

**Scenaria,**

# **Case Study Summaries Light-Duty Suppliers**

## Situation:

- Client looking to expand plant capacity in order to supply hybrid powertrain components for U.S., E.U., and Chinese OEMs
- Regulation and other market drivers viewed as risks, due to potential to change OEM requirements and end-customer purchase decisions
- Client needs to select investment strategy: build new technology manufacturing capacity or expand facilities for existing technology

## Approach:

- Identify potential hybrid applications for three technology alternatives available for client investment (current, advanced, cutting-edge)
- Define component performance requirements and technology development timing
- Evaluate regulation-driven technology demand and sensitivity to market factors under 6 different market scenarios

## Results:

- Increasing regulations will drive growth in hybrid technology. However, the type of hybrid technology adopted is sensitive to market factors and vehicle type, which drives the type of product adopted by consumers.
  - Markets with low energy prices justified the expansion of existing facilities, due to the cost-effectiveness of existing hybrid technology
  - Markets with high energy prices justified investment in manufacturing capacity for new technology, because money saved by advanced technology offset vehicle price increases (over a 5-year period).

## Situation:

- Client entered a licensing agreement for new transmission technology, and needed to improve product positioning strategy.
- Targeting business development efforts required an evaluation of light-duty vehicles across three key markets (US, Europe and China)

## Approach:

- Identify potential targets (OEMs and light-duty nameplates) for new transmission technology, and evaluate cost and fuel economy benefit of client technology
- Map technology attractiveness based on 3 drivers of technology application (Fuel Economy, Regulations, Cost)
- Conduct a customer fit analysis using key performance parameters of competitive transmissions and input from Voice of Customer surveys
- Assess overall opportunities by combining customer fit and technology attractiveness with market factor sensitivities, stranded capital analysis, and a qualitative assessment of barriers to entry.
- Produce a targeted sales plan based on OEM switching cost estimates, key performance indicators and estimated fuel economy benefit across customers.

## Results:

- D-Segment vehicles were the most attractive segment and provided the greatest potential for technology adoption across the three key markets, within the 2020-2023 timeframe. The best "individual" segment was US light truck.
- Compared to competitive transmissions, the clients technology ranked highest for fuel economy and lowest for cost and drivability.

**Situation:**

- Client planning to ramp-up production of electrified driveline technology for the 2015-2017 timeframe and needed to review and validate regulatory and market requirements
- Client viewed regulations as key driver of OEM hybrid requirements, but presumed current hybrid products were not the most cost effective option available to OEM's.

**Approach:**

- Investigate cost reductions required to make client offering the lowest cost option at a given level of fuel economy performance.
- Calculate fuel economy and cost for available technology combinations
- Determine model years that client technology could meet or exceed fuel economy regulations
- Estimate price reductions needed to make client technology cost effective

**Results:**

- Minimal adoption of client technology prior to 2020 model year without major cost reductions
  - Prior to 2018, client technology requires a cost reduction of 58%-88% to be the most cost-effective option for OEMs to meet regulations
  - Moderate cost reductions (~14%) could shift demand into 2019 timeframe.
- After enacting moderate cost reductions, client received first order for technology application on 2019 MY vehicles.

**Situation:**

- Technology start-up for novel energy storage technology investigating light duty vehicle applications
- Board of directors seeking data-based marketing materials to supplement selling efforts at automotive OEMs
- Technology must be evaluated based on system level requirements for electrification and hybrid architectures

**Approach:**

- Work with subject matter experts from AVL Powertrain Engineering to properly specify costs and benefits of client technology in mild hybrid automotive systems
- Investigate unique benefits provided by applying new battery technology to existing electrification options (12V, 48V, and 115V Start/Stop systems)
- Calculate fuel economy and cost for available technology combinations
- Determine advantages of client technology over existing batteries (energy storage/cost)
- Estimate price reductions needed to make client technology cost effective

**Results:**

- Client advised that 48V and 115V systems show the most promise for leveraging advantages of their technology. Specifically for a 2014 midsize passenger car, the clients battery technology provided:
  - ~\$2/mpg improvement over existing 48V start/stop systems
  - ~\$10/mpg improvement over existing 115V start/stop systems

**Situation:**

- Global automotive supplier desired support for product pricing strategy and negotiations with key OEM customers
- Client needed to identify OEM vehicle nameplates with greatest potential for sales, timing of potential demand, and the price at which client technology is no longer a cost-effective solution for meeting US CAFE regulations

**Approach:**

- Identify OEM vehicle nameplates, technologies of interest and research baseline characteristics
- Collaborate with client in developing achievable cost/benefit scenarios, based on their expertise in lowering rolling resistance.
- Model all potential technology combinations available to achieve regulatory compliance on a per vehicle basis
- Evaluate changes in application of client technology based on changes to underlying price.

**Results:**

- Client technologies are supplements, rather than substitutes, to the most-cost effective bundles of technology.
- The relative price of client technology to the overall price of a vehicle is very small, which creates inelasticity. Therefore, attributes other than fuel economy and/or price will need to be used in the client's marketing strategy.
- The large truck segment offered the best opportunities for potential sales volume, based on effective price and the availability of alternative technology choices.

**Situation:**

- Global chemical supplier interested in applying expertise to vehicle light-weighting technology, and desired support for market entry decision.
- Objective was gaining a vehicle-level perspective on the technology trends generated by US CAFE regulations, with cost/benefit targets required for weight reduction to compete with other technology improvements.

**Approach:**

- Collaborate with client to develop achievable price per pound scenarios based on applying chemical expertise to vehicle light-weighting
- Estimate fuel economy impacts of new light-weighting “technologies”
- Model all potential technology combinations available to achieve regulatory compliance on a per vehicle basis
- Identify price per pound scenarios that enabled client light-weighting actions to be part of the most cost-effective solution for meeting regulatory targets using a representative light-duty vehicle fleet.

**Results:**

- Mass reduction actions above 20% of the base vehicle weight were cost prohibitive, given their relative fuel economy improvements to other technology combinations
- Mass reduction actions below 15% need to approach the “\$1/lb removed” price threshold in order to be a cost-effective solution to meet regulatory targets.
- Achieving the “\$1/lb removed” threshold creates robust demand in 2021 and beyond. The 2021MY also marks the start of higher year-over-year increases in US regulatory standards.