

BONUS
CONTENT



**ELECTRIFICATION:
CURRENT TRENDS AND
FUTURE TRAJECTORIES**

EQUIPMENT MARKET OUTLOOK **ON-THE-GO**



November 2019



Although 2019 is outperforming 2018 numbers when compared year over year, growth rates and indicators are seeing declines around the world and across industries. For example, U.S. Construction Machinery New Orders are in a slowing growth trend, further signaled by the U.S. ISM Purchasing Managers Index.

Similarly, Europe's Industrial Production is virtually flat compared to last year while the production average continues to decline, but the Europe Leading Indicator and Eurozone Purchasing Managers Index formed tentative cyclical troughs, indicating possible recovery.

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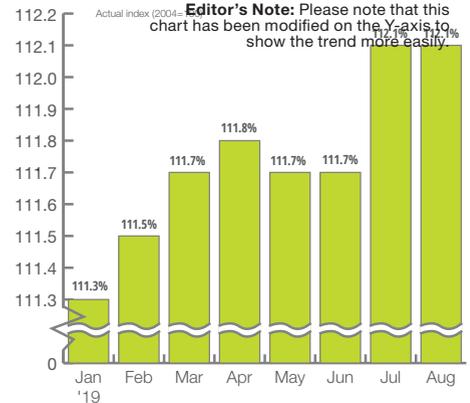


ITR Economics is an independent economic research and consulting firm with 60+ years of experience.



U.S. Leading Indicator:

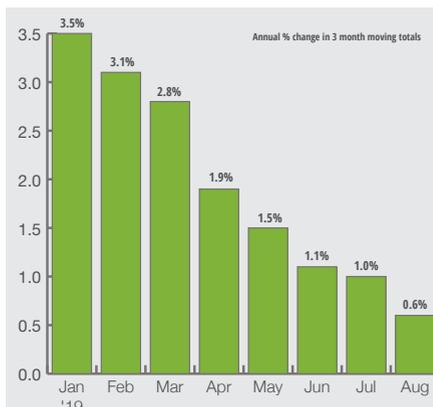
- The Conference Board's US Leading Indicator moved higher in April. The pace of growth is declining.
- Decline in the Indicator monthly rate-of-change suggests that US Industrial Production is likely to be in business cycle decline (slowing growth or recession) through at least the end of the year.



Editor's Note: Please note that this chart has been modified on the Y-axis to show the trend more easily.



U.S. Industrial Production:

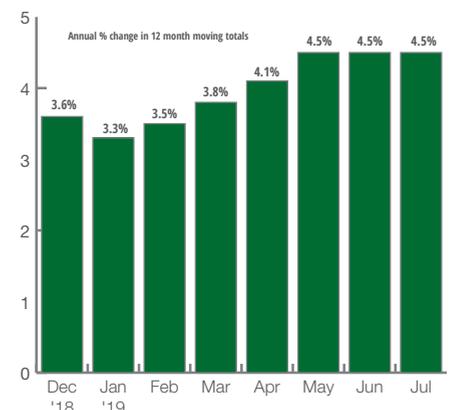


- Quarterly average U.S. Industrial Production moved lower in recent months but was 2.0% above the year-ago level in April.
- Further decline in the Production quarterly rate-of-change is probable in at least the near term, given the trends in the OECD's U.S. Leading Indicator.



U.S. Total Public New Construction:

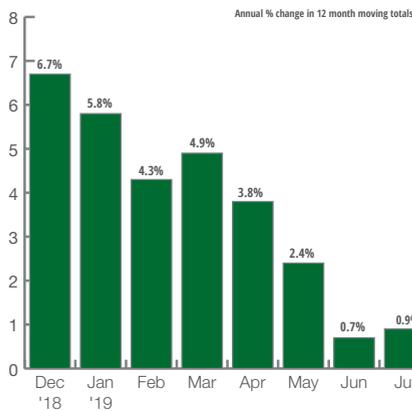
- U.S. Total Public New Construction during the 12 months through March totaled \$306.7 billion, 7.7% higher than last year. Construction is in an accelerating growth trend.
- Construction is rising at the fastest pace in over a decade. Prior trends in U.S. Federal Government Current Tax Receipts suggest the Construction annual growth rate could peak in the near term.





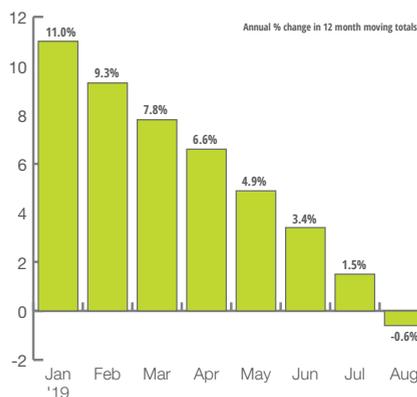
U.S. Construction Machinery, New Orders:

- U.S. Construction Machinery New Orders during the 12 months through March totaled \$35.9 billion, up 4.9% from one year ago. New Orders are in a slowing growth trend.
- Further slowing growth and potential contraction in New Orders in at least the coming quarters is suggested by trends in the U.S. ISM PMI (Purchasing Managers Index).

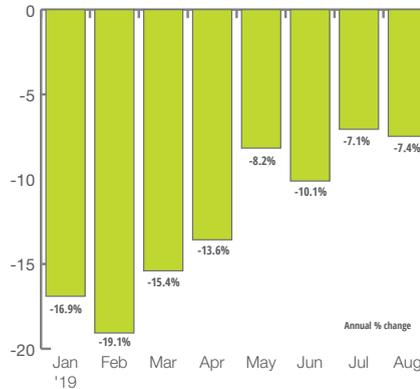


North American Rotary Rig Count:

- The North American Rotary Rig Count annual average has moved lower over the last three months, coming in at 1,238 rigs in April. Despite recent decline, the annual Rig Count is 6.6% higher than one year ago.
- Trends in the U.S. Wilshire Total Market Capitalization Index suggest further business cycle decline in the Rig Count into at least late in the year.



China Diesel Bus Production:



- Annual China Large Diesel Bus Production ticked up in March to 28.8 thousand units. The pace of contraction eased slightly; annual Production is down 15.4% from one year ago.
- Trends in the China Leading Indicator suggest that year-over-year decline in Production could become less severe in the second half of 2019.

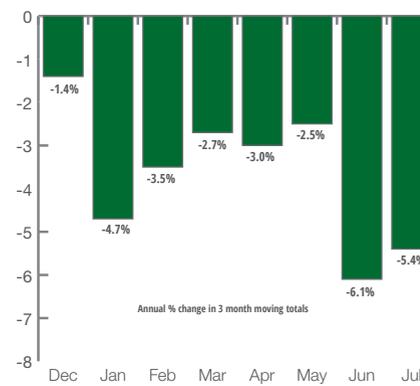


U.S. Private Nonresidential New Construction:

- Q1 U.S. Private Nonresidential New Construction totaled \$106.4 billion, 2.2% higher than one year ago. The pace of growth is diminishing, but trends in the US Commercial and Industrial Sector Architecture Billings Index suggest that the growth rate could rise in the near term.
- The Multi-Tenant Retail Construction segment was down 29.4% in the first quarter relative to the same quarter last year and is dragging down the performance of the whole.



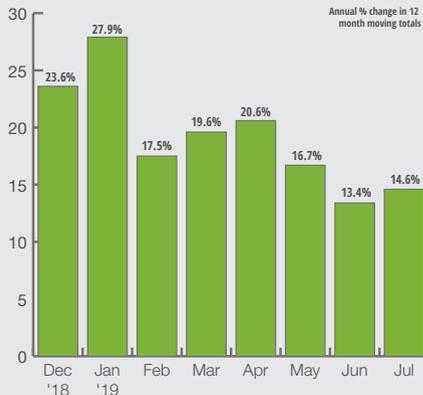
Germany Industrial Production:



- Quarterly average Germany Industrial Production ticked up slightly in March, coming in 2.3% lower than one year ago.
- The Europe Leading Indicator and Eurozone PMI formed tentative cyclical troughs, indicating that recovery in Production may materialize in the near future. However, Germany's heavily export-reliant economy is susceptible to adverse effects stemming from the global trade war and Brexit. Tread carefully in Germany, and in Western Europe more generally, this year.



U.S. Defense Industry, New Orders:

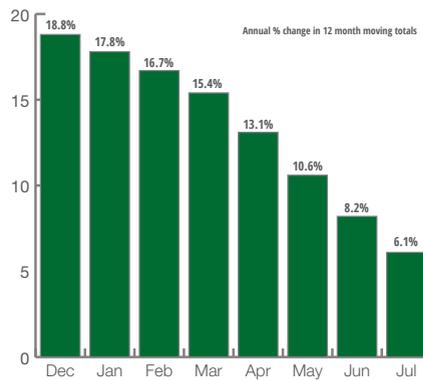


- Annual U.S. Defense Capital Goods New Orders totaled \$157.1 billion in March, 19.5% higher than one year ago.
- The pace of growth slowed in recent months. Many U.S. leading indicators point to business cycle decline ahead for New Orders; however, trends in U.S. Real GDP suggest that the New Orders growth rate could rise further in the next two quarters.

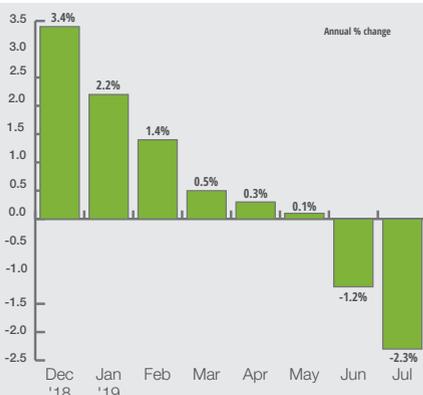


U.S. Farm Machinery Production:

- Annual U.S. Farm Machinery and Equipment Supplies totaled \$31.4 billion in March. Supplies are up 15.4% from one year ago.
- First-quarter U.S. Food Products Shipments were 0.5% below the first-quarter-of-2018 total. Cyclical decline in Food Products Shipments suggests further business cycle decline (slowing growth or recession) in Farm Machinery and Equipment Supplies into at least late this year.



Europe Ag & Forestry Machinery Production:



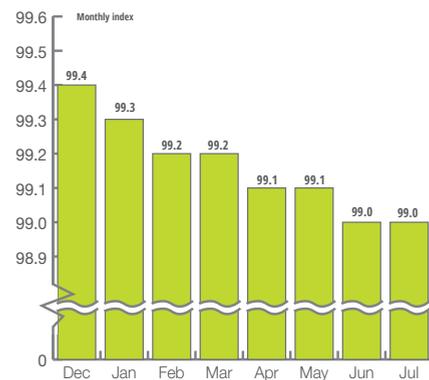
- Europe Agriculture Machinery Production during the 12 months through March was virtually flat with the year-ago level. The Production annual average is declining off a tentative September 2018 peak.
- Trends in the JP Morgan Global Purchasing Managers Index suggest cyclical decline in Production is likely to extend into at least early 2020.



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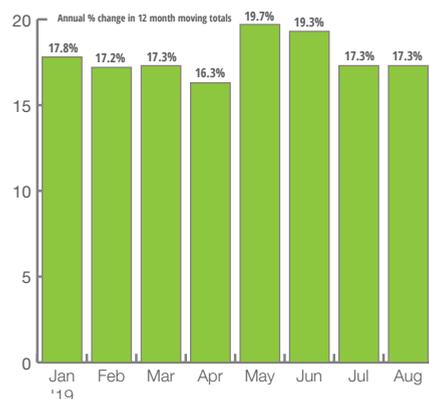
Europe Leading Indicator:

- The Europe Leading Indicator declined in March. However, the pace of contraction eased for the second month in a row.
- The tentative January low in the Indicator rate-of-change suggests that Europe Industrial Production could enter a recovery trend during the fourth quarter of the year, given the typical 10-month lead time from changes in the Indicator to changes in Production.



U.S. Heavy-Duty Truck Shipments:

- Annual average U.S. Heavy-Duty Truck Production in April was 15.5% higher than one year ago. Trends in quarterly Production suggest further business cycle decline on the horizon.
- Business-to-business activity, as measured by US Nondefense Capital Goods New Orders (excluding aircraft), is expected to move lower during the second half of the year. This could limit demand for new heavy-duty trucks during the same time period.





ELECTRIFICATION: WHERE DOES IT STAND AND WHERE IS IT GOING?

GRADUAL AND INEVITABLE SEEMS TO BE THE CURRENT TRAJECTORY OF ELECTRIFICATION FOR ON- AND OFF-HIGHWAY VEHICLE APPLICATIONS, BUT THAT PACE MAY QUICKEN.

by Michelle Kopier

Over the past year, *OEM Off-Highway* and Waytek have been carefully monitoring, covering and analyzing the growth and trajectory of the electrification market in heavy-duty equipment. [According to a report](#) written by Waytek based on a collaborative industry survey with OEM Off-Highway, the gradual changes in electrification technology mean that businesses, team members and mindsets need to adapt in order to stay relevant into the future.

The survey put data behind industry opinion to paint a clearer picture as to the future of electric-powered systems. Even with electrification technology and system integration on the rise, the survey results demonstrated that fewer than half of the respondents worked for companies taking concrete

🔋 Cummins and Hyundai Construction Equipment have developed an electric mini excavator powered by Cummins' BM4.4E flexible battery modules.

steps to incorporate electrified technologies to participate in the trend.

This disconnect between the big picture direction of the industry and the financial and personnel investments necessary to join the electrification movement – not to mention the long-term payback for such an investment – has stymied a large portion of the industry and contributes to the velocity by which the trend will take hold for equipment manufacturers. However, this adoption rate seems to be changing.

According to David Venable, Director of Off-Highway Sub-Segment at Cummins Inc., “Three years ago or so, there were about four to six OEMs actually producing an electric excavator. Over the last 2-3 years, we’ve just seen this influx in experimentation, development, prototype units and now there [are] over 20 OEMs that have either produced or are in production with electric excavators.”

And while Cummins specifically is focusing more on material handling applications that are more aggressively adopting electrification technologies, the electric excavator is where manufacturers want to prove themselves, according to Venable. “It’s somewhat been deemed the marquee application, where OEMs are looking to prove out technology, learn about the technology and be ready for it when it does start to pick up.”

i The Volvo CE ECR25 compact excavator will replace diesel versions starting in mid-2020.

INVESTING IN THE FUTURE

In OEM Off-Highway’s Annual State of the Industry issue, several prominent industry members discussed their current and future goals regarding electrification participation. Eric Alström, President of Danfoss Power Solutions commented that electrification has been a core technology at Danfoss for years. Two of its fastest growing businesses are Danfoss Silicon Power, responsible for manufacturing power modules for electric cars, and Danfoss Editron which focuses on electric drivetrains systems for marine, on- and off-highway applications.

Going hand-in-hand with Danfoss’ recent merger with UQM, a developer of alternative energy technologies, Alström sees electrification’s continued growth as eminent, “as it’s the answer to many of the challenges facing the off-highway industry. This is in regard to efficiency as well as productivity. In fact, most of the applications where we install electric drivetrain systems... have become more productive as a result.”





i Meritor's 17Xe is an electric axle designed for powering heavy-duty trucks up to 44 tons with a single drive axle.

Cummins Inc., well-known for its diesel engine product portfolio, last year, [acquired Efficient Drivetrains](#), an electric and hybrid powertrain provider, [and Johnson Matthey](#), an automotive battery systems company. More recently, [it purchased Hydrogenics](#), a Canadian-based fuel cell company. “With [these acquisitions] we brought in integration, we brought in high-voltage batteries, and we have the capability to do full-system integrations, so we’re ready for the market,” said Venable.

A major player in the electrification space, Dana Inc., has dedicated itself to building out a full electrification portfolio through organic technology development and acquisitions. A key focus of the company, [according to Jeroen Decler](#), Vice President of Global Off-Highway Sales, Product Planning, and Strategy at Dana Inc., is “evolving, enhancing, and creating products to support electrification, especially as rapid improvements in vehicle intelligence play a greater role in driving performance and efficiency. We foresee electrification playing an ever-increasing role in the off-highway market in the years ahead, so we are rapidly adding to our portfolio to support it.”

The major consensus seems to be that electrified power will not replace diesel, at least not for a long while. The power density achieved with diesel combustion cannot currently be matched. However, as electrified systems

i The Liebherr LB 16 is a battery-powered drilling rig that reduces emissions and noise and doesn't require being plugged in. It features an electro-hydraulic drive concept and can operate for up to 10 hours before recharging.





Cummins has been developing battery technology to provide an alternative to diesel in various on- and off-highway applications.

get more powerful, and as battery technology continues to improve in its energy collection, storage capacity and output rates, the competitive advantage will get slowly chipped away from diesel's stronghold on the heavy-duty marketplace.

The power density argument is also why excavators are likely an area of focus for several OEMs looking to prove their electrified power solutions, because of the high power demands during digging events and the energy reclamation opportunity during the boom's decent and even during rotation.

Inevitably, as the larger manufacturers continue to pursue electrification, it will only be a matter of time before smaller companies have to decide whether to invest to stay competitive and relevant in the changing industry, or get enveloped into the continued industry consolidation that has been occurring rapidly over the last several years.

As government mandates in cities, states and countries around the world become more stringent on emissions, many in the industry see a looming electrification technology boom around the corner. "We're seeing Europe be very aggressive, obviously California is very aggressive, as well," said Venable. He sees the next decade being evolutionary for compact equipment as lower-level emissions regulated engines

become prohibited over the course of the next several years.

And once compact equipment applications are seeing the cost savings, reduced emissions, noise and maintenance opportunities that electrification offers, it's only a matter of time before the technology scales up for heavier applications in some capacity. [Read more about the Top 5 Benefits of Electrification based on Waytek and OEM Off-Highway's survey results.](#)

 Fuel cells are one of the technologies in which Cummins is investing to provide zero-tailpipe emission products. The hydrogen fuel cell truck pictured was debuted at the NACV Show 2019.



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