Greenhouse gas mitigation at landfills by methane oxidation in engineered biocover systems is believed to be a cost effective technology, but so far a full quantitative evaluation of the efficiency of the technology in full scale has only been carried out in a few cases. A third generation semi-passive biocover system was constructed at the AV Miljø Landfill, Denmark. The biocover system was fed by landfill gas pumped out of three leachate collection wells. An innovative gas distribution system was used to overcome the commonly observed surface emission hot spot areas resulting from an uneven gas distribution to the active methane oxidation layer, leading to areas with methane overloading. Performed screening of methane and carbon dioxide surface concentrations, as well as flux measurement using a flux chamber at the surface of the biocover, showed homogenous distributions indicating an even gas distribution. This was supported by results from a tracer gas test where the compound HFC-134a was added to the gas inlet over an adequately long time period to obtain tracer gas stationarity in the whole biocover system. Studies of the tracer gas movement within the biocover system showed a very even gas distribution in gas probes installed in the gas distribution layer. Also the flux of tracer gas out of the biocover surface, as measured by flux chamber technique, showed a spatially even distribution. Installed probes logging the temperature and moisture content of the methane oxidation layer at different depths showed elevated temperatures in the layer with temperature differences to the ambient temperature in the range of 25-50 °C at the deepest measuring point due to the microbial processes occurring in the layer. The moisture measurements showed that infiltrating precipitation was efficiently drained away from the methane oxidation layer, leading to areas with methane overloading. Performed screening of methane and carbon dioxide surface concentrations, as well as flux measurement using a flux chamber at the surface of the biocover, showed homogenous distributions indicating an even gas distribution. This was supported by results from a tracer gas test where the compound HFC-134a was added to the gas inlet over an adequately long time period to obtain tracer gas stationarity in the whole biocover system. Studies of the tracer gas movement within the biocover system showed a very even gas distribution in gas probes installed in the gas distribution layer. Also the flux of tracer gas out of the biocover surface, as measured by flux chamber technique, showed a spatially even distribution. Installed probes logging the temperature and moisture content of the methane oxidation layer at different depths showed elevated temperatures in the layer with temperature differences to the ambient temperature in the range of 25-50 °C at the deepest measuring point due to the microbial processes occurring in the layer. The moisture measurements showed that infiltrating precipitation was efficiently drained away from the methane oxidation layer.