about **3.2% CAGR** (2000-2023). The paints and coatings industry can be categorized into three markets: *Architectural* (aka: decorative), *OEM*, and *Special Purpose*. *Architectural Coatings* have been a clear outperformer, growing at a 4.0% CAGR (2000-2023). *OEM* and *Special Purpose* coatings have grown at 2.0% and 3.3% CAGRs, respectively, over the same time period. All three are forecast to see continued growth in 2024.

Figure 1. U.S. Coatings Sales by Segment, 1977-2024

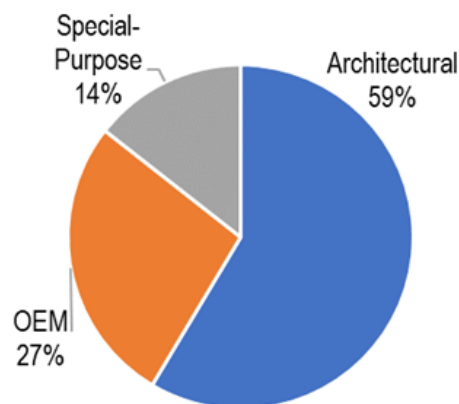


Source: The ChemQuest Group and Fermium Research LLC

Architectural Coatings make up 48% of the **\$35.0B** U.S. coatings sector value and 59% of the **1.36B gal** volume. New home sales typically contribute just 25% of demand for coatings, while existing home sales really drive *Architectural*, contributing 75%. For 2024, new homes sales are forecast to be down 4% and existing home sales are projected up 1%. *OEM* constitutes roughly 29% of the sector, followed by *Special Purpose* at 23%.

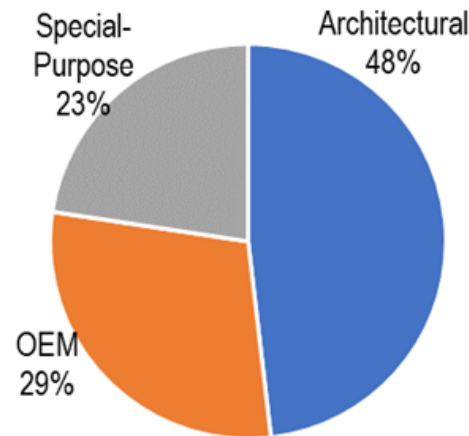
For its 2024 U.S. outlook, CQ forecasts *Architectural* volumes to increase to 797MM gal (**\$16.9B** in value). *OEM* and *Special Purpose* volumes are expected to increase to 368MM gal (**\$10.2B**) and 196MM gal (**\$7.9B**), respectively. These forecasts reflect yr/yr **volume** increases of 2.3% for *OEM* and *Special Purpose* and a 2.4% decline for *Architectural*.

Figure 2. 2024 U.S. Paints & Coatings Segments by Volume, 1.36B gal



Source: The ChemQuest Group and Fermium Research LLC

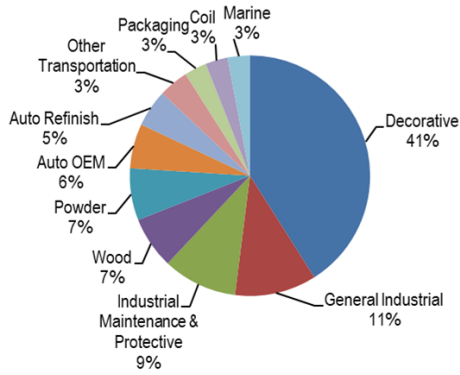
Figure 3. 2024 U.S. Paints & Coatings Segments by Value, \$35.0B



Source: The ChemQuest Group and Fermium Research LLC

The 2023 global breakdown differed from that of the U.S., as *Architectural* accounted for a smaller piece of the pie in other regions. Specifically, *Architectural/Decorative* accounted for 41% of sales on a global basis and ~50% in the U.S., while *OEM* accounted for a larger portion of demand worldwide.

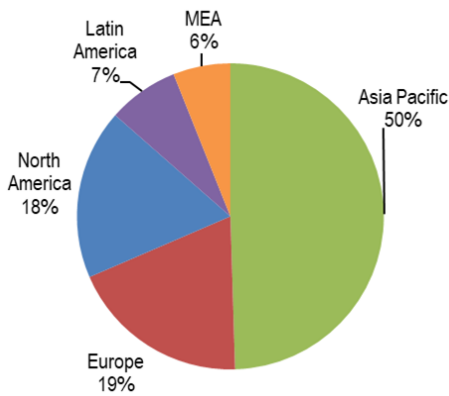
Figure 4. Paints & Coatings Global End-Market Breakdown, 2023



Source: The ChemQuest Group and Fermium Research LLC

By region, **Asia** is the leading coatings consumer, accounting for 50% of global demand, followed by **Europe** at 19%, and **North America** at 18%.

Figure 5. Global Coatings Regional Breakdown, 2023



Source: The ChemQuest Group and Fermium Research LLC

Leading Producers

Since the early 2000s, the landscape of coatings companies has changed significantly. In recent years, **SHW** has moved to the No. 1 position following its acquisition of Valspar, though **PPG** is trailing closely behind. The top three coatings firms, SHW, PPG, and AkzoNobel, account for 64% of the top nine coatings firms' sales.

Figure 6. Top Coatings Producers, Sales in \$B, 2003 – 2023

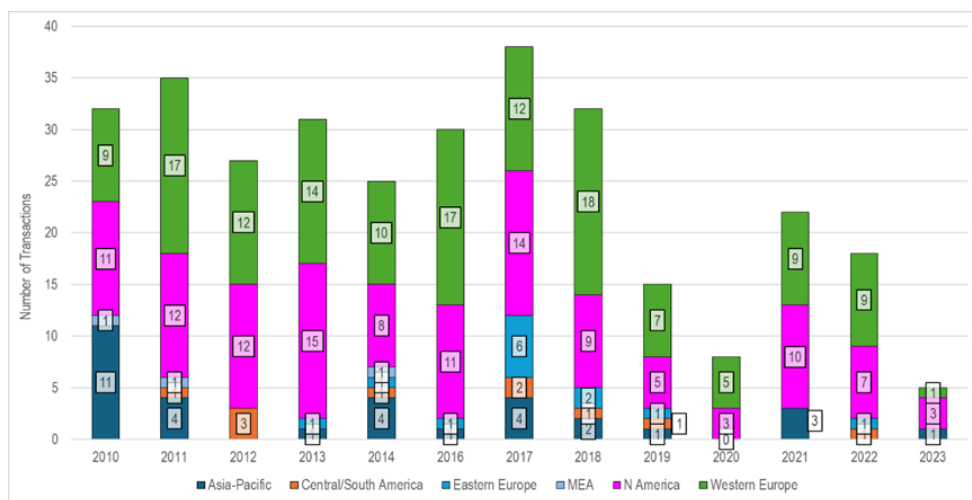
\$ Billions	2003	2008	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Sherwin Williams	5.4	8.0	11.1	11.3	11.9	15.0	17.5	17.9	18.4	19.9	22.1	23.1
PPG	4.8	10.1	14.3	15.3	14.8	14.8	15.4	15.1	13.8	16.8	17.7	18.3
AkzoNobel	6.3	14.2	12.1	11.1	10.5	10.4	10.9	10.9	10.0	11.3	11.6	11.6
Nippon Paint	1.9	2.0	2.8	3.9	3.9	5.2	5.7	5.6	6.3	8.1	10.0	10.1
Axalta	3.7	4.1	4.4	4.1	4.1	4.4	4.7	4.5	3.7	4.4	4.9	5.2
BASF	2.4	3.3	3.8	3.5	3.5	4.3	4.5	4.4	4.0	4.0	3.9	4.7
Kansai Paint	-	1.9	2.9	2.9	3.0	2.8	3.6	3.8	3.3	3.0	3.8	3.8
Masco	-	-	2.0	2.0	2.1	2.2	2.4	2.5	2.8	3.0	3.0	3.3
Jotun	-	1.6	2.0	2.0	1.8	1.8	2.0	2.2	2.4	2.6	2.9	3.0
Valspar	2.3	3.3	4.5	4.4	4.2	-	-	-	-	-	-	-

Source: The ChemQuest Group and Fermium Research LLC

On **M&A**, Dan detailed that “higher interest rates dented M&A activity” with many companies who were planning to sell delaying deals. CQ noted that following the three-year period of 2020 to 2022 where at least 20 “mega” coatings M&A deals took place each year, 2023 saw a material slowdown to just 4 transactions. **PPG’s** announcement regarding its strategic review of its U.S. and Canadian architectural paints business was a prime topic for this year’s Q&A. Given the global consolidation that has taken place, Dan expects that any transaction that might occur would more likely involve a financial sponsor rather than strategic. He further opined that given the differences in profitability by region among the company-owned stores, a potential transaction could be on a geography-by-geography basis.

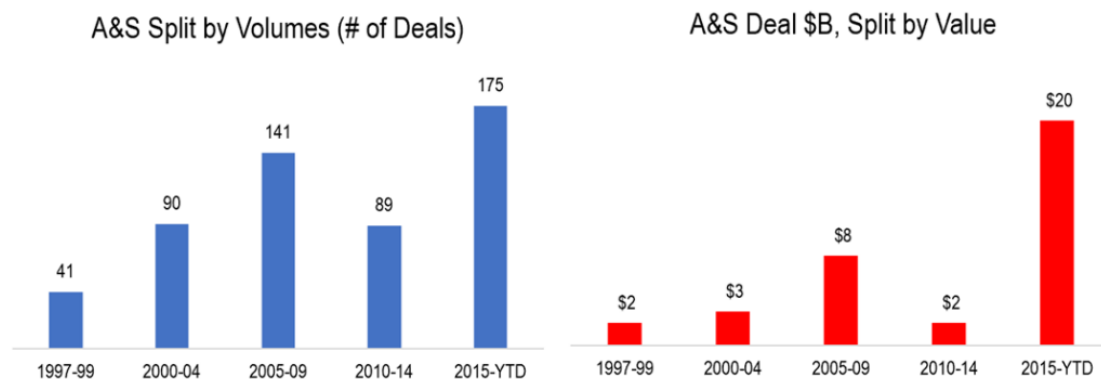
PPG completed multiple transactions in recent years (e.g., Tikkurila, Ennis-Flint, and VersaFlex in *Performance Coatings*, and Wörlag and Cetelon in *Industrial Coatings*) as M&A has been the largest use of cash over the past 10 years (~35% of total), but appears to be shifting its strategy toward organic growth, with a focus on acquisitions of “the right property at the right price at the right time.” **RPM** has largely focused on its acquisition strategy as a main pillar for the company over the last 30 years though has slowed of late. After spending \$127MM on M&A in F2022, it declined to \$48MM in F2023 and just \$16MM in F2024.

Figure 7. Paints and Coatings Acquisitions by Acquiring Region, 2010 – 2023



Source: The ChemQuest Group and Fermium Research LLC

Figure 8. Adhesives & Sealants Deals by Volume and Value, 1997 - 2024 YTD

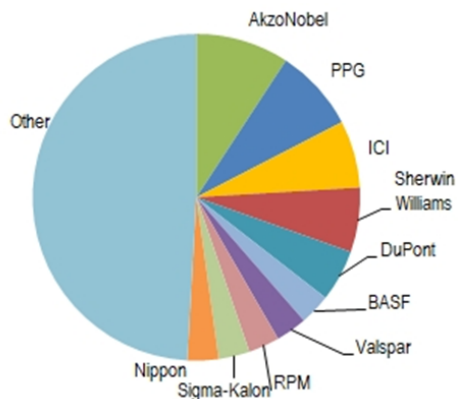


Source: The ChemQuest Group and Fermium Research LLC

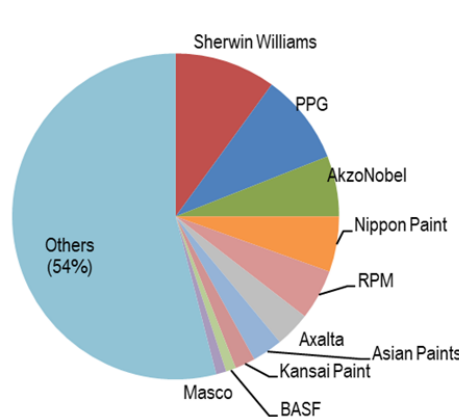
Since 2002, we've seen both **SHW** and **PPG** grow to their current dominant positions, with AkzoNobel trailing closely. According to PPG's estimate of a ~\$190B global industry, the top 10 producers account for roughly half of the market.

Figure 9. Global Coatings Industry, 2002, \$65B

Figure 10. Global Coatings Industry, 2023, \$190B



Source: PPG

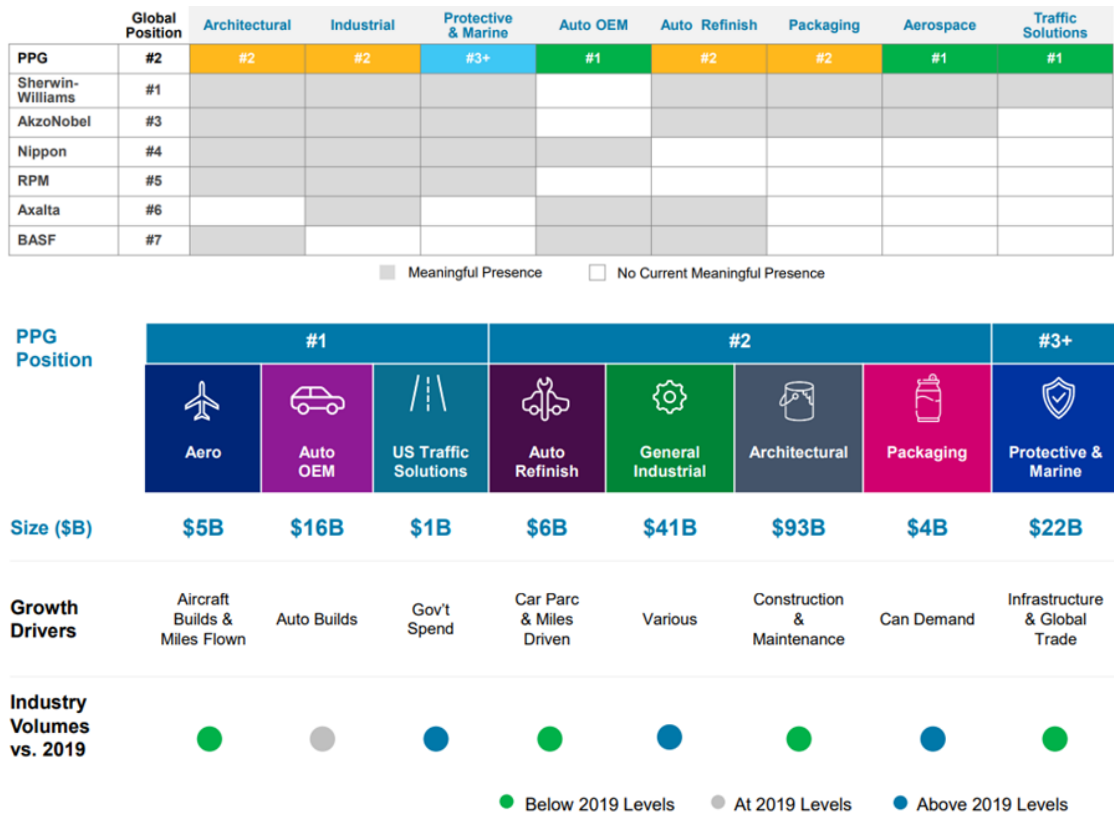


Source: PPG

By end market, **PPG** is the only global player that competes in all major categories, with its Ennis-Flint acquisition propelling it into the pavement markings category, as well. Despite the 2012 sale of AkzoNobel's North American *Architectural Coatings* business to **PPG**, AkzoNobel still ranks within the top three global coatings positions across most markets (except for auto OEM, as it does not participate). Also notable from this analysis is **RPM's** participation in only three of the seven segments, focusing on architectural, general industrial, and protective & marine coatings.

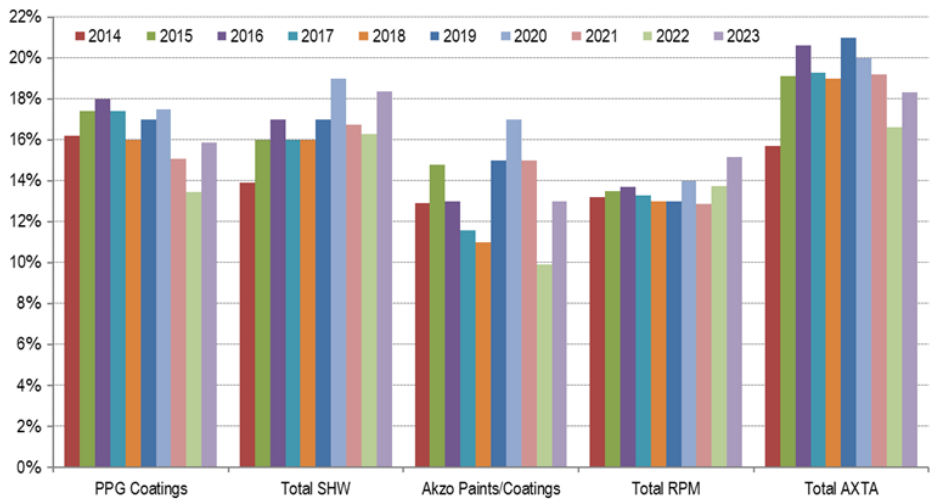
SHW is the No. 1 architectural paint supplier globally, with the highest brand awareness. **SHW** also secured an exclusive agreement with Lowe's Home Improvement, allowing it to be the sole supplier of architectural paints within Lowe's stores. **PPG** ranks No. 2, and the AkzoNobel North America deal added the popular *Glidden* brand. **PPG** strength stems from its leadership positions in the auto OEM, aerospace, and pavement markings segments, while holding #2 positions in architectural, general industrial, refinish/collision, and packaging. **PPG** is also ranked third for its protective & marine segment.

Figure 11. Global Competitive Positions of Coatings Companies, February 2024



Comparing the **margins** of major coatings producers, **PPG** historically was the leader among its competitors, sporting a ~17% margin in strictly coatings, but has trailed behind SHW and AXTA of late. AXTA took first place in 2015 with a 19% margin. Other companies such as **SHW**, **AkzoNobel**, and **RPM** all ranged between 11% and 19% in recent years. Historically, RPM's margins have lagged peers, giving more than enough ambition to catch up through its renditions of *MAP to Growth* programs.

Figure 12. Coatings Peers' EBITDA Margin, 2014-2023



Source: PPG and Fermium Research LLC; Note that PPG adjusted all historical data to reflect Glass operations as disc ops.

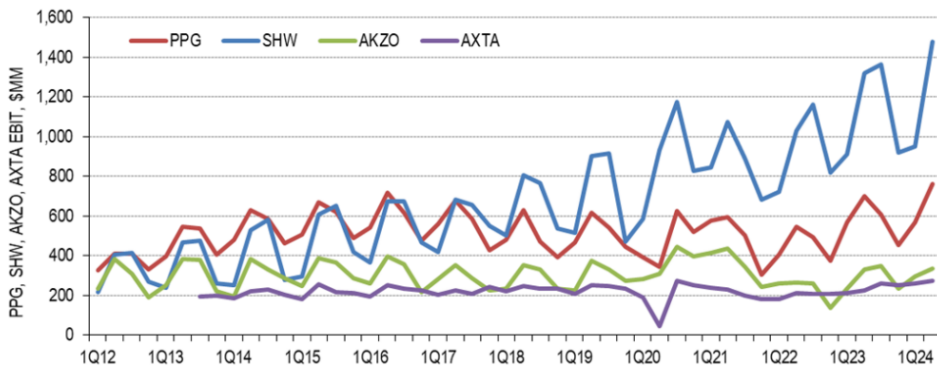
Looking more recently at the topline yr/yr comps for 2Q24, performance was mixed with **PPG's** sales down 2% yr/yr factoring 1% headwinds tied to FX and divestitures. After 27 consecutive quarters of higher pricing, 1Q and now 2Q saw pricing flat yr/yr. Following several quarters of declining yr/yr volumes, 2Q volumes remained flat, missing expectations of actual positive growth. **SHW** 2Q sales were flat yr/yr and noted volume gains in its *Paint Stores* and *Performance Coatings Groups*, partially offset by lower sales volumes in its *Consumer Brands Group*. **AKZO** sales increased 2% yr/yr (vol +1%, price/mix +1%, M&A +1%, FX -1%) with earnings fairly flat.

AXTA saw sales rise 4% yr/yr (vol +5%, price/mix flat, FX -1%) with its commercial vehicle related business posting HSD yr/yr organic growth within *Mobility Coatings*. **RPM** saw F4Q24 flat yr/yr (organic +0.4% (all P, no V), M&A -0.1%, FX -0.7%) as its sales in LatAm increased 5%, while the largest region, N.A., was up 1% and Europe declined 4%.

For **3Q24**, expectations are for a modest yr/yr increase at PPG with a more substantial yr/yr increase at SHW. Looking at 2024 following the 2Q conference calls, **PPG** reduced its full year guidance to **\$8.15 - \$8.30** (prior **\$8.34 - \$8.59**; down ~3% at the midpoint), as it now expects 2H24 to increase by just ~7% yr/yr vs. the prior expectations of ~15% higher yr/yr growth, citing softness in global auto and arch EMEA. Following a stronger than expected 2Q, **SHW** raised its 2024 expectations to post low-single-digit growth in sales for the year led by its *Paint Stores Group*, while raws are projected down LSD yr/yr.

RPM is guiding F1Q EBIT to a range of \$318MM - \$330MM, which ought to be the 11th consecutive record result. F1Q sales are expected to be flat at ~\$2.01B. For fiscal 2025, it offered sales guidance at up low-single digits with the adj EBIT range up mid-single-digits to up low double-digits with consensus expectations currently at up 10%. Nearer-term, *MAP* benefits, continued favorable trends in infrastructure, high performance buildings, and resilient repair/maintenance demand will largely offset continued macro weakness, especially in Europe, continued DIY and residential OEM market weakness, and challenging comps. Many of these trends are expected to carry-through in F2025 with positive pricing expected vs. a return of inflation, especially in F2H25. Limited economic viability was also cited, including election uncertainty.

Figure 13. EBIT Comparison for Coatings Competitors, 1Q12 - 2Q24



Source: Company Reports and Fermium Research LLC

Margins and Raw Materials

The cost structure for a U.S. coatings company has continued to remain relatively unchanged over the past few years. On average, raw materials moved up slightly beginning in 2018, but started to moderate in 2022 and now reaching 43%-54% of sales, off of the peaks of earlier years with TiO₂ inflation. Other major raw materials include acrylics, phenol, and other pigments. *Gross margin* was in the mid-30% area a decade ago but is ranging between 35-48% recently.

Among the key highlights is ChemQuest's tracking of ~20 raw materials with its CQMI index (**Figure 15**). The patterns are clear with deflation during the initial stages of Covid, only to begin an upward tilt as we entered the fall of 2020 sparking a rise that lasted into the middle of 2022 (*CQ estimates that a \$10 change in oil results in a 3% variance in raws for coatings/adhesives manufacturers with a 0.71 correlation*).

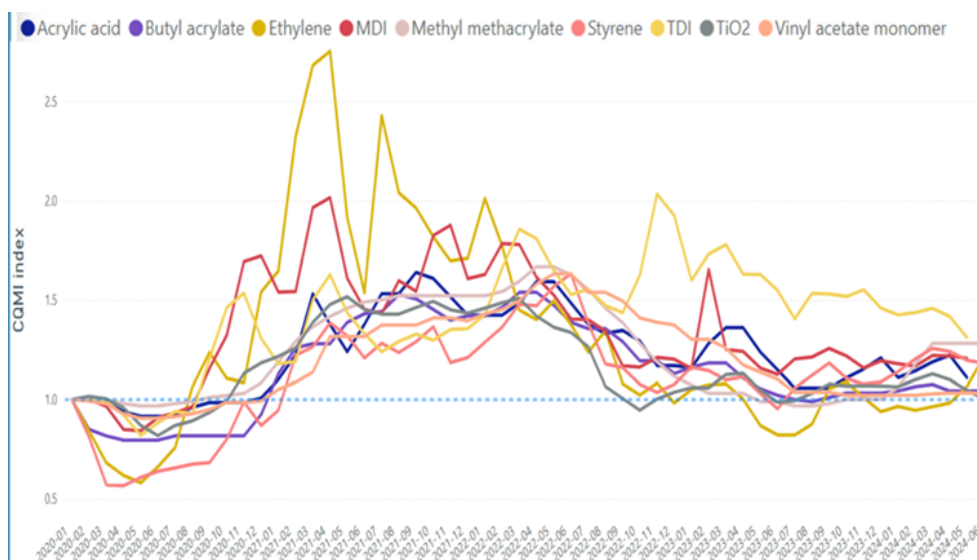
Figure 14. Comparison of Average U.S. Companies' Cost Structures, 2005-2023

	2005	2009	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Sales	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Cost of Goods Sold															
Raw Materials	50-55%	45-49%	47-53%	45-53%	45-53%	43-51%	44-52%	43-51%	45-53%	45-55%	45-55%	45-55%	47-58%	46-57%	43-54%
Labor	6%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Energy	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Overhead, Taxes, Ins., Dep., Pkg.	7%	6%	6%	6%	6%	6%	6%	6%	6%	4%	4%	4%	4%	4%	4%
Total	65-70%	58-62%	60-66%	58-66%	58-66%	56-64%	57-65%	56-64%	58-66%	57-66%	57-66%	57-66%	60-69%	57-66%	54-63%
Gross Margin	30-35%	38-42%	34-40%	34-42%	34-42%	36-44%	35-43%	36-44%	34-42%	34-43%	34-43%	34-43%	31-44%	32-45%	35-48%
SG&A	20-30%	19-34%	19-34%	19-34%	19-34%	19-34%	19-34%	20-35%	19-34%	19-34%	19-34%	19-34%	19-34%	19-34%	19-34%
EBIT	5-10%	8-17%	6-15%	8-15%	8-15%	10-17%	9-16%	9-16%	8-15%	6-13%	6-13%	6-13%	3-10%	4-11%	7-14%

Source: The ChemQuest Group, Inc. and Fermium Research LLC

In total, Dan expects to see a modest ~2% reduction in coatings raw materials for 2024, following the ~8% decline in 2023; a sheer contrast to the double-digit inflation seen in 2022. Therefore, the margin declines seen in 2022 are likely to be the low point for this cycle. However, selected coating pricing declines in 2024 are not out of the picture as Big Box, large REITs, auto OEM, and oil & gas asset owners exert their market influence, though this topic will spark a debate with paint producers. Raw material costs surged due to conflicts in Ukraine and Israel, disrupting coatings shipments, but have since declined and are projected to stabilize in 2024.

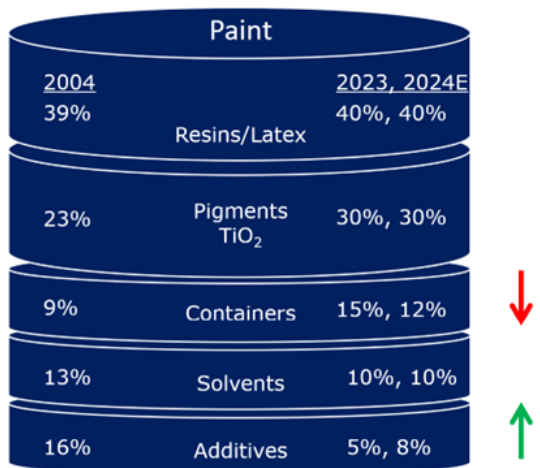
Figure 15. Elevated Raw Materials Expecting Some Abatement



Source: The ChemQuest Group, Inc.

The following exhibit shows the expected breakdown of the various raw materials found in a typical can of paint. Compared to 2023, CQ expects a slight increase in the share of additives, offset by containers ticking down. In recent years, the cost of containers also increased considerably, primarily reflecting metals inflation, but has shown some easing.

Figure 16. Raw Material Input for Avg Unit of Coatings, 2004, 2021, 2024



Source: The ChemQuest Group, Inc., SHW, and Fermium Research LLC

During 2012-14, pigments input was driven by mix, as solvent prices declined and new low-VOC resin systems utilized latex binders, driving higher pigment use. A look at the coatings cost structure over time shows that pigments trended upward during 2012-14 despite the considerable decline in TiO₂ prices. However, further TiO₂ price drops finally depressed cost in 2015, causing the input per unit percentage to drop from 2013-14 levels, though it has recently been increasing. Pigments now account for ~30% of raw material inputs.

Figure 17. Regional TiO₂ Pricing

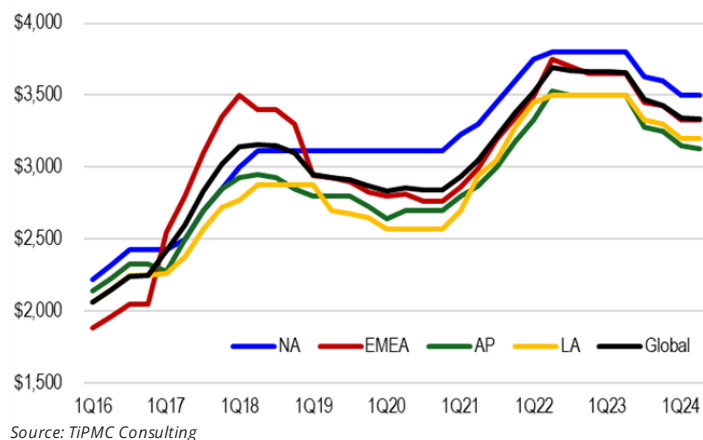


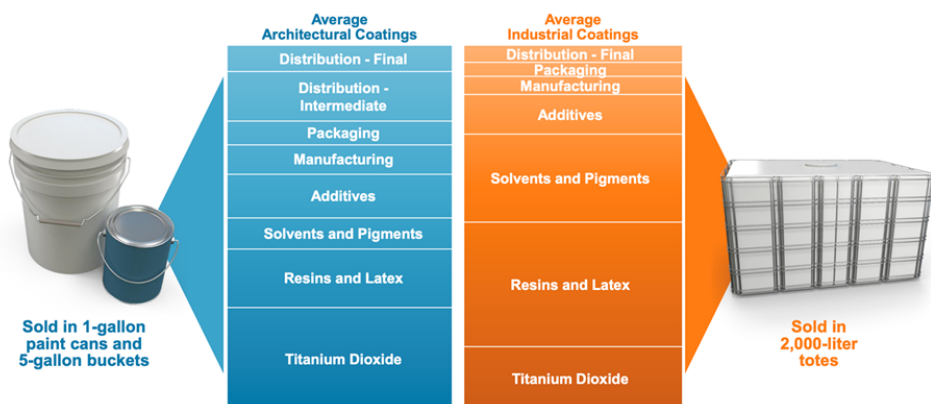
Figure 18. Historic Raw Materials Input Per Unit of Coatings (%), 2010-2024

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024E
Resins/Latex	37	36	37	40	40	38	40	44	44	43	41	43	40	40	40
Pigments	27	29	27	34	30	27	25	26	26	27	29	29	30	30	30
Containers	16	14	16	11	11	14	14	12	12	13	15	15	15	15	12
Solvents	10	12	10	5	9	10	8	7	7	8	8	7	10	10	10
Additives	9	10	10	10	10	11	13	11	11	9	9	7	5	5	8

Source: The ChemQuest Group, Inc. and Fermium Research LLC

Manufacturing costs and raw material inputs vary for *Architectural Coatings* and *Industrial Coatings*. *Architectural* paints use more TiO₂, as decorative paints require more opacity. *Industrial Coatings* use a larger amount of other such raws as resins, latex, solvents, and pigments. In terms of packaging, *Architectural* is typically sold in one-gallon paint cans and five-gallon buckets, while *Industrial Coatings* are mainly sold in 2,000-liter totes.

Figure 19. Coatings Cost Comparison, Architectural vs. Industrial



38 Source: PPG and industry estimates – figures vary greatly by end-use and application

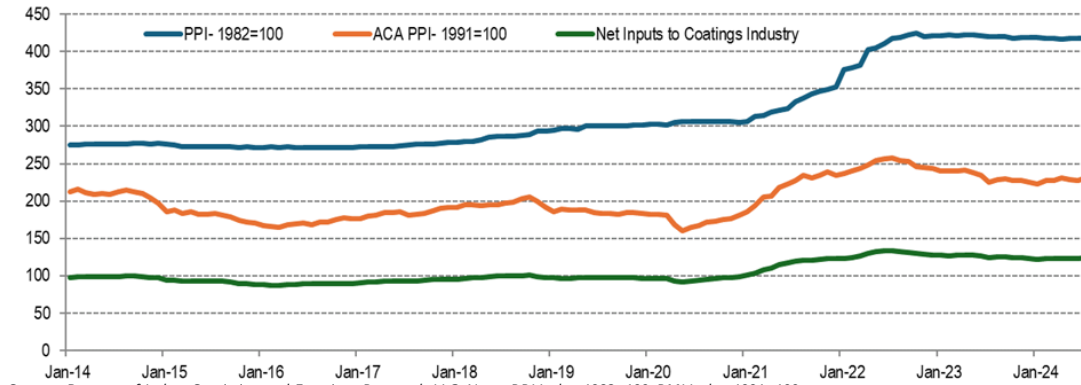
Source: PPG



Historically, price increases typically lagged raw material inputs by 3-6 months, resulting in margin squeezes in inflationary environments. The PPI and PMI for coatings dating back to February 2004 have ~78% correlation, though 2023 closed closer to 90%.

Paint producers have been effective at raising prices, with a significant step-up after 2010 in response to higher raws. Price increases accelerated in 2012 and have since been steady at a moderate level despite more volatile raw materials, though saw an acceleration in 2021. In fact, one of the attractive attributes of paints is that prices rarely go down, even if the underlying raw materials do.

Figure 20. PPI and PMI, Paints and Coatings Manufacturing, 2014 - Current

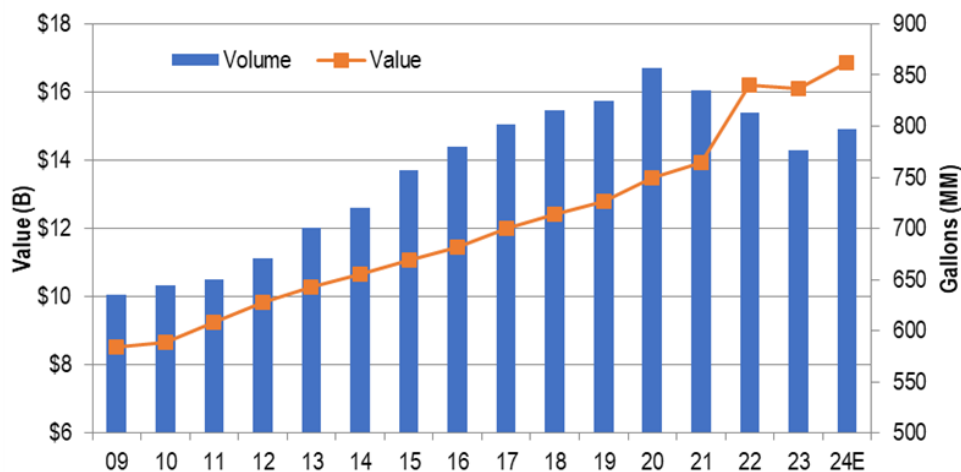


Source: Bureau of Labor Statistics and Fermium Research LLC; Note: PPI Index 1982=100, PMI Index 1991=100

Architectural Coatings

Architectural. Within the \$16.1B U.S. *Architectural Coatings* segment, sales are forecast to increase 5% (vol +2.7%, price +2.1%) in 2024 following a 1% decline in 2023. For 2024, new homes sales are forecast to be down 4% and existing home sales are projected up 1%. Remodeling activity shined through the pandemic as the crown jewel but slowed in 2023 and is expected to decline in 2024.

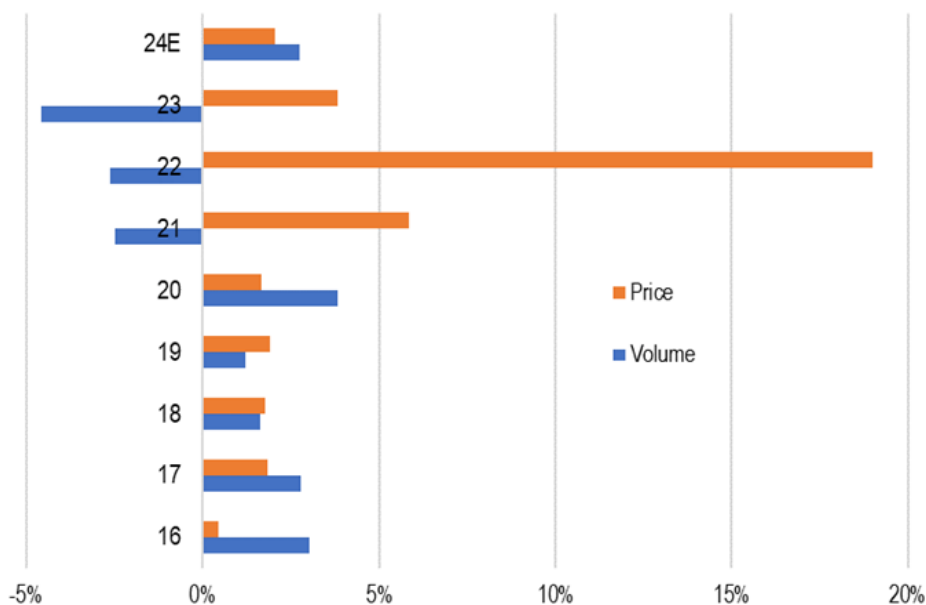
Figure 21. U.S. Architectural Value and Volumes, 2009 – 2024



Source: The ChemQuest Group, Inc.

Recent housing trends point to an increase in the average home size serving as a positive, though more open-space plans limit the surface area to be painted. Contractor applied paints continue to outpace, following the short reversal during Covid-19. Furthermore, the preferences toward zero VOC formulations (regulatory-driven), odor absorbing, and convenience paints (2-in-1 paint and primer products, faster dry, etc.) continue. The contractor portion (63%) has rebounded off the 2020 lows and back at 2019 peak level so is a modest benefit for SHW and less-so PPG, but the opposite for MAS which is more DIY-oriented.

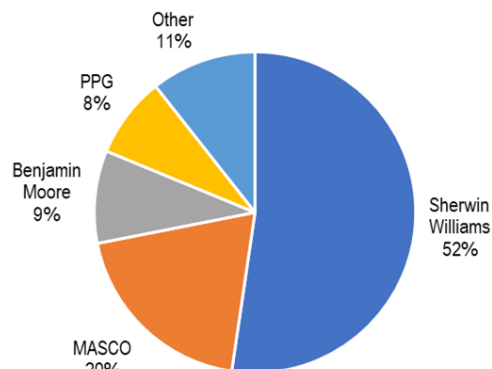
Figure 22. U.S. Architectural Yr/Yr Volume and Price Trends, 2016 – 2024



Source: The ChemQuest Group, Inc.

SHW, PPG, MAS (Behr) and BRKA (Benjamin Moore) are the segment leaders making up more than 90% of NA Arch coatings.

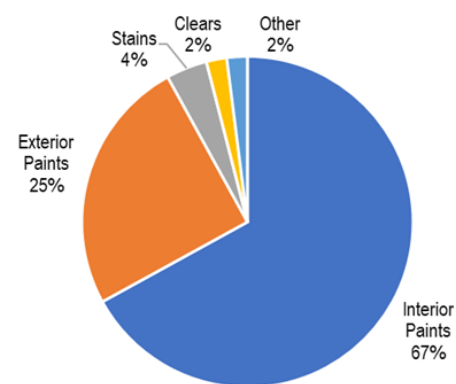
Figure 23. N.A. Architectural Coatings Producers, 2024



Source: The ChemQuest Group, Inc.

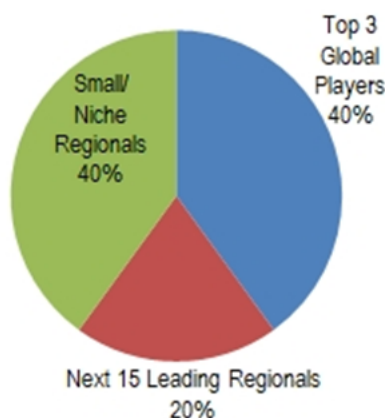
The end-market breakdown is estimated to be a 67/25 breakdown of interior paints vs. exterior, compared to 2018's 75/13 interior vs. exterior. The remainder includes stains, clears, lacquers, varnishes, and other categories. We estimate the top three global *Architectural Coatings* (SHW, PPG, AkzoNobel) producers take up ~40% of the global market, while the next 15 leading regionals (e.g., Asian Paints, BASF, Masco, etc.) are approximately 20% of the market.

Figure 24. Arch Coatings End Market Segment Share



Source: The ChemQuest Group, Inc.

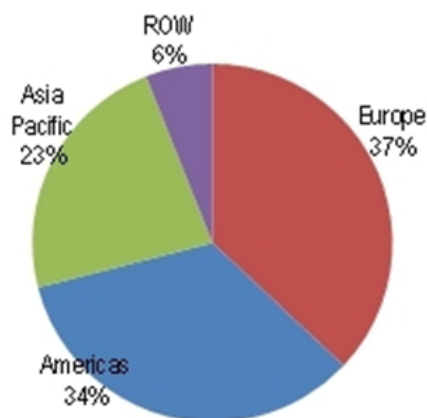
Figure 25. Global Arch Coatings Producers



Source: Fermium Research LLC

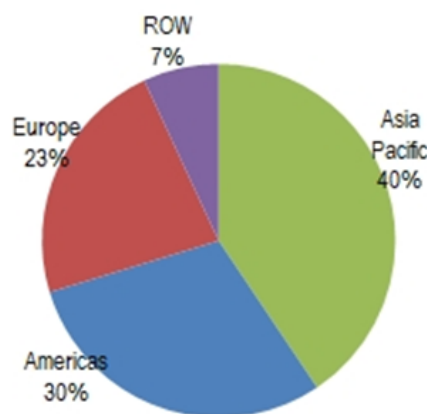
Regionally, Asia and the Americas account for roughly a third each of sales. Over recent years, Asia grew as a percent of total demand, due to faster economic growth, which has subsided. Consequently, Europe makes up a smaller percentage of the pie today.

Figure 26. 2009 Arch Coatings Demand by Region



Source: SHW and Fermium Research LLC

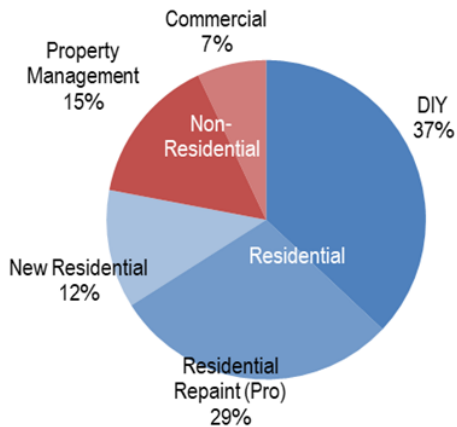
Figure 27. Recent Arch Coatings Demand by Region



Source: The ChemQuest Group, Inc.

Regardless of region, *Architectural Coatings* sales are largely driven by the residential market, with CQ estimating that residential accounts for almost 75% of coating's volumes.

Figure 28. U.S. Arch Market Breakdown by Type



Source: The ChemQuest Group, Inc.

Figure 29. CQ Arch Coatings Estimates

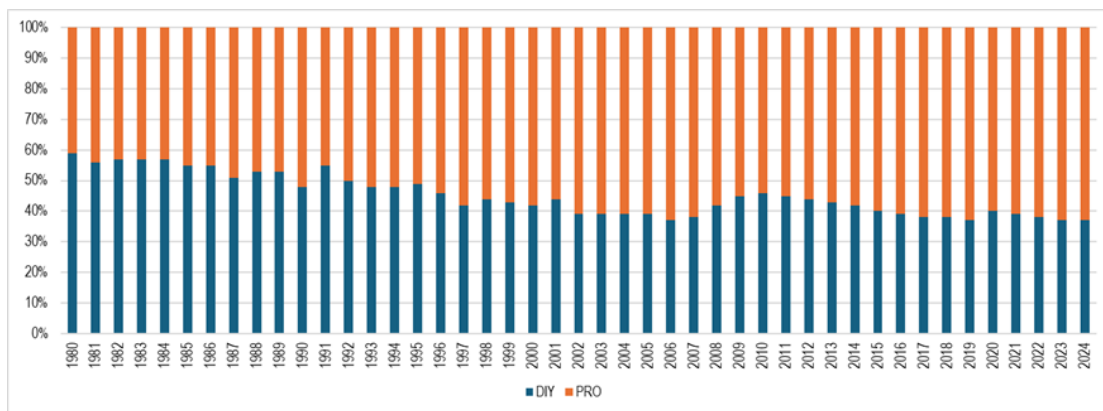
Sector	Approximate % of Market Gallons	Key Drivers of Growth for This Market Sector
DIY	40-45%	New and existing home sales
Residential repaint	15-20%	Existing home sales
New residential construction	5-8%	New home sales
New commercial and institutional construction	4-6%	Value of construction put in place
Residential property maintenance (MFU, condo)	5-8%	New and existing home sales Rental turnover rates
Commercial-institutional property maintenance	15-20%	New and existing home sales Economic growth – productivity, labor hours

Source: The ChemQuest Group, Inc.

Over the past several years (and punctuated during the recession), there has been a moderate shift back toward professional contractors (DIFM), representing about 63% of the market in 2019, well above 1980's 41%. 2020 saw an uptick in DIY projects during the pandemic, with 2020 reaching a 60/40 split but has since reverted back to 63/37.

Millennials have been moving toward DIY through their use of *Youtube* to learn how to paint, while Baby Boomers have moved toward professional contractors as they age. The majority of DIY purchases occur through such home centers as Home Depot and Lowe's. However, Home Depot and Lowe's are focusing on providing more products and services for professionals. Paint stores are a distant second, with dealers and mass merchants contributing to the remainder of sales. In contrast, contractors make most of their purchases at paint stores.

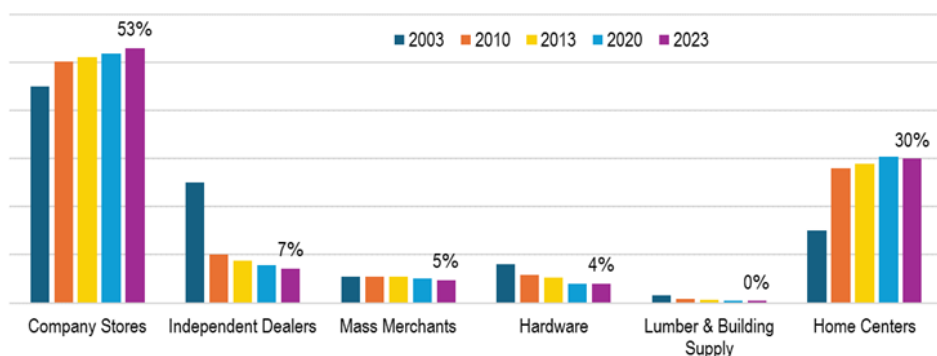
Figure 30. PRO vs. DIY in U.S., 1980-2024



Source: The ChemQuest Group, Inc.

Looking more closely at the channels of distribution, the predominance of company-owned paint stores for the contractor market shows why the aforementioned shift has continued to be favorable for **SHW**, which has ~4,930 stores across its Americas Group. **PPG** has ~750 company-owned stores in the U.S. and Canada, with 5,200 concessionaires in Mexico, having added ~1,600 new stores since the *Comex* acquisition.

Figure 31. Arch Distribution Channel Evolution



Source: The ChemQuest Group, Inc.

Globally, the *Architectural Coatings* channels of distribution mix is composed primarily of independent distributors, followed by such regional home centers as Lowe’s, Home Depot, and Bunnings, while mono-branded stores make up the remaining portion. Specifically for PPG in the U.S. and Canada, it estimates its *Architectural Coatings* sales breakdown across company stores, national retailers (DIY), and independent dealers to be 45%, 40%, and 15%, respectively.

Figure 32. PPG Global Arch Sales Mix

Region	Company Stores	Independent Dealers	National Retailers
USCA	45%	15%	40%
LA	~1%	90%	10%
AP	15%	35%	50%
EMEA	45%	30%	25%
Worldwide	35%	35%	30%

Source: PPG

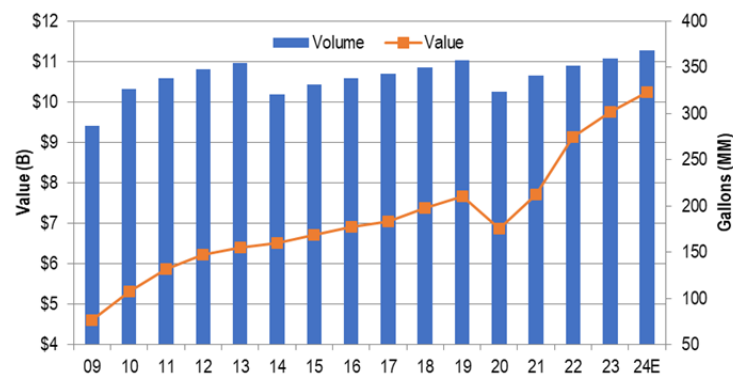
Another trend that has continued to be popular is **zero-VOC** formulation. Despite what the name implies, “zero-VOC” is not completely devoid of volatile organic compounds, as a small amount is added when color is blended with the base coats at the retailer level. Manufacturers are moving to a zero-VOC colorant/tinting system as they try to stay ahead of industry standards. Other formulation innovation has taken the form of **de-polluting coatings**, which prevent dirt from ruining surfaces. These can be used to keep buildings clean and reduce the need for renovations. **De-Nox coatings** have been on the rise as well, serving to reduce the number of nitrogen oxides and particulates that contribute to smog.

Emphasis on **convenience** also continues to be a major focus of consumers. Opportunities to save time or the number of painting steps are being developed, with a *prime* example being “*paint and primer in one.*” Manufacturers are formulating paints that dry faster or reduce surface preparation to paint. Additional emphasis is also being placed on the durability of the paints, with lifespans of greater than 25 years being targeted. This increases the value-add felt by consumers when using these new formulations of paint. All these changes help add value to products beyond what traditional painting provides, lending support to *higher average selling prices*, regardless of the level of raw material inflation/deflation.

Industrial OEM Coatings

Industrial. Following a 7% increase in 2023 U.S. *OEM Coatings* sales, 2024 is forecast to see pricing up 2.7% and volumes up 2.3%, reflecting a slowing in durable goods demand. The leading applications are general industrial, powder, coil, auto OEM, and wood (furniture, cabinets, etc.)

Figure 33. U.S. OEM Value and Volumes, 2009 – 2024

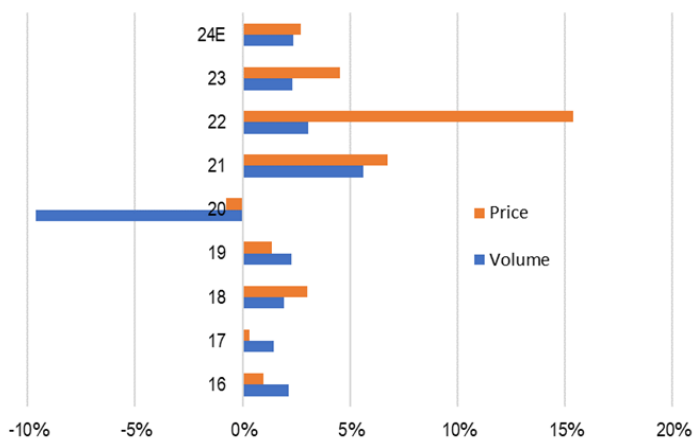


Source: The ChemQuest Group, Inc. and Fermium Research LLC

CQ highlighted such major trends as products that create reformulations amidst raws inflation, operational efficiencies (improve productivity/provide wet-on-wet applications, UV-curable coatings and powder coatings), increase sustainability especially in energy consumption, and provide innovation (solar heat management/infrared reflectance/noise vibration/uniform pigment distribution of premium vivid colors/self-healing). With such trends as light-weighting, there is an increased need for functionality and fuel efficiency across multiple substrates (i.e., steel, metal alloys, plastics, composites). **PPG, BASF, AXTA, and SHW** are the segment leaders.

CQ also highlighted *Light Vehicle Production*, which is expected to be up 3% globally for 2024. In terms of geography, South America and South Asia show the best opportunities for LVP growth with China leading production and Europe, NA, and Japan/Korea showing stability or modest declines. Additionally, higher than expected interest rates, greater impact related to the transition to battery-electric vehicles, and some automakers running with less inventory, are expected to put a cap on sales and production volume over the next five years. However, LVP is still expected to experience moderate growth until 2031, with a consistent upward trend each year. PPG estimates the global auto OEM coatings market at ~\$16B.

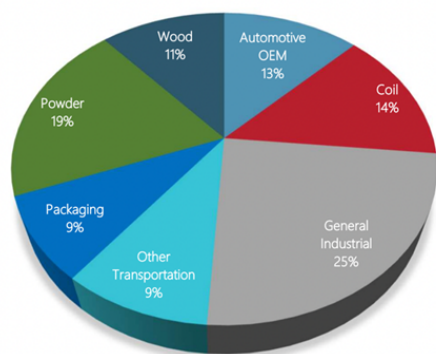
Figure 34. U.S. OEM Yr/Yr Price and Volume Trends, 2016 – 2024



Source: The ChemQuest Group and Fermium Research LLC

General Industrial is the largest *OEM* end market at about a fourth of sales, followed by powder and auto OEM, at 19% and 13% respectively. *Industrial Coatings* can serve functional (hardness, corrosion resistance) and decorative purposes in such household objects as refrigerators, HVAC, fireplaces, microwaves, and vacuum cleaners, and in such automotive parts as bumpers, axles, brake systems, and rigid and flexible exterior trim systems. They can also be used in electronic devices including mobile phones, laptops, and tablets. PPG estimates the global industrial coatings market at ~\$41B, with packaging at ~\$4B.

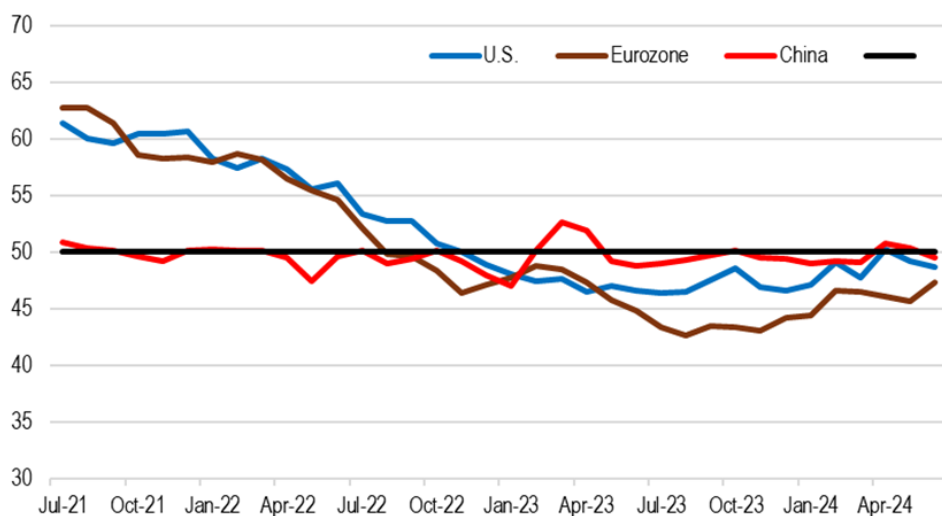
Figure 35. OEM Coatings End Markets, 2023



Source: The ChemQuest Group and Fermium Research LLC

SHW estimates that more than half of *OEM Coatings* sales are in Asia, followed by ~20-25% in Europe, and ~20% in U.S./Canada, and has highlighted that all regions are trending flattish or contracting in 2024.

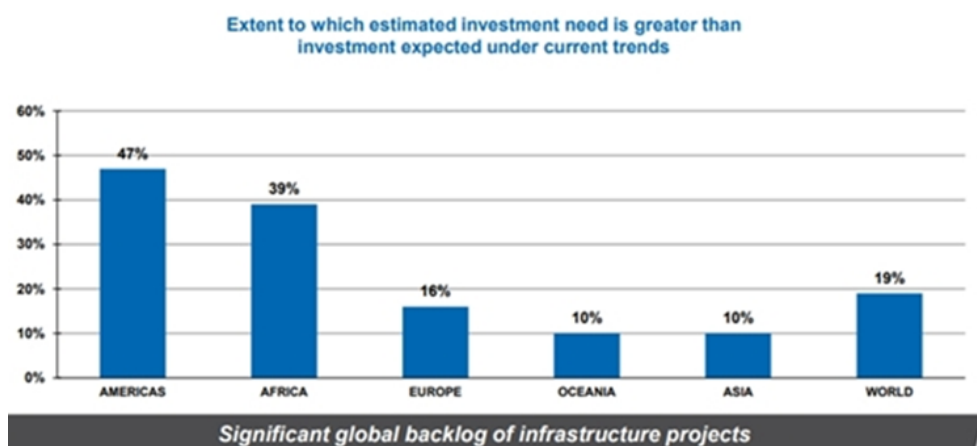
Figure 36. Purchasing Manager Index (Manufacturing) by Region, July 2021 – Present



Source: Bloomberg

Much of what drives demand in *Industrial Coatings* end markets relies on the macroeconomic environment and is fueled by industrial production. The fastest-growing region (in non-Covid times) has been Asia Pacific, as it saw bursts of economic and GDP growth, excluding Covid lockdowns. However, there are current concerns over the ability to maintain this in future. There are some expectations calling for even greater investment in infrastructure than is currently being planned, with the largest gap in the Americas. The discussions about added investment in U.S. infrastructure from new legislation are serving to bolster future expectations from many.

Figure 37. Infrastructure Investment Gap by Region, 2016-2040



Source: SHW

Compared to 2005, the competitive landscape has seen the biggest players take a larger share, though the market still remains fairly fragmented. PPG, which estimates that the 2023 global industrial coatings was ~\$50B, has expanded its footprint through acquisitions mainly focused on technologies, including *Worwag* (a global manufacturer of coatings for industrial and automotive applications), and *Cetelon* (a manufacturer of coatings for automotive and light truck wheel applications), though AkzoNobel remains the industry leader.

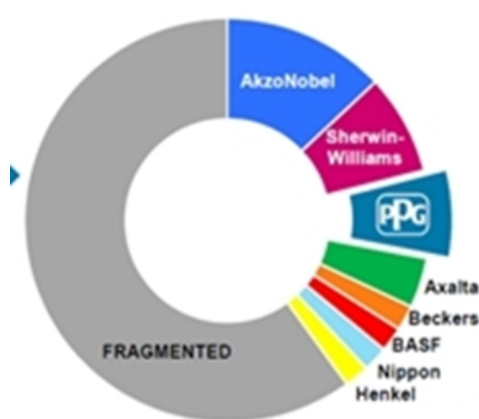
On *Industrial Coatings*, PPG offered that there are four technology offerings, including liquid, powder, pretreatment, and electrocoat. **Liquid**, which consists of traditional primers and topcoats, is by far the largest, accounting for nearly two-thirds, and continues to outpace competing technologies. **Powder**, for which a solid coating is applied by electrostatic spray, follows at ~25% but PPG believes it is growing faster than the market and will likely expand its portion of the market. **Pretreatment** and **electrocoat** are about 5% each; the former includes cleaners and phosphate chemicals to condition metal before paint is applied, while the latter applies coatings by electrically charged immersion. All major coatings producers offer liquid solutions, many offer powder, a handful offer E-coat, and **PPG** offers all four. Pretreatment is a primary technical solution in appliances, auto parts, general finishes, and heavy-duty equipment.

Figure 38. 2005 Industrial Coatings Competitive Landscape



Source: PPG and Fermium Research LLC

Figure 39. Current Industrial Coatings Players



Source: PPG

Several **major trends** are defining the current OEM coatings landscape. Operational efficiencies continue to be a major focus of the industry with the rise of automation in manufacturing leading to increased demand for coatings that cure faster and require less manual labor. Such advanced materials as nanocomposite coatings are being explored to enhance performance. These coatings will allow for superior strength and scratch resistance, as well as thermally conductive coatings for better heat dissipation in electronics.

Innovative solutions are also a key part of the evolving field of OEM coatings, with work being carried out on numerous new functional coating technologies. Some of the areas being explored include self-healing paints for minor scratches, antimicrobial coatings for hygiene, and even self-cleaning surfaces. Additionally, reformulation of key products has increased due to the raw material shortages in 2022, resulting in manufacturers finding alternate ways to meet demand. Data-driven development is also something to look at going into the future as manufacturers are increasingly using data analytics to optimize coating formulations and application processes, allowing for more targeted solutions and improved quality control

Interestingly, PPG has noted that motorcycle coatings, with a diversity of applications, represent a high growth segment in emerging markets.

Figure 40. Fermium Conducts Field Research



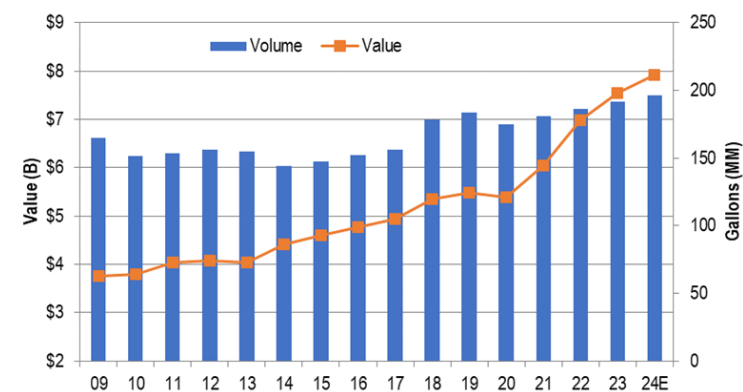
Source: PPG and Fermium Research LLC



Special Purpose Coatings

Special Purpose. Following an 8% increase in 2023 U.S. *Special Purpose Coatings* sales, 2024 is forecast to see volumes up 2.4% and pricing up 2.6%. Auto refinish coatings continue to rebound as well as vehicle miles driven have returned to pre-Covid levels. The negative impact of newer collision avoidance systems is being offset by the increase in distracted driving. There is still a positive outlook for protective coatings through 2030 as well, with higher capex another benefit.

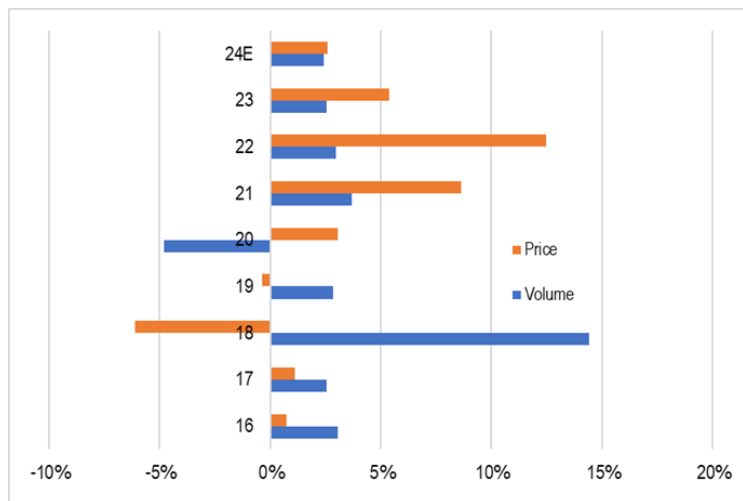
Figure 41. U.S. Special Purpose Value and Volumes, 2009 – 2024



Source: The ChemQuest Group, Inc. and Fermium Research LLC

As one of the highest value segments, refinish continues to outperform relative to other segments with vehicle miles surpassing pre-covid levels and accident rates being up substantially. Longer term, however, autonomous driving technology, new safety systems in cars (collision avoidance) and ride sharing apps pose a threat to the segment. Aging U.S. infrastructure remains an area of opportunity, along with the focus on solvent-borne coatings. **PPG, AXTA,** and **RPM** are among the segment leaders.

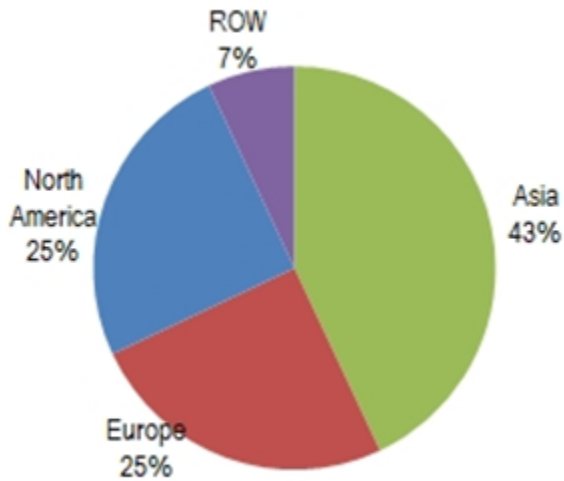
Figure 42. U.S. Special Purpose Yr/Yr Price and Volume, 2016 – 2024



Source: The ChemQuest Group, Inc. and Fermium Research LLC

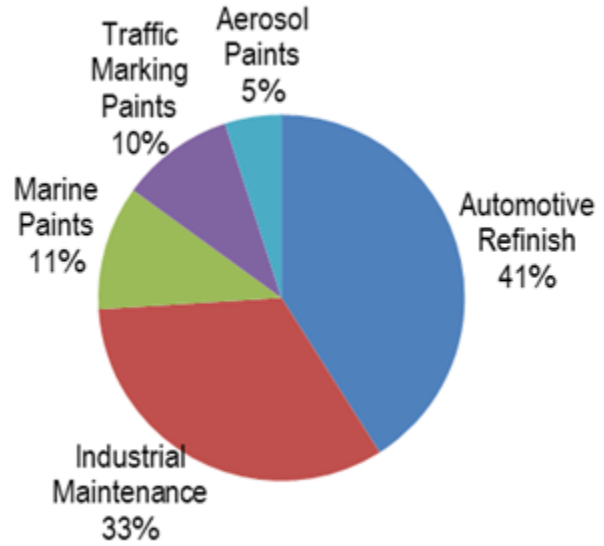
Special Purpose coatings serve far fewer **end markets** than those served by industrial *OEM* coatings, but they typically carry higher margins. Major end markets for *Special Purpose* coatings include automotive refinish, industrial maintenance, and traffic-marking paints. Aerosol and marine paints are the remaining end markets, with the latter seeing particularly subdued demand in recent years due to the decline in shipbuilding activity, as *Clarksons* estimates 2022 global newbuild order volumes fell 20% yr/yr, though shipbuilding activity started to recover in 2023 and looks to continue growth through 2024. The segment is due to bounce back due to an increase in oil & gas as well as infrastructure. Additionally, *Auto Refinish* is expected to outperform all other segments due to the recovery in vehicle miles driven.

Figure 43. Special Purpose Coatings Sales by Geography



Source: SHW and Fermium Research LLC

Figure 44. Special Purpose Coatings Sales by End-Market

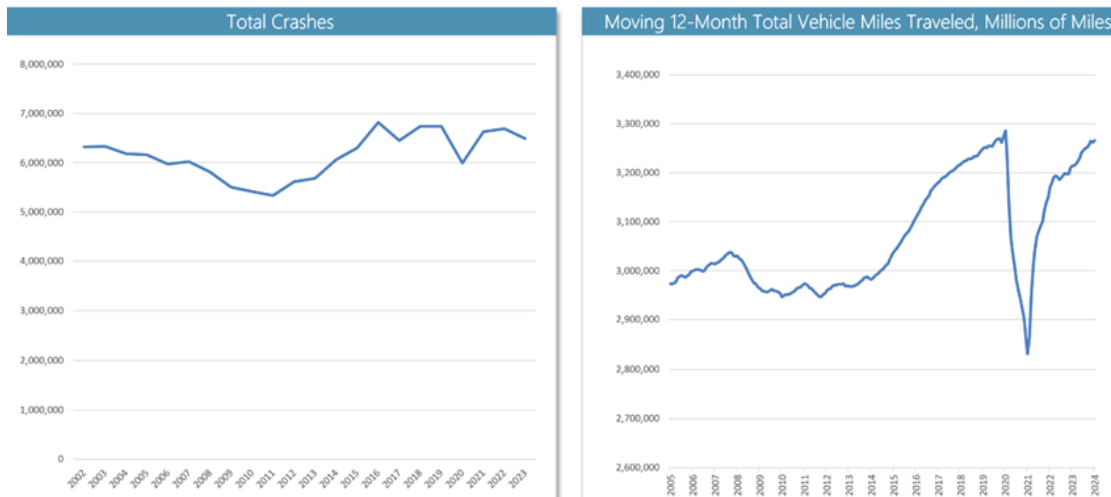


Source: The ChemQuest Group, Inc. and Fermium Research LLC

VMT is an important metric for auto refinish, as repair/refinish activity picks up with increased driving (which unfortunately means more accidents). VMT typically slows in the early months of the year, as cold weather curbs travel, partially offset by icy conditions increasing accidents. March 2020 saw the beginning of the sequential declines as Covid kept many of us at home, but 2021 and 2022 increases has allowed VMT to surpass pre-Covid levels in 2023, while 2024 YTD is up 1.5% yr/yr.

Auto refinish volumes continue to be threatened by both the increase in autonomous driving and collision avoidance systems (forecasted to reduce accidents by 30% over the next 5 years), as well as continued increases in both ride sharing and car sharing. This has been partly offset by a rise in oil demand as well as distracted driving trends, and 2022 sadly showed the most vehicle-related deaths in 16 years with 2023 having trended flat. These negative factors are expected to continue to impact the industry longer-term. Aging U.S. infrastructure continues to be an area of opportunity (2024/5 is expected to see significant increase in building projects), coupled with growing needs for water and wastewater management as the population increases.

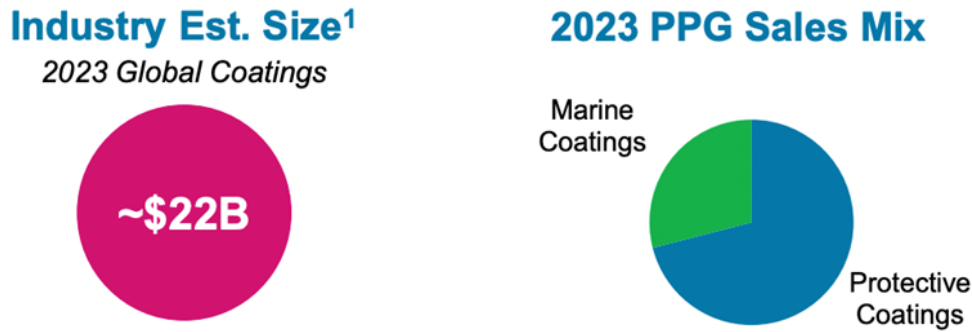
Figure 45. Refinish Coatings Indicators



Source: Federal Reserve Economic Data

Focusing on the protective and marine market, PPG estimates the following breakdowns for the ~\$22B global business and provided the following breakdown of its own P&MC sales.

Figure 46. PPG P&MC Sales Mix and Key End-Markets



Source: PPG

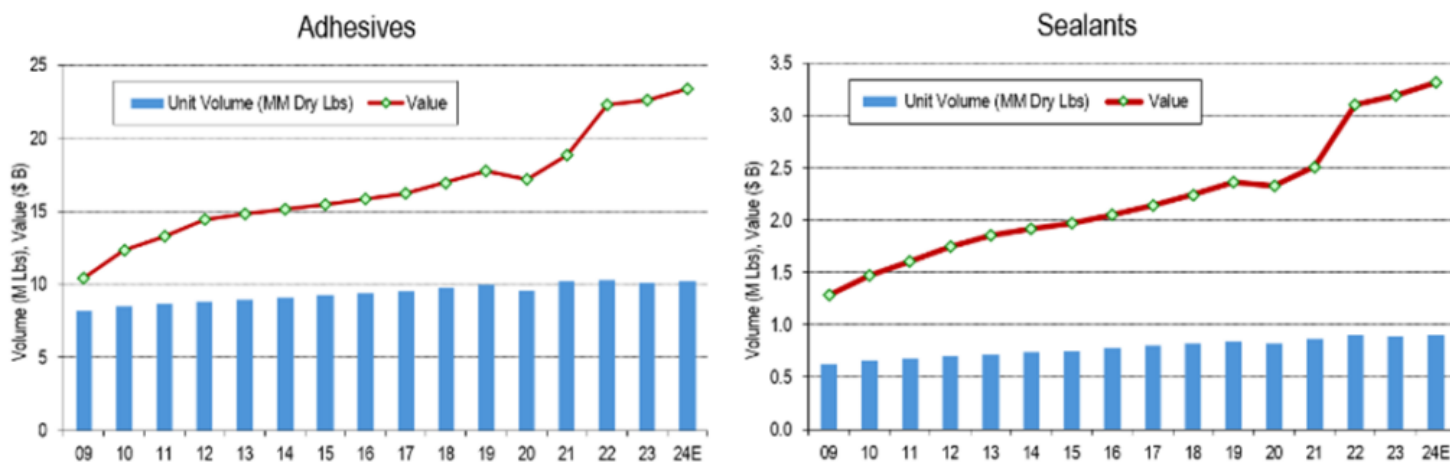
Defining the global aerospace coatings market is a relatively difficult task with various third parties, including sealants or a variety of resins, base coats, clear coats, etc., but CQ believes the U.S. market to be roughly \$250MM. This market is equally split between aftermarket and OEM sales, with aftermarket referring to refinishing or maintenance on existing planes. For PPG (pre-COVID), the split has been 50/50 OEM/aftermarket and 70/30 military/commercial. Airline consolidation was a nice positive driver in years gone by.

Adhesives and Sealants

Market Overview

The global *Adhesives and Sealants* market finished 2023 valued at **\$72.3B** in sales. In NA, 2024 volumes are expected to be relatively flat at ~1-2% growth. Value is forecasted to grow in the low to mid-single digits driven by manufacturers seeing the end of large price increases. Paper board dominates adhesives volume demand, tied to internet shopping and fast-moving consumer goods, with sealants predominately tied to construction and transportation.

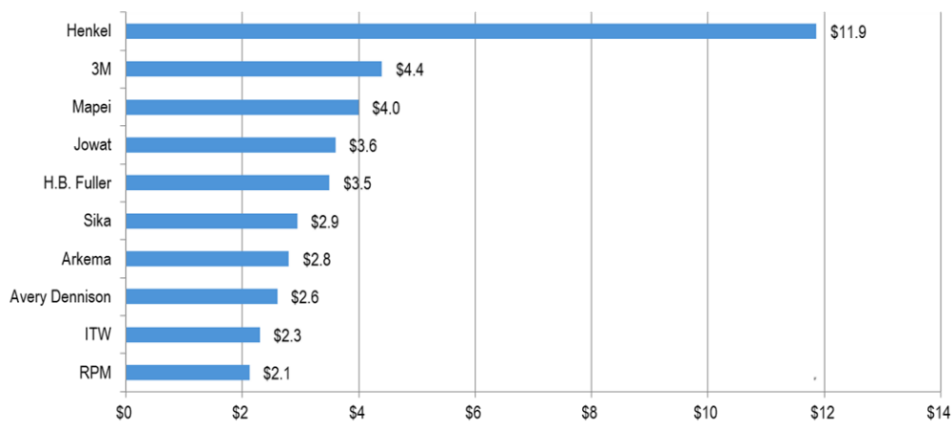
Figure 47. U.S. Adhesives and Sealants Industry, 2009 – 2024



Source: The ChemQuest Group, Inc. and Fermium Research LLC

Henkel is the dominant supplier (almost 3x the size of #2 player **MMM**) in the A&S market, and they have expanded further in 2024 with the acquisition of *Seal for Life*. This competitive landscape stands in stark contrast to the coatings market, where the top players have similar market shares.

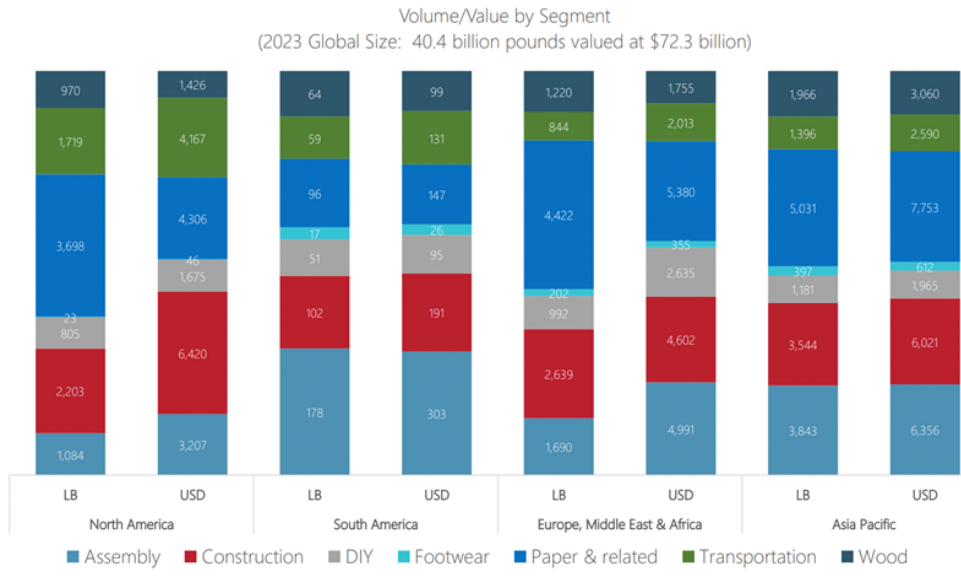
Figure 48. Top Adhesives & Sealants Companies, 2023 (\$B)



Source: The ChemQuest Group, Inc. and Fermium Research LLC

Building/construction accounts for the largest end market by value at ~30% in N.A., followed by transportation and packaging each at 20%.

Figure 49. Global Adhesives & Sealants End-Market Breakdown



Source: The ChemQuest Group, Inc.

Industry Margin

Raw materials are the largest component of costs, representing 53-63% of cost of goods sold in 2023, compared to 43-54% in the coatings industry. *Adhesives* typically use higher molecular weight products, which generally include dependence on crude oil input. Similar to coatings producers, Adhesives producers have been facing raw material price increases and have been working to offset with their own increases. In addition, producers have rationalized and shed less strategic customers, which midsize players have picked up.

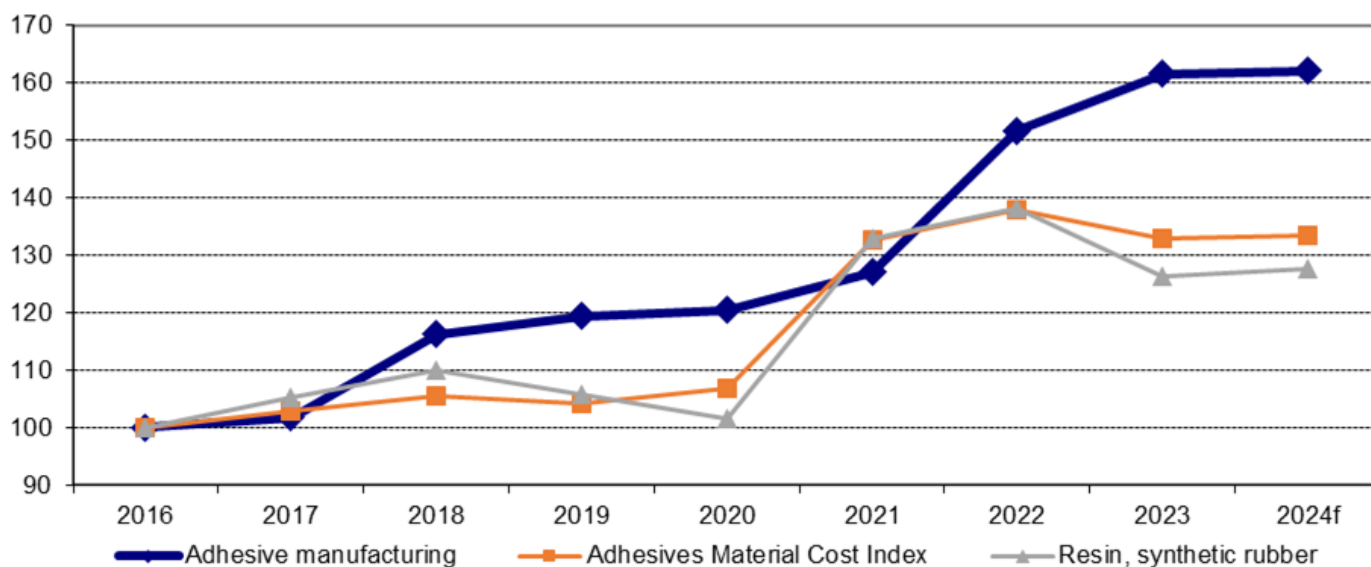
Figure 50. Average U.S. Adhesive Company's Cost Structure, 2023

	2005	2009	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Sales	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Cost of Goods Sold															
Raw Materials	53-59%	52-60%	53-63%	53-63%	53-63%	53-63%	53-63%	51-61%	54-64%	53-63%	55-65%	55-65%	55-65%	56-66%	53-63%
Packaging	2%	2%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Labor	5-7%	2-3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	4%
Energy	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Overhead, Taxes, Ins., Dep., Pkg.	5%	5-7%	5%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Total	67-75%	62-72%	63-73%	63-73%	63-73%	63-73%	63-73%	61-71%	64-74%	63-73%	65-75%	65-75%	65-75%	66-76%	64-74%
Gross Margin	25-33%	28-38%	27-37%	27-37%	27-37%	27-37%	27-37%	29-39%	26-36%	27-37%	25-35%	25-35%	25-35%	24-34%	26-36%
SG&A	19-25%	15-21%	15-21%	15-21%	15-21%	15-21%	15-21%	16-22%	15-21%	15-21%	13-19%	13-19%	15-21%	15-21%	16-22%
EBIT	6-14%	7-23%	6-22%	6-22%	6-22%	6-22%	6-22%	6-22%	5-21%	6-22%	6-22%	6-22%	4-20%	5-21%	4-20%

Source: The ChemQuest Group, Inc. and Fermium Research LLC

Adhesives pricing in N.A. increased steadily until 2014 and then remained flattish to up ~3% through 2021, but 2022 then increased 17.5% and 2023 increased 6.5%. Through 2024, pricing is expected to be flattish, making top-line growth challenging in 2024. Resin PPI has typically tracked the adhesives material cost index, especially the decline in 2023 though it has remained lower through 2023 and 2024.

Figure 51. Adhesives PPI, Resin PPI, and Cost Index (Indexed to 2016)



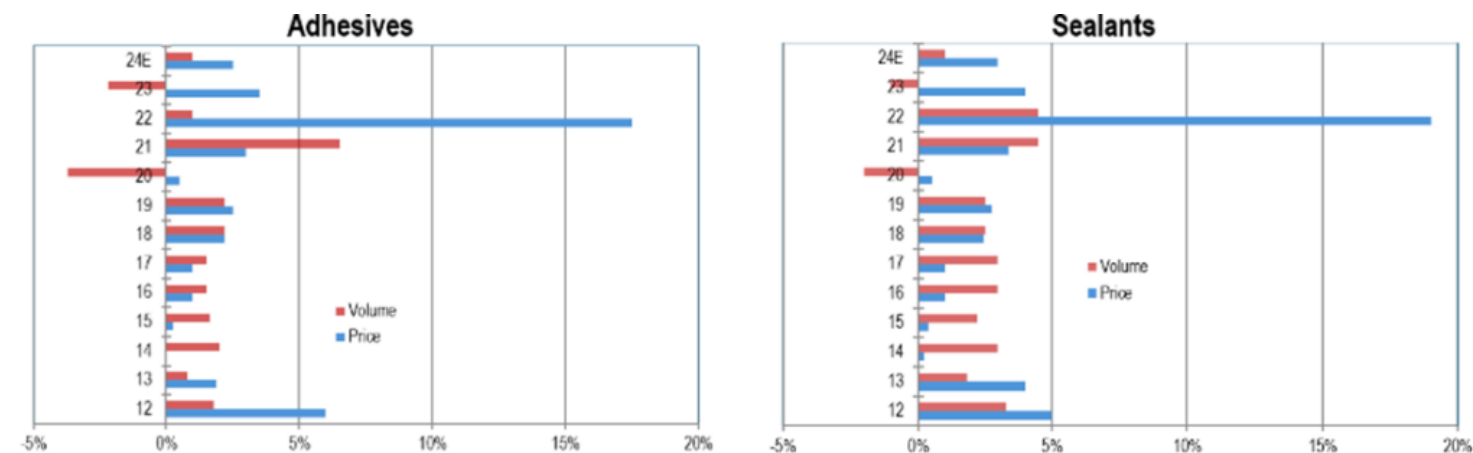
Source: The ChemQuest Group, Inc.

In **construction**, improved building standards are among the demand drivers. *Adhesives* in general have been gaining at the expense of metal fasteners, due in part to the lightweighting trend. This is especially true in the automotive manufacturing segment. Also, *Adhesives* offer desired traits such as flexibility, ease of repair, and strength.

Through 2024, CQ expects major themes tied to *Adhesives and Sealants* to include a slowdown in new residential construction, auto/light trucking starting to slow coming off a strong 2023 where it was up 15%, and consumer spending slowing going into the

second half of 2024. Boeing production will also be a factor as it's not expected to improve in the back half of the year. Raw materials costs are also on the radar as expected deflation ought to lead to improved gross margins. New uses for sealants are expected to drive growth, with a focus on the bonding of dissimilar materials. An additional focus of these new sealants is in shielding dissimilar metal substrates from each other during transportation, construction, and assembly in order to prevent galvanic corrosion. Beyond 2024, CQ forecasts a longer-term run of **3%** annual growth for the global market.

Figure 52. U.S. Adhesives and Sealants Volume and Price Growth, 2012 - 2024

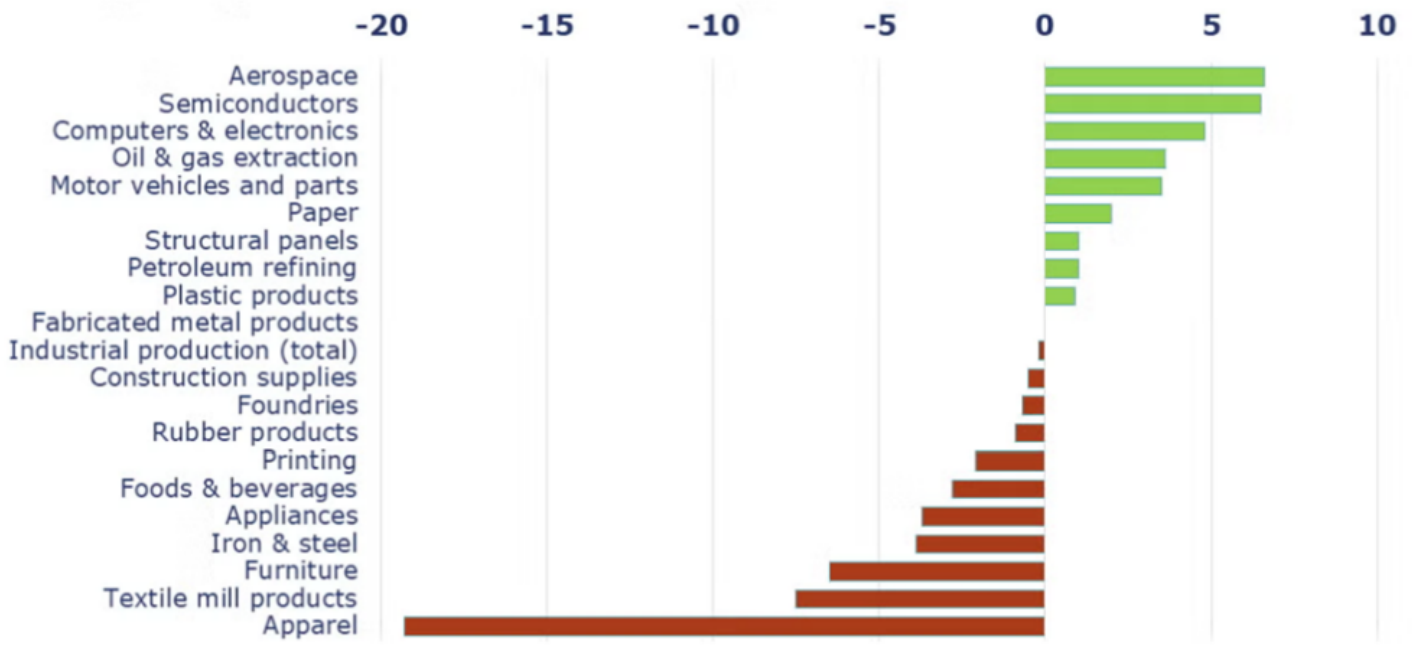


Source: The ChemQuest Group, Inc.

Macroeconomic Backdrop

With the global economy somewhat improving since Covid, 2023 global GDP is forecast up 3.2% yr/yr, with emerging markets at 4.2% (excluding China). CQ estimates the U.S. coatings volumes to increase 2.6% in 2024, with pricing up 2.3%. As far as the expected end-market winners for 2024, the list features **aerospace**, with oil & gas and semiconductors seeing recent strength.

Figure 53. Outlook for Key End-Use Markets, % Change Y/Y (3MMA, July 2024)



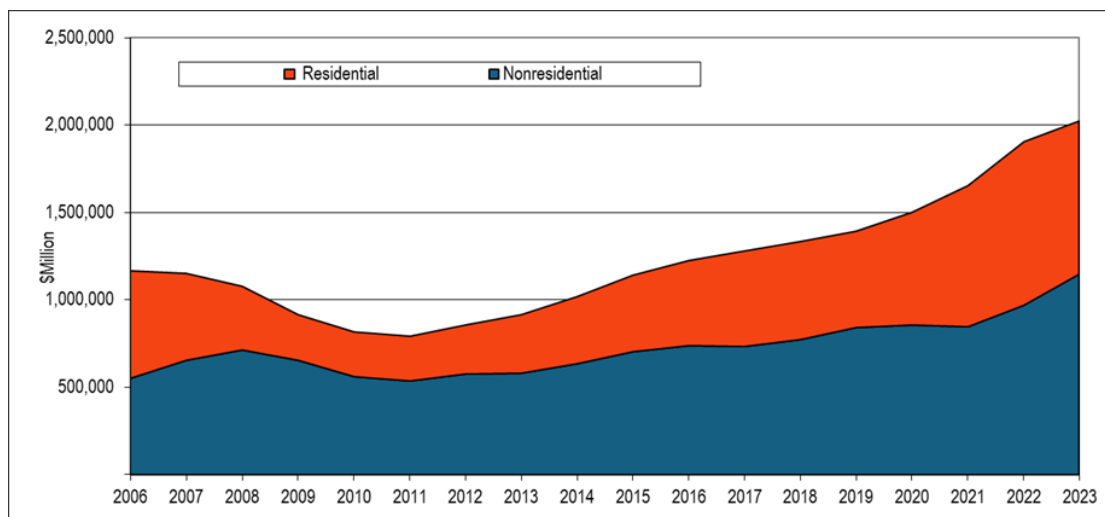
Source: Federal Reserve

Major End Markets

Construction

Within the U.S., construction continues to surpass peak 2006 conditions, benefiting *Architectural Coatings*. Total construction spending has been on the rebound since 2011, including yr/yr growth of 8% in 2020, 10% in 2021, 15% in 2022, and 6% in 2023, reaching approximately \$2.02T. This continued string of increases follows five years of declines that drove activity down almost 32% from the 2006 peak of about \$1.17T.

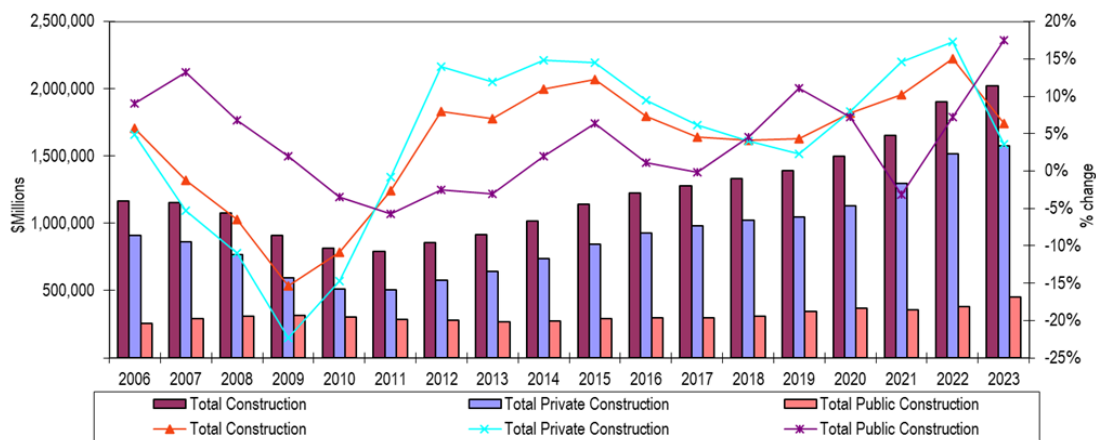
Figure 54. U.S. Private Construction Spending, 2006 - 2023



Source: The ChemQuest Group, Inc., US Census, and Fermium Research LLC

Public spending reversed its 2017 decline with 2018, 2019, and 2020 increasing 5%, 11%, 7%, respectively, but 2021 declined 3%, though still exceeded the 2009 peak by 10%, and then returned to 7% growth in 2022 and 18% in 2023. Private spending's more pronounced growth (2012-2017 timeframe) was muted with 2018, 2019, and 2020 up 4%, 2%, and 8%, respectively, though 2021 shot back up to 15% and there was another 17% gain in 2022, with 2023 lowering to 4% growth.

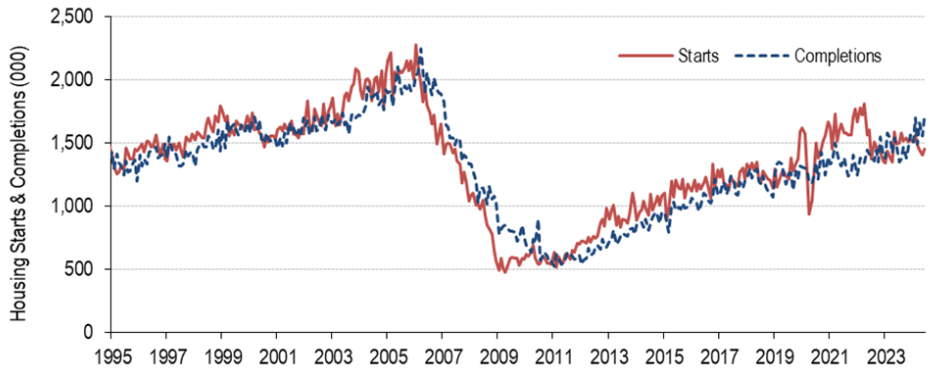
Figure 55. Yr/Yr Change in Construction Spending, 2006 - 2023



Source: The ChemQuest Group, Inc., US Census, and Fermium Research LLC

2021 housing starts reached 1.77MM units (according to the Census Bureau), with elevated levels through 1H22 but have lingered within 1.3-1.6MM units since. 2023 and 2024 YTD estimated monthly readings are still far from the 2.27MM unit peak number in 2006. The SAAR of housing starts for June 2024 rang in at 1.446MM, down 3% from a revised June 2023 figure of 1.493MM units.

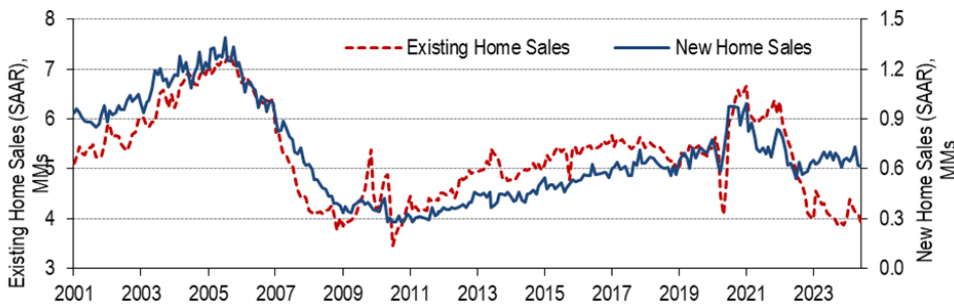
Figure 56. Housing Starts and Completions, 1995 – Present



Source: U.S. Census Bureau and Fermium Research LLC

Compared to housing starts, *existing home sales* are a more relevant indicator and driver of coatings demand; 75-80% of coatings are tied to existing home sales and remodeling, with the balance being new homes. For the months of January through June 2024, existing home sales were *down* ~4% yr/yr compared to the same period in 2023, vs. flat new home sales yr/yr.

Figure 57. Existing Home Sales and New Home Sales, 2001 – Present



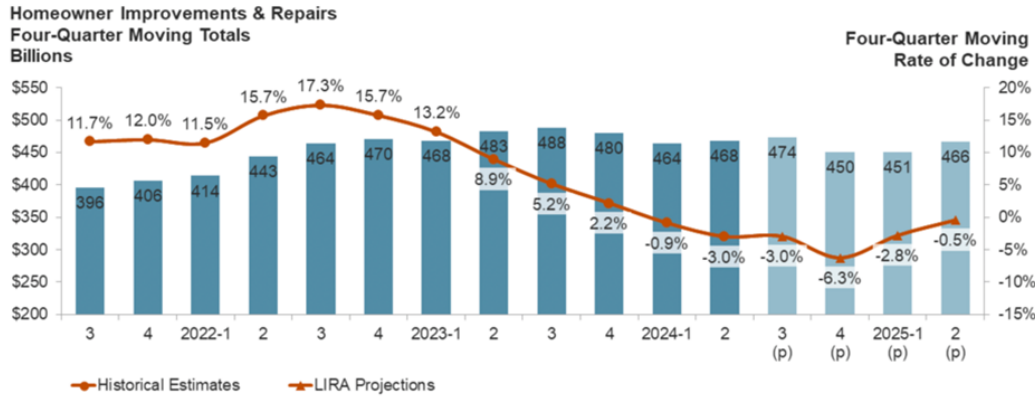
Source: U.S. Census Bureau and Fermium Research LLC

The latest LIRA report (*Leading Indicator of Remodeling Activity*) pointed to a downturn through the rest of 2024 with home renovations rebounding in 1H 2025. The decline can be attributed to economic uncertainty, continued weakness in home sales, and the sale of building materials putting a lid on residential remodeling, coupled with DIY volume declining past pre-pandemic levels as we've returned to more "normal" life. However, some bright spots include homeowners now making upgrades and repairs at a more sustainable rate after frenzied activity during the pandemic, and reduced home sales still expected to generate substantial remodel and refinish activity for stay-in-place homeowners.

Following a share shift to the DIY market during 2006-09, professional contractor share has continued its upswing among boomers in general, while beginning to shift more toward DIY among millennials. This gradual shift to contractor-applied paint benefited **SHW** more than **PPG**.

Figure 58. Homeowner Improvements, 2021 – 2025E

Leading Indicator of Remodeling Activity – Second Quarter 2024



Notes: Improvements include remodels, replacements, additions, and structural alterations that increase the value of homes. Routine maintenance and repairs preserve the current quality of homes. Historical estimates since 2021 are produced using the LIRA model until American Housing Survey benchmark data become available.

© PRESIDENT AND FELLOWS OF HARVARD COLLEGE

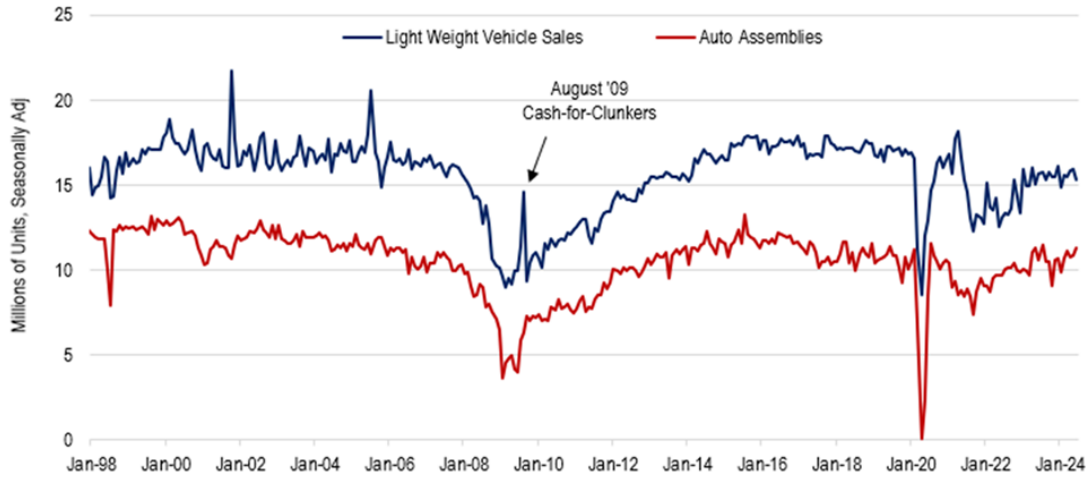
Joint Center for Housing Studies of Harvard University JCHS

Source: Harvard Joint Center on Housing Studies

Transportation

Infrastructure spending and auto-related trends are important drivers for both the *OEM* and *Special Purpose Coatings* segments. For the latter, automotive refinish accounts for 41% of the end market segment share. Monthly auto and light truck sales have continued to recover from troughs in early 2009 and 2020 of about 9MM and 8.6MM units respectively and have since recovered to 15.3MM as of June 2024. As auto demand and production return/surpass pre-Covid levels, auto OEM and Refinish should continue to improve.

Figure 59. Light Vehicle Sales vs. Auto Production, 1998 – Present



Source: Federal Reserve Economic Data

Industrial

IP growth in the U.S. faltered following a peak in December 2018 and plunged during the pandemic. It has since gradually recovered. Continued growth in this area would bode well for *Industrial OEM* coatings, which benefits from strength in U.S. manufacturing.

Figure 60. Industrial Production and Capacity Utilization, 2001 – Present



Source: U.S. Census Bureau and Fermium Research LLC

Current Rating Distribution

Coverage Universe	Percent
Buy	50
Hold	50
Sell	0

DISCLOSURES AND DISCLAIMERS

Analyst Certification

The analyst, Frank J. Mitsch, primarily responsible for the preparation of this research report attests to the following: (1) that the views and opinions rendered in this research report reflect his or her personal views about the subject companies or issuers; and (2) that no part of the research analyst's compensation was, is, or will be directly related to the specific recommendations or views in this research report.

Analyst Certifications and Independence of Research.

Each of the Fermium Research analysts whose names appear on the front page of this report hereby certify that all the views expressed in this Report accurately reflect our personal views about any and all of the subject securities or issuers and that no part of our compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views of in this Report.

Fermium Research (the "Company") is an independent equity research provider. The Company is not a member of the FINRA or the SIPC and is not a registered broker dealer or investment adviser. Fermium Research has no other regulated or unregulated business activities which conflict with its provision of independent research.

Ratings Definitions

Current Ratings Definition

Fermium Research recommendations are based on a stock's total forecasted return over the next 12 months. Total forecasted return is equal to the expected percentage price return plus gross dividend yield. We divide our stocks under coverage into three primary ratings categories, with the following return guidelines:

Buy –

We expect the stock price to appreciate by 10% or more over the next 12 months

Neutral –

We expect the stock price to change by less than 10% within the next 12 months

Sell –

Our firm's opinion is that this stock likely will be down by 10% or more over the next 12 months

Limitation Of Research And Information.

This Report has been prepared for distribution to only qualified institutional or professional clients of Fermium Research. The contents of this Report represent the views, opinions, and analyses of its authors. The information contained herein does not constitute financial, legal, tax or any other advice. All third-party data presented herein were obtained from publicly available sources which are believed to be reliable; however, the Company makes no warranty, express or implied, concerning the accuracy or completeness of such information. In no event shall the Company be responsible or liable for the correctness of, or update to, any such material or for any damage or lost opportunities resulting from use of this data.

Nothing contained in this Report or any distribution by the Company should be construed as any offer to sell, or any solicitation of an offer to buy, any security or investment. Any research or other material received should not be construed as individualized investment advice. Investment decisions should be made as part of an overall portfolio strategy and you should consult with a professional financial advisor, legal and tax advisor prior to making any investment decision. Fermium Research shall not be liable for any direct or indirect, incidental or consequential loss or damage (including loss of profits, revenue or goodwill) arising from any investment decisions based on information or research obtained from Fermium Research. Reproduction and Distribution Strictly Prohibited. No user of this Report may reproduce, modify, copy, distribute, sell, resell, transmit, transfer, license, assign or publish the Report itself or any information contained therein. Notwithstanding the foregoing, clients with access to working models are permitted to alter or modify the information contained therein, provided that it is solely for such client's own use. This Report is not intended to be available or distributed for any purpose that would be deemed unlawful or otherwise prohibited by any local, state, national or international laws or regulations or would otherwise subject the Company to registration or regulation of any kind within such jurisdiction.

Reproduction And Distribution Strictly Prohibited.

No user of this Report may reproduce, modify, copy, distribute, sell, resell, transmit, transfer, license, assign or publish the Report itself or any information contained therein. Notwithstanding the foregoing, clients with access to working models are permitted to alter or modify the information contained therein, provided that it is solely for such client's own use. This Report is not intended to be available or distributed for any purpose that would be deemed unlawful or otherwise prohibited by any local, state, national or international laws or regulations or would otherwise subject the Company to registration or regulation of any kind within such jurisdiction.

Copyrights, Trademarks, Intellectual Property.

Fermium Research, and any logos or marks included in this Report are proprietary materials. The use of such terms and logos and marks without the express written consent of Fermium Research is strictly prohibited. The copyright in the pages or in the screens of the Report, and in the information and material therein, is proprietary material owned by Fermium Research unless otherwise indicated. The unauthorized use of any material on this Report may violate numerous statutes, regulations and laws, including, but not limited to, copyright, trademark, trade secret or patent laws.