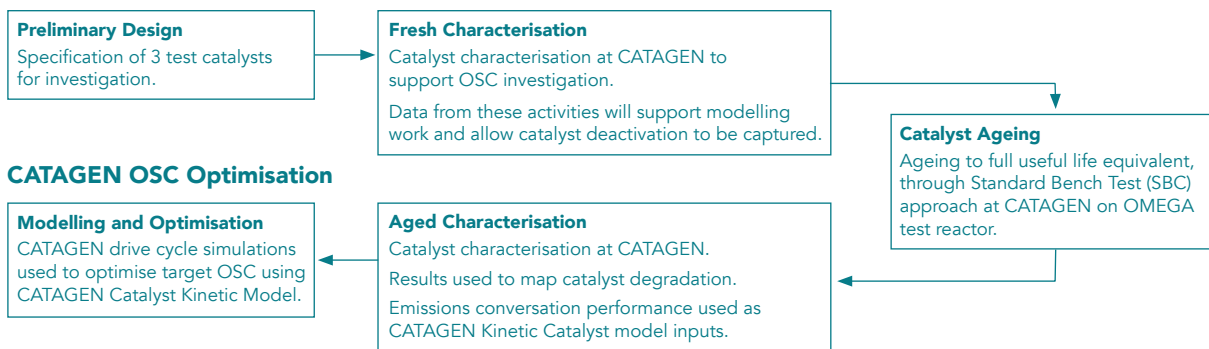


Process guide

Controlling transient emissions performance through the use of Oxygen Storage Capacity (OSC)

As demonstrated in the CATAGEN Blog – “Maximise your Emissions Performance with Best Practice Catalyst Design” - oxygen storage is a powerful means of minimising the tailpipe emissions throughout a drive cycle. As with anything, OSC comes at a cost; and there is a trade-off between OSC and even more expensive precious metal loadings for optimised unit cost. This places the aftertreatment design team in somewhat of a predicament; how much OSC is enough?

Through a development partnership with CATAGEN, this question can be answered. The process diagram below details the CATAGEN OSC Optimisation Process. This involves a combination of physical testing and simulation within CATAGEN, in order to identify the optimum oxygen storage in terms of tailpipe emissions. A brief description of each of the processes involved is detailed below.



- 1. Preliminary Design** - Suggest that two – three catalysts are specified with various levels of OSC, this will allow a data rich investigation to be completed.
- 2. Fresh Characterisation** - Mapping of catalyst performance in a fresh state, with the primary purpose of understanding catalyst degradation.
- 3. Catalyst Ageing** - Ageing of catalyst to full useful life state, with the potential for mid-life checkpoint characterisation. Key understanding in this study arises from the behaviour of aged hardware, CATAGEN ageing process ensures that each set of hardware is aged to an equivalent and reproducible state (within 2%).
- 4. Aged Characterisation** - Mapping of catalyst performance in an aged state. This completes the picture of degradation and provides a dataset to tune the CATAGEN Catalyst Kinetic Model*.
- 5. Modelling and Optimisation** - Data gathered during previous stages used as CATAGEN Catalyst Kinetic Model inputs, with physical performance measurements used to tune model parameters. From here, the models tuned for each set of hardware can be used alongside engine-out drive cycle emissions to predict tailpipe emissions for each configuration. With this understanding, the OSC can be fine tuned to suit the specific performance requirements. The previously mapped degradation profiles can then be used to quantify this in terms of fresh catalyst specification.

*CATAGEN Catalyst Kinetic Model - a mathematical model developed to simulate catalyst out conditions – publications available on request.