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Editorial

Methane: Signs of progress along the road

"*We drive into the future using only our rearview mirror*."
Marshall McLuhan (1911–1980)

Analyses of air bubbles within ice cores suggest that the concentration of atmospheric methane remained fairly steady from 1500 BC to 1700 AD. However, with the dawn of the Industrial Revolution atmospheric methane concentrations began to increase. Recent findings of Simpson et al. (2006) have shown that the growth in the concentration of tropospheric methane has leveled off based on air sampling conducted throughout the Pacific basin (71°N–47°S) over the last seven years. Methane is second only to carbon dioxide in terms of importance in climatic greenhouse warming scenarios. This plateau is in stark contrast to the increasing atmospheric methane concentrations during the 1980s, where the concentration grew by an average of 15 ppbv yr^{-1} (Blake and Rowland, 1988). This slow-down in the growth of methane is positive news in terms of human interaction in reducing greenhouse gas emissions. In my view, there are two important thoughts related to these recent findings that I would like to share: (1) the reduction in the sources of methane, and (2) the importance of actual measurements versus modeled data.

One portion of the reduced burden of methane in the atmosphere is a direct result of the increasing number of landfill gas recovery and utilization projects. There has been exceptional growth in the number of landfill gas utilization projects worldwide. The first landfill gas utilization project came to life in 1975. There are currently over 1100 active utilization projects globally, with several additional projects in varying stages of construction or planning (Willumsen, 2003). In the US, the number of projects has more than doubled since 1990, increasing from 130 projects to over 395 in 2006 (http://www.epa.gov/landfill/index.htm). In the US alone, an estimated 600 additional sites have economically-feasible options for utilization. In addition to the new projects, there is rarely a modern landfill built without an active landfill gas recovery system. This recovered methane is subsequently utilized or flared. In developed countries, the decision to install a gas recovery system is largely controlled by regulations. In developing countries, it is primarily a financial decision. Greenhouse gas emission credit trading, such as those allowed under the Kyoto protocol, has reduced the financial hurdle making it easier to establish viable projects in developing countries.

This response of the waste industry in reducing methane emissions from landfills is worthy of notice. Slower growth of atmospheric methane concentrations does suggest that a reduction in the quantity of methane released to the atmosphere has resulted from several measures that have been taken over the last decades. Landfill emissions are targeted by many developed countries as a greenhouse gas source that should and can be reduced for two reasons. First, technology to do so is readily accessible and commercially available since 1975. Second, with increasing energy prices, recovered methane also has an economic value, leading to potential financial payback from gas utilization. The exact contribution of these landfill gas utilization projects on the global methane budget is difficult to directly measure. Limited field assessments indicate that upwards of 90% efficiency in the capture of landfill gas can be attained through a properly engineered cover system with an active gas recovery system. High recovery percentages greatly reduce the potential of gas emissions through the cover system and the resulting atmospheric methane load. Growth of landfill gas recovery projects globally has assisted in reducing the contribution of methane to the atmosphere, and should be applauded.

The second item that came to mind with the recent methane findings is the need for sound and reliable field data. Overall trends in atmospheric greenhouse gas concentrations are a heavily debated topic both in scientific and political circles. An example of this is in the forecasting of methane concentrations as presented by Simpson et al. (2006). Based upon historical trends, methane concentrations were predicted to be around 1.9 ppmv by 2010. However, actual field data (such as that presented in Simpson et al., 2006) now casts some doubt on this forecast, since this current stabilization of methane growth was not foreseen in the initial modeling and its duration is unknown. This exemplifies the need for high-quality field

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data to support all modeling predictions. Without actual field data supporting the results, model forecasts are strictly speculation. Models, after all, only perform calculations based on the inputs provided to them, providing a means to predict the future through one possible forecast based upon those inputs. Past performance cannot always predict future trends. The emphasis should be on reliable field data.

In keeping with the analogy in the quote from Marshall McLuhan, we do drive into the future looking into our rearview mirrors. The past is the best predictor that we have of the future, even though it may not always be accurate. This historical evidence is the foundation and the basis of developing models. However, occasionally we need a glimpse forward or even better a "spot-check" with actual field data to verify that we are still on the road.

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