

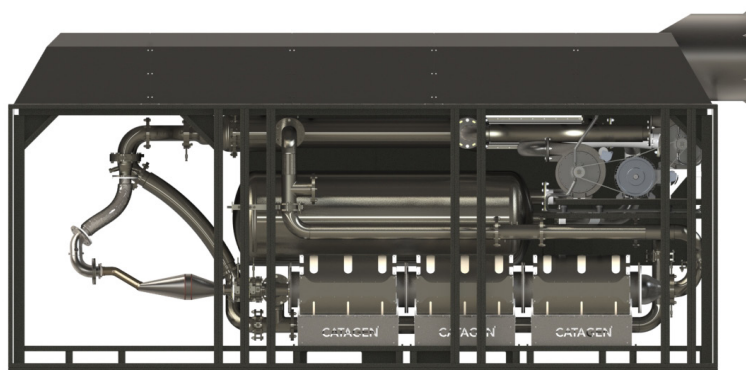
### Executive Summary

Euro 5 motorcycle emissions legalisation requires OEMs to test their OBD systems to show they will effectively work when emissions levels of CO, THC and NOx pass a threshold limit.

This legislation will come into effect for new vehicles in 2024 and existing vehicles in 2025. Motorcycle OEM's are required to understand the vehicle emissions of their products in time to guarantee success for passing legislation requirements.

The employed method to create catalysts was successful and allowed the OEM to deliver their project goals and pass OBD II limits.

CATAGEN have produced a methodology to age motorcycle catalysts to the required OBD limits using catalyst modelling and a range of different ageing methods.



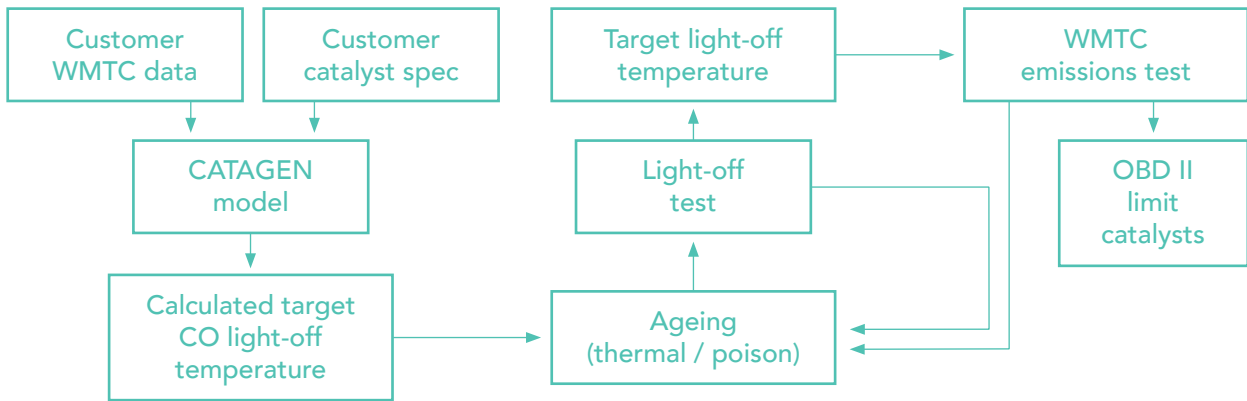
CATAGEN Omega test reactor

### Challenges

OEM's have previously attempted to use traditional ageing methods to produce catalysts which meet OBD II limits. Traditional ageing techniques fail to consistently deliver an OBD II catalyst and typically result in excessive costs and timeframes.

## Methodology

To start the ageing process the CATAGEN Catalyst Kinetic Model is used to predict a light-off performance which the catalyst will be aged to that point. This is calculated using the motorcycle developers' World Motorcycle Test Cycle (WMTC) data. Ageing is completed with a range of ageing methodologies including thermal and poison ageing. The full procedure is highlighted.



The CATAGEN OMEGA test reactor was used to complete all characterisation and ageing work.

Once the light-off temperature was reached, a World Motorcycle Test Cycle (WMTC) was completed to test the emission levels of the system.

## Results

The graph below highlights the typical WMTC emissions results for a catalyst post ageing, highlighting that all required pollutants passed the threshold limit.

The use of the CATAGEN Catalyst Kinetic Model proved successful in delivering OBD II limit age catalysts to the OEM. Measured predicted light off subsequently went on the pass the OBD II limit requirement.

This project studies Euro 5 OBD II vehicle categories L3e -L6e but the methodology is adaptable to all motorcycle and light duty vehicle catalysts.

