

Supply chain perfect storm

Lansdale Semiconductor's president, R Dale Lillard, reminds readers that in today's uncertain world, JIT manufacturing will need re-tooling to provide sufficient redundancy

Since the 1980s manufacturers have enjoyed years of just-in-time manufacturing using outside suppliers. This let them reduce inventories and shorten cycle times for improved quality. They also discontinued vertical integration of their supply chain leaving them vulnerable to different supplier priorities which can be driven by political upheavals, environmental disasters and pandemics.

When the coronavirus emerged in March of 2020, it caused a perfect storm: shutting businesses, causing labor shortages and slowing transportation of goods. This led to supply shortages and long lead times. Many manufacturers have faced significant delays in buying materials for production. The most dramatic is the auto industry, which is reported to lose \$210 billion in sales in 2021 because of the IC supply slowdown.

Even without the pandemic, commercial life cycles can be two to three-years where automotive life cycle can exceed 10-years for production and maintenance support. Although the automotive industry has experienced supply issues when their products' technology lagged the rapid changes of advanced commercial products, the extent of this problem is something new.

Semiconductor companies' shift in production from automotive ICs to home computer products were well publicized. When demand changes rapidly, as it did in 2020, suppliers review their wafer production line run rates and modify them to improve sales per square inch of wafers produced. This can force unpredicted obsolescence and long cycle time delays as they optimize production for current product demand. The pandemic has caused a shift in wafer fabrication processes that is not easily reversed, leading to the possibility of permanent changes in availability for some products.

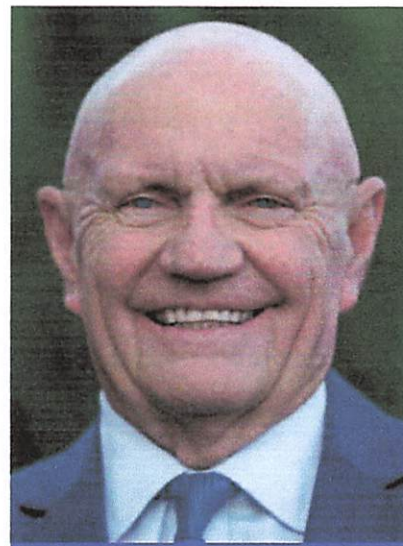
IC life cycles are driven by the wafer fabrication foundry process. Foundry equipment is expensive (new fabs cost \$5 to \$10 B) and their processes become difficult to modify. When market driven semiconductor technology advancements demand newer equipment and processes, the switch can make it difficult to produce older products. In many cases, the fab uses existing floor space and personnel for the newer equipment, forcing them to remove older equipment and shut down the older process. If older products are not compatible with new equipment, they become obsolete.

Pandemic induced supply chain problems have caused many semiconductor customers to spend time interrogating their suppliers about product life cycle, cycle times and overall lead times. The belief is that manufacturers can warn them of potential problems. However, suppliers cannot always accurately predict potential problems due to uncertainties within their own supply channels.

I'm sure most companies consider how to reduce supply shortfalls. It is a good time to increase inventories where possible, lengthen supply contracts and switch to suppliers who are closer and have good environments. The automotive industry used to have its own semiconductor manufacturing capability and may need to restart some closed foundries to ensure supply.

Nothing lasts forever. In an uncertain world, just-in-time manufacturing needs to be re-tooled to provide enough redundancy to cope with events that stress the supply chain, such as new technologies and a worldwide pandemic.

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