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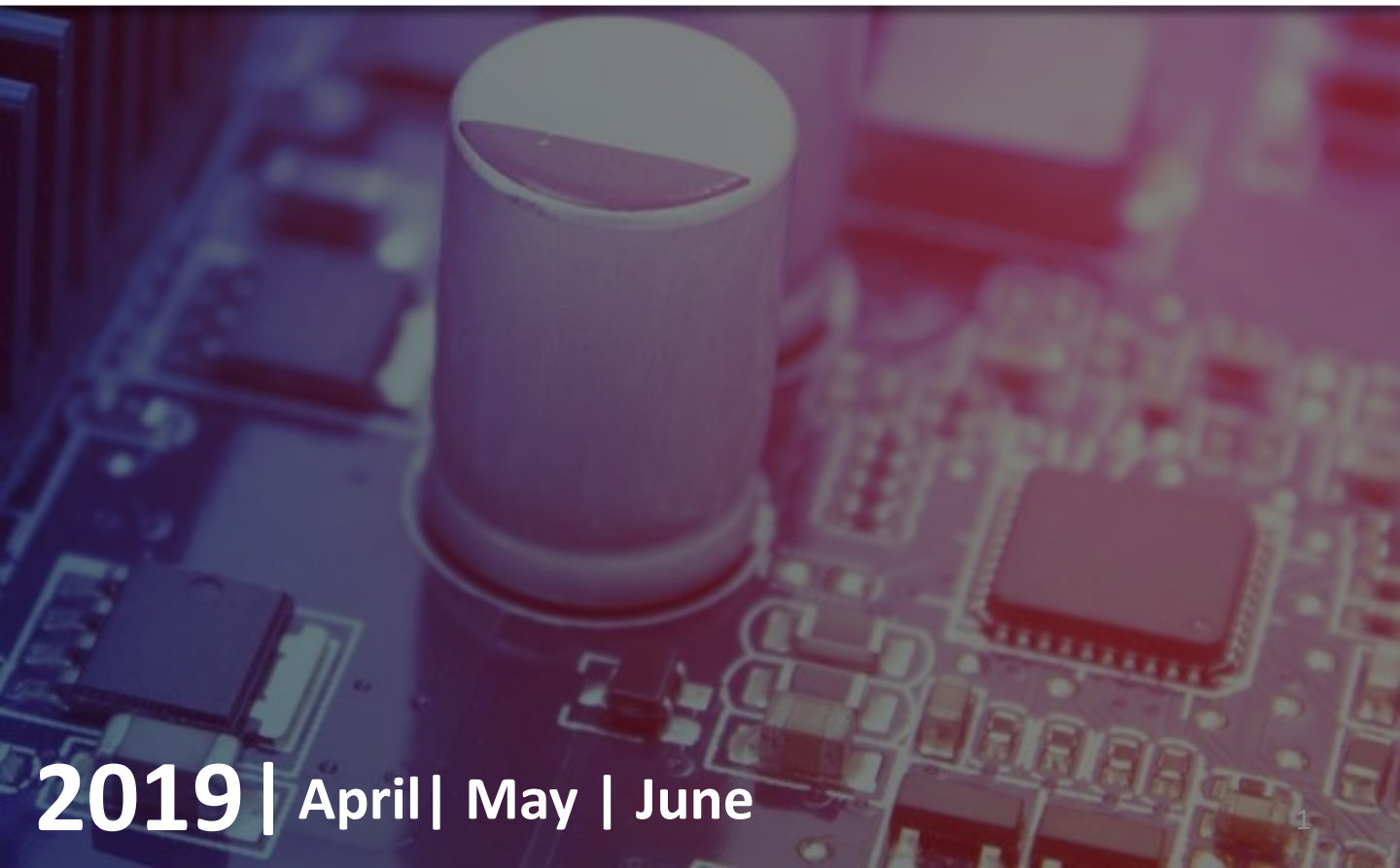
SUPPLY INTELLIGENCE

Materials Report



2019 | April| May | June

Market trends and analysis report

Since Q1 2019 the market is softening. Some manufacturers have increased their capacity but the main reason is due to Global demand drop, driven by China, the Automotive and smartphone market.

\ Moving into 2019, MLCC constraints still continue on some values/packages even though we see some softening due to sluggish demands on smart phone and electric car sales and tariffs by US, but suppliers still expect the automotive demand to continue to drive tight capacity on the larger case sizes for the next year or two. Be advised if the China demand picks up we could be in the same situation we were in last year, but for now it seems stabilized.

\ ST Micro: reports the market has slowed down and lead times are 20 to 25 weeks in most cases .

\ MOSFETS: The general outlook for MOSFETs is positive, with lead times trending down from 60+ weeks to the 39-42-week range and is expected to fully stabilize by Q4 2019.

\ Market is down for semiconductors and other components, ,some companies are slowing production on certain commodities.

\ More US tariffs are on hold for now.

\ Brexit has been extended until October 31st 2019 will advise

\ Yageo acquired the manufacturer : Pulse

LEADTIMES & PRICING Analysis

- **MLCC** – market softening in some cases Multilayer ceramic capacitors still constrained on some Values/packages (large case sizes) .. Murata last time buys past. Kemet not taking any new orders. All suggest move to lower case sizes. Lead time reduced for some manufacturers.

- **Chip Resistors** - Lead times are decreasing. Vishay still on allocation.

- **Discrete** - Majority of the Discrete devices stabilizing.

- **Mosfets**- The lead times are decreasing a bit. Should fully stabilize end of year. There are still issues across many series and manufacturers, especially on low voltage capacities and SOT23 packages. The demand for power MOSFET is fueled by the growing use in replacing insulated-gate bipolar transistors. Manufacturers of electronic devices are actively adopting power MOSFET to increase the efficiency of operations involving high switching speeds. In addition, the top advantage of using power MOSFET to enhance the power efficiency of devices at low voltages is further fueling the expansion of the global power MOSFET market.

- **Memory:** Memory prices have continued to decline due to oversupply carried over from 2018.

- **Cypress and SK Hynix:** Agree to joint venture

- **Renesas:** Is stopping production in several factories due to excess inventory.

Non-Volatile & Volatile Memory

	Pricing	Lead Time	Supply	General Lead Time
Nand-Flash	stable	decreasing	Stable	8-12 w
Nor-Flash	stable	decreasing	Stable	8-12 w
EeProm	Stable	Stable	Stable	6-12 w
SRAM	Stable	stable	stable	6-25 w –see ST below
DRAM	Stable	stable	Stable	6-10 w
DDR3-DDR4	Stable	stable	Stable	8-10 w
EPROM	Stable	Stable	stable	6-12 w

- ST Micro is reporting market has slowed down and lead times are 20 to 25 weeks in most cases.
- Cypress has a lot of EOL product. DRAM is stable.
- Micron lead times stable for Flash, SDRAM, DDR, DDR2, DDR3 price is stable, looks to be softening. Suggest Alliance for SRAM and DRAM, and Adesto for Flash.
- Renesas lead times good , they are actually reporting excess inventory
- IDT stable for SRAM.

Analog, Linear, Logic

	Pricing	Lead Time	Supply	General Lead Time
Data converters	Stable	decrease	No constraints	7-8 w
Amplifiers	Stable	Stable	No constraints	8-24 w
Interfaces	Stable	decrease	No constraints	7-8 w
Power Management	Stable	Stable	No constraints	2-16 w
Logic	Stable	stable	No constraints	8-24 w
Programmable Logic-FPGA	Stable	stable	Lt's extend	8-18 w
Linear	Stable	Stable	No constraints	4-22 w
Sensors	stable	decreased	No constraints	8-28 w
Standard Analog	Stable	Stable	No constraints	6-8 w

- Data Converters are stable besides Automotive VNX series : 24+ weeks.
- Amplifiers are mostly stable On-Semi and ST Micro stabilized 26 weeks and 20 weeks for On-Semi.
- Power Management are stable.
- Sensors decreased lead times and stable
- Logic stabilized Microchip is stable.

Passives

	Pricing	Lead Time	Supply	General Lead Time
Chip Resistors	Stable	stable	stable	12-50w and allocation
Network & Array Resistors	Stable	stable	stable	+16w
Non-Linear Resistors Thermistors	Stable	Stable	Lt.'s extend	13-15w
Trimmers & Pots	Stable	Stable	No constraints	10-16w
Varistors	Stable	Stable	No constraints	6-14w
Fuses	Stable	Stable	No constraints	2-10w
Frequency Control-Crystals & Oscillators	Stable	Stable	No constraints	10-14w
Resonators	Stable	Stable	No constraints	12-14w
Filters	Stable	Stable	Lt.'s extend	8-32w

Passives Continued

	Pricing	Lead Time	Supply	General Lead Time
Ceramic Capacitors	Still high but stabilizing	Remain long	Some constraints and allocation	20-52+w
SMP Tantalum Capacitors	fluctuates	stable	constrained	14-30w
Film Capacitors	Stable	stabilizing	stabilizing	12-16w
Aluminum Capacitors	stabilizing	Stable	Stable	15-40w
Coils-inductors-chokes	Stable	Stable	No constraints	8-20w
Transformers	Stable	stabilizing	Lt.'s extend	8-14w
Ferrites	Stable	Stable	No constraints	6-12w
Inductors	Stable	stabilizing	stabilizing	12-40+w

- Some MLCC constrained or on allocation Yageo, and Samsung expanding their Automotive capabilities. Market softening - lead time reduced.
- Tantalum Capacitors constrained.
- Film capacitors, less manufacturers carrying them.
- Inductors Large case sizes 3232,4040,6767 and all automotive parts ending in A 24-40 plus weeks demand slowed slightly.

Discretes

	Pricing	Lead Time	Supply	General Lead Time
Thyristors	Stable	Stable	No constraints	8-16 w except ST
BiPolar Transistors	Stable	Stable	Stable	4-12 w
Transient Voltage Suppressors	Stable	stable	stable	10-24 w
Rectifiers	Stable	stable	stable	16-24 w
Small Signal Devices	Stable	stable	stable	12-24 w
Zener Diodes	Stable	stable	stable	10-24 w
IGBT	decreasing	stable	stable	18-30 w
MOSFETs	Stable	stable	stable	39-42 w

- Lead time and pricing stabilizing, automotive still long lead time but stable.
- ST advises they see softening.

Connectors

	Pricing	Lead Time	Supply	General Lead Time
HeadersDin, PCB	Stable	Stable	No constraints	6-12w
Board to Board High Speed	Stable	Stable	No constraints	8-14w
I/O , D-sub	Stable	Stable	No constraints	6-10w
IC Sockets	Stable	Stable	No constraints	8-14w
Terminal Blocks & Crimps	Stable	Stable	No constraints	6-12w
RF Connectors	Stable	Stable	No constraints	6-12w
Automotive	Stable	Stable	No constraints	6-12w

\ Stable for all connectors.

Electro Mechanical & Optoelectronics

	Pricing	Lead Time	Supply	General Lead Time
Circuit Breakers	Stable	Stable	No constraints	Stock-14w
Fans & Blowers	Stable	Stable	No constraints	14-16w
Heat Sinks	Stable	Stable	No constraints	Stock-8w
Relays	Stable	Stable	No constraints	6-26 w
Sensors	Stable	Stable	No constraints	8-10w
Switches	Stable	Stable	No constraints	8– 12w
Power Supplies	Stable	Stable	No constraints	6-14w
Infrared Comp	Stable	Stable	No constraints	6-14w
Isolation Comp	Stable	Stable	No constraints	4-16w
LED Displays	Stable	Stable	No constraints	8-12w
LED	Stable	Stable	No constraints	6-12w

\ Panasonic series still long lead time up to 26 weeks.

\ All others are stable.

OIL – Plastic, Transportation, utilities

- Worldwide crude oil prices will average $63 a barrel in 2019 and $62 per barrel in 2020. That's according to the Short-term Energy Outlook by the U.S. Energy Information Administration. The estimate is $1/b lower than the EIA prediction a year ago.The forecast dropped after oil prices dipped below $50 a barrel in November.

- On December 7, 2018, OPEC agreed to cut 1.2 million barrels per day from the October levels. Members would cut 800,000 barrels per day and allies would cut 400,000 barrels per day. Cuts would continue for six months. OPEC's goal is to return prices to $70 a barrel by early fall 2019.

- The price drop occurred just two months after global oil prices hit a four-year high of $81.20/b on September 24, 2018. At that time, commodities traders believed that U.S. sanctions against Iran and outages in Venezuela would lead to supply shortages. OPEC had promised to keep production steady.

- Oil prices have been volatile thanks to swings in supply. On May 10, 2018, prices rose to a record of $80/b. That occurred two days after the United States pulled out of the Iran nuclear agreement and reinstated sanctions.

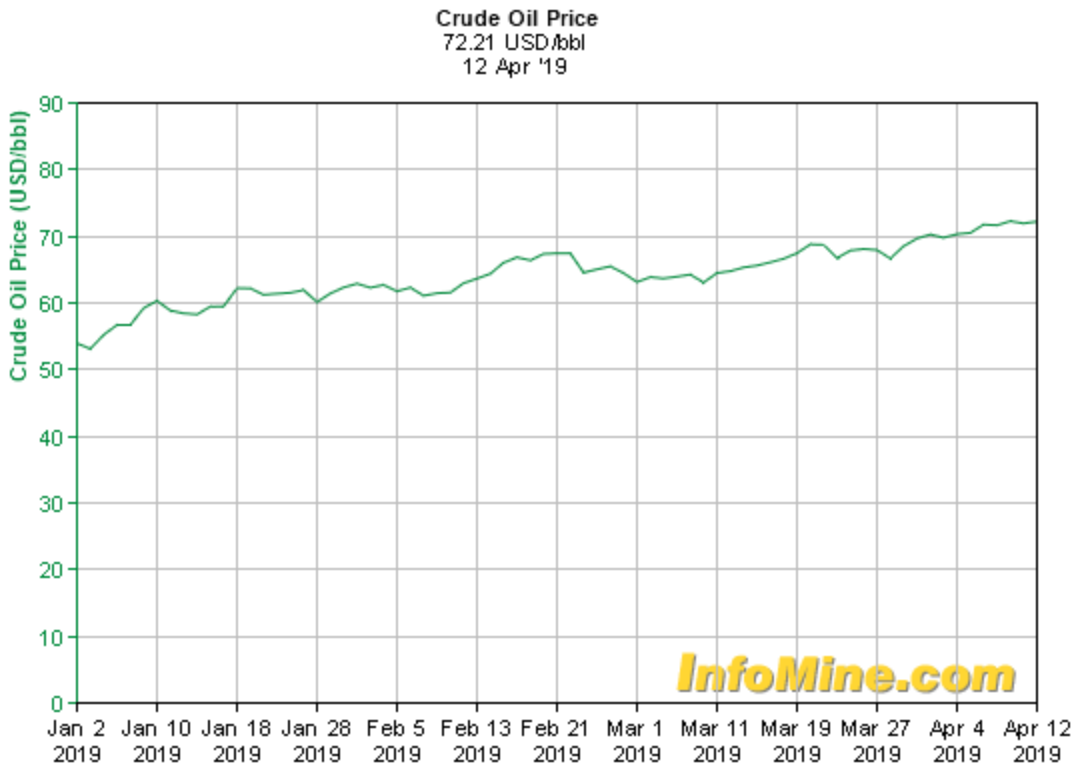
OIL – Plastic, Transportation, utilities

- Global oil prices had fallen to a 13-year low of $26.55/b on January 20, 2016. Six months before that, prices had averaged $60/b. A year earlier in June 2014, they had averaged $100.26/b. Today's oil price fluctuates due to these constantly changing conditions.

- Oil prices used to have a predictable seasonal swing. They spiked in the spring, as oil traders anticipated high demand for summer vacation driving. Once demand peaked, prices dropped in the fall and winter. So why are oil prices no longer as predictable? The oil industry has changed in four fundamental ways.

- https://www.thebalance.com/oil-price-forecast-3306219

Crude Oil price



COPPER – PCB, Cables, Connectors, LCD

\ According to a recent Reuters poll of metals industry analysts, copper prices are due to bounce back in 2019 as healthy supply/demand fundamentals overcome macro-economic worries.

\ The London Metal Exchange index of industrial metals shed 13 percent last year, largely due to concerns about trade tensions and slowing growth in top copper consumer, China–despite signs of potential shortages of many metals. The LME cash copper price in 2019 is predicted to average $6,699 per metric ton (tonne), according to the median forecast of 30 industry analysts. This prediction is about 7 percent higher than the market price toward the end of last year but represents a 6 percent downgrade of the forecast in the previous Reuters poll conducted back in July of ‘18.

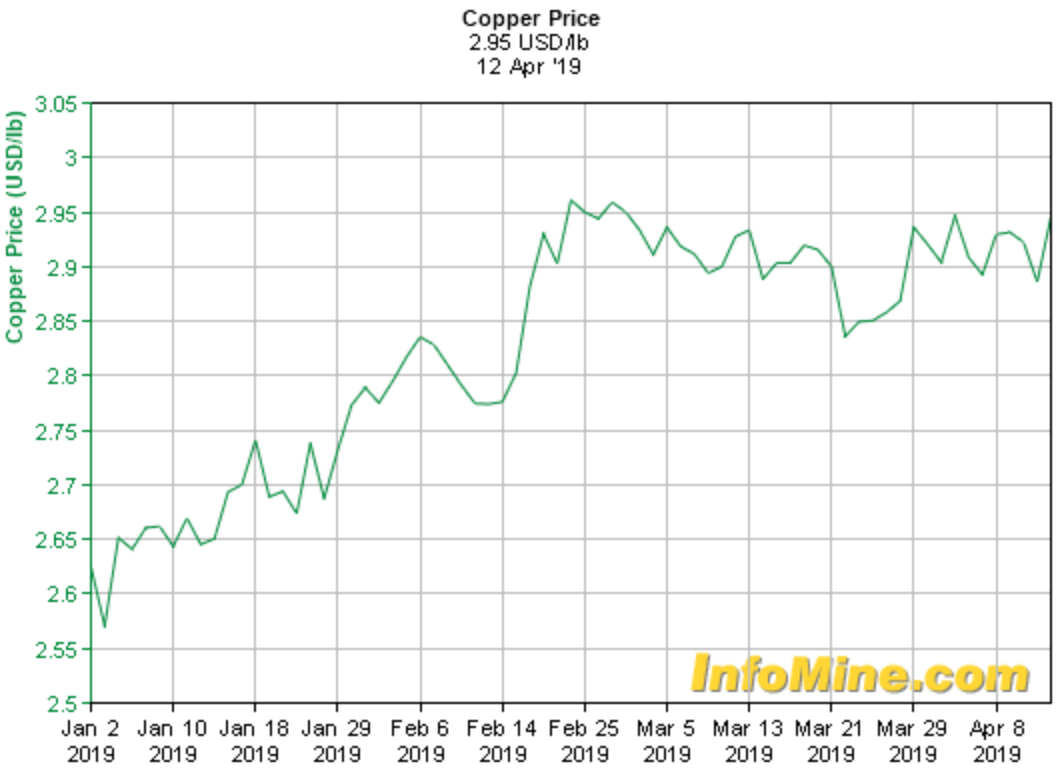
\ While analysts still expect shortages this year, they have cut their consensus forecast of a global deficit to 44,000 tonnes from the 151,000 tonnes that they had projected last July. Analysts have also penciled in a surplus of 13,500 tonnes for 2019, down from their previous estimate of a 129,000 tonne shortfall, after a strike last year failed to materialize at Chile’s Escondido mine.

COPPER – PCB, Cables, Connectors, LCD

\ Geopolitics, economic factors, and international trade policies will continue to influence copper prices throughout 2019. Many economists expect slightly rising interest rates to trigger inflation which tends to drive-up copper prices. Collectively, analysts see stabilization in the market climate toward the back half of 2019 that will likely drive copper prices higher.

\ https://www.distributorwire.com/blog/copper-price-forecast-2019/

LME Cooper price



Q2 2019

GOLD – CONNECTORS, PCB, PLATING

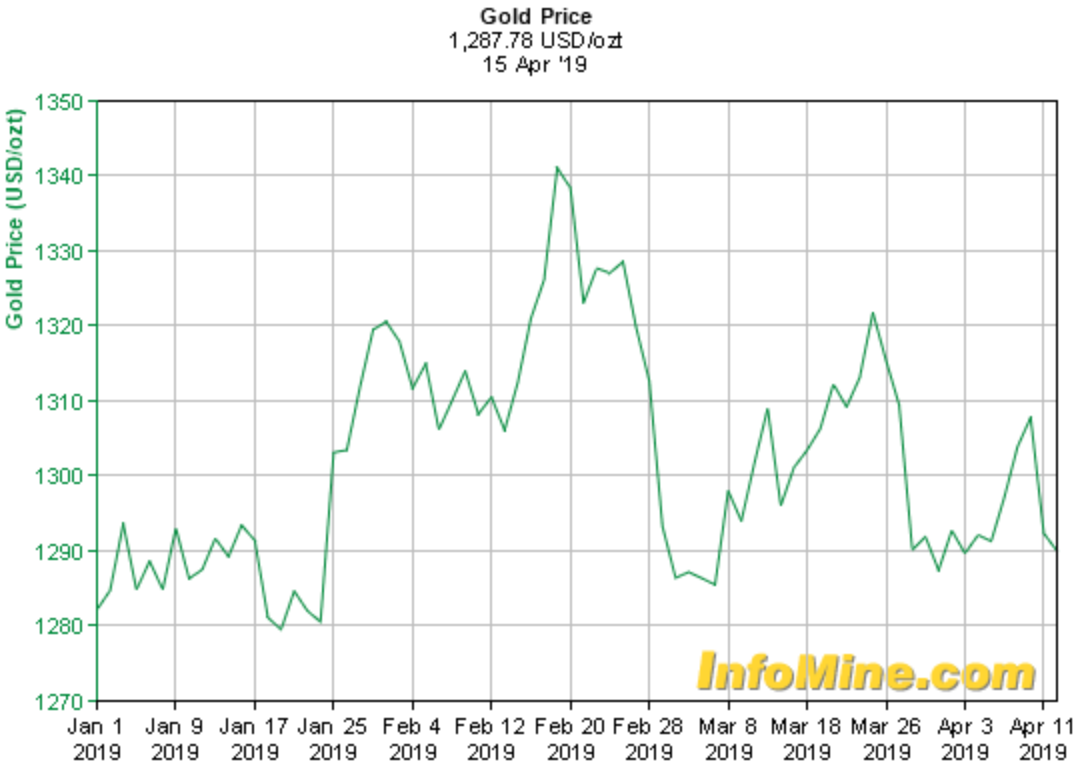
\ First, the WGC expects higher levels of risk and uncertainty this year, due to the elevated market volatility, rising political and economic instability in Europe (think about Brexit, social unrest in France, populist government in Italy, or secessionism in Spain), and potential higher inflation from protectionist policies. All these factors are said to increase the likelihood of a global recession, nudging investors toward gold as an effective portfolio diversifier and a safe haven.

\ Second, the WGC admits that, although market risk will likely remain high, higher interest rates and US dollar's strength could limit gold's upside. However, the organization believes that the greenback may be losing steam, while the positive effect of higher federal funds rate on the dollar will diminish as the Fed's monetary policy stance becomes neutral.

\ Third, the WGC argues that pro-growth economic reforms implemented in India and China would support consumer demand and, thus, gold prices. This claim is the weakest – and we refuted many times the argument that consumer demand drives the gold prices. Actually, the opposite is true, i.e., consumers are price-takers, not price setters.

\ http://www.mining.com/web/gold-market-2019-wgc-versus-lbma/

GOLD price



Q2 2019

PCB

\ The **global printed circuit board (PCB) market** was valued at USD 60.42 billion 2017 and is expected to reach **USD 80.38 billion** by 2024, at a **CAGR of 4.2%**. Factors driving the growth of the market are: rising adoption of automation in various end-user industries, growing demand for wireless devices, increasing miniaturization of devices, surging need for more efficient interconnect solutions, and rapid growth in flexible circuits. Owing to the implementation of processors and sensors in smart gadgets, the size of the PCB has reduced to 74%. Additionally, usage of flame retardant chemicals in PCBs to ensure fire safety, and increasing capital investment is further augmenting the market growth. Moreover, huge growth in global PCB market is also led by the increasing demand for smart tablets and smart phones in IT and consumer electronics sector. Growth in wearable electronics is emerging as a key opportunity in the growth of the global PCB market.

\ Based on type, multi-layer PCB is expected to dominate the global PCB market in 2019, and also emerging as fastest growing segment during the forecast period.

\ On the basis of substrate type, standard multilayer segment held the major market share. Rigid-flex printed circuit board is likely to register the highest CAGR during 2017-2024. The growth is owing to the increasing demand for display applications and rising adoption of smart phones.

PCB

\ Based on PCB laminate Type, FR-4 PCB laminate type dominated the global PCB market share in terms of value. This material provides a cost effective and reliable solution for the various designs.

\ On the basis of end-use, communication segment held the major market share in 2017, and is likely to register the fastest CAGR during the forecast period. The growth in the segment is owing to the increasing adoption of digital devices such as mobiles, networking equipment, power distribution system, amplifiers routers, etc. Automotive is experiencing a fastest growing segment.

https://globenewswire.com/news-release/2019/01/03/1679894/0/en/Global-Printed-Circuit-Board-PCB-Market-to-Witness-a-CAGR-of-4-2-during-2018-2024-Energias-Market-Research.html

Transportation

The transportation market trends for 2019 are as follows:

- Air freight market rates will soon increase, for 2 main reasons:
  - the Gafa (Google, Apple, Facebook, Amazon) members are launching new products like Apple (launching the new Ipad and the new Air Pods) and have already booked main space capacities in planes from Asia to Europe and to Americas for the coming weeks; as a consequence, rates will automatically increase
  - Peak Season Surcharge might be put in place during the summer

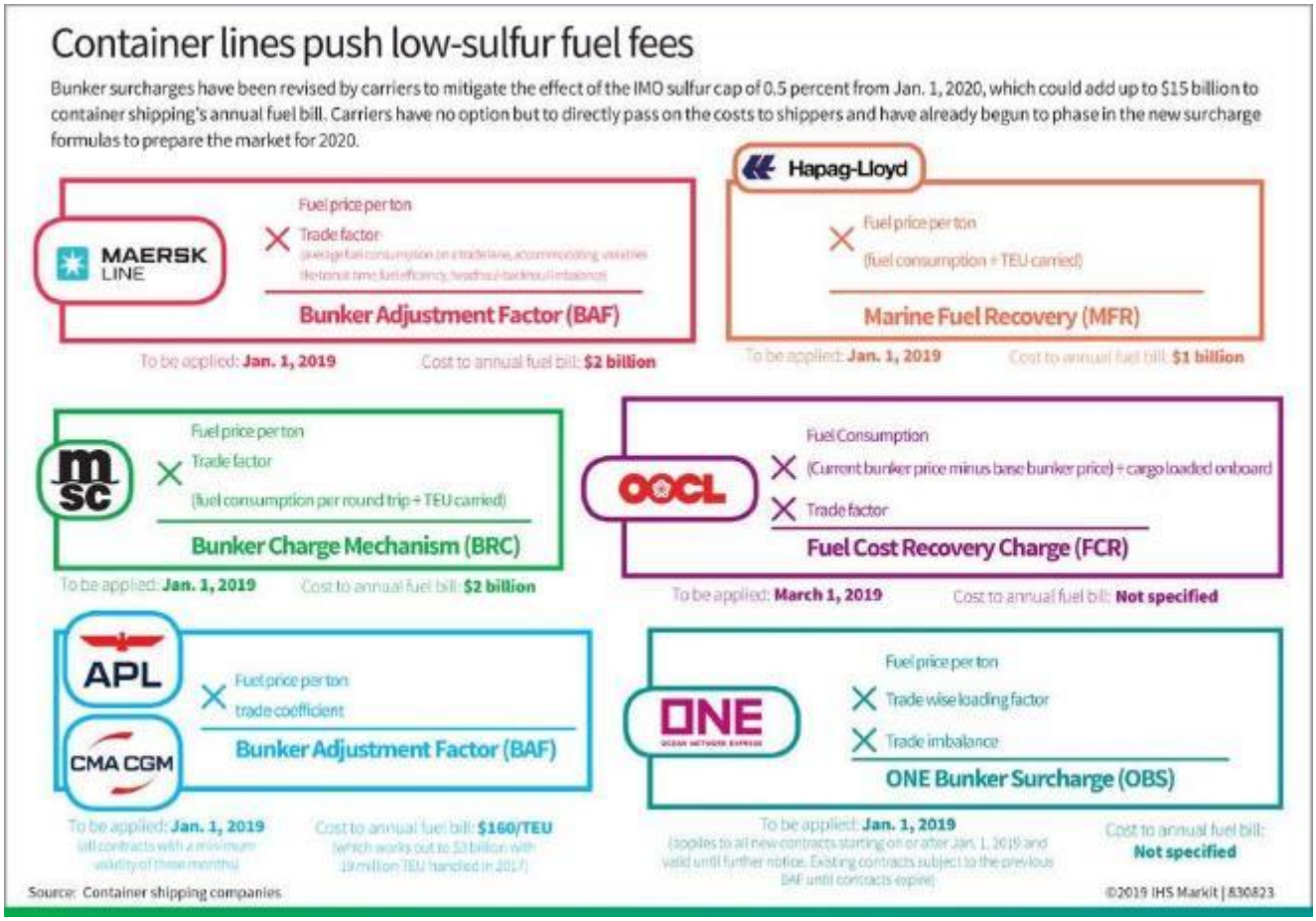
- Ocean freight rates will be increasing slowly due to the WW implementation of the Low Sulfur regulation: this regulation is eco-friendly and was set up in order to protect the environment; sea freight companies have invested billions of $ in order to comply with it, and will be soon implementing a related tax to shippers (attached is the slide); the average rate will be around $160 / TEU (Twenty foot Equivalent Unit); in other words, it seems that there will be no “all in” rates any more and that sea freight companies are trying to re-implement an old process where the BAF (Bunker Adjustment Factor) and CAF (Currency Adjustment Factor) will be billed separately from the main freight charges, and will change on a monthly basis

Transportation

- Ocean freight transit times will also be increased for environmental purposes: as an example, a complete ship rotation from Asia to Europe and back to Asia was about 9 weeks in the early 2000's ; by the year of 2020, the same transit time will have been increased by 2 weeks, i.e. 11 weeks door to door, roundtrip.

- Rail Road from Asia to Europe is trendy; the westbound volumes have increased by 35% in 2018; 75% of the shipments are being done via Kazakhstan (so called "silk road" or " south road") and 25 % via Mongolia / Transiberian; this means of transportation is a good alternative to air freight because it is cheaper; it still is not competitive compared to sea freight and transit times are still quite long; as of today, each train can load 118 TEU's

Transportation



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