

KmX is a clean technology company providing an alternative to disposing waste chemicals through incineration. There are approximately 55,000 chemicals in use today with approximately 1,000 new compounds formed each year. The most widespread methodology for disposing spent chemical streams is through incineration and landfill. We believe that from an environmental, public health as well as economic standpoint there is a need to provide a more comprehensive plan where recycling chemical waste streams would play a more prominent role than it does today. This would allow us to develop a more sustainable waste minimization program through the recovery and rectification of spent chemicals. A comprehensive plan for minimization should include the exploration and development of products and processes that do not use toxic chemicals in the first place. However, given that we are still some way off from the ubiquitous use of green chemicals, recycling toxic and hazardous waste streams to recover the inherent value within these streams would seem a very good second best.

The "Toxic Release Inventory" (TRI 2006) data provided by the US Environmental Protection Agency (EPA), found that 24.5 billion lbs of waste chemicals were generated in 2006 from a sample of just under 600 tracked chemicals. Considering the EPA sample is just approximately 1% of the estimated total number of chemicals in use today, we start to realize the immense challenge we face annually in finding suitable disposal methods for this toxic waste.

The biggest restraints to recycling being a more prominent solution in the recovery of spent chemicals have been a lack of technology, government regulations that have worked against recycling solutions as well as insufficient data about the environmental benefits of rectification versus incineration.

The advent of pervaporation membrane technology is providing a new dimension in the pursuit of increasing the role recycling plays in the disposal of spent chemicals. To be of value the technology must be capable of providing separation capabilities that are far superior to those separation technologies that exist today as well as being totally scalable. After decades of research and development since P.A Kober invented it in 1917, we believe pervaporation membrane technology is finally at a stage where it can be put to commercial testing and should provide a paradigm shift in the way we dispose of spent chemicals. In addition certain changes taking place shortly to EPA regulations surrounding the liability of hazardous waste disposal should drive more spent streams from incineration to recycling.

In the past few years there have been several studies showing the benefits of rectification compared to incineration. One such study is the "Environmental Assessment of Waste-Solvent Treatment Options" by Christian Capello and Stefanie Hellweg. This study showed that the rectification using distillation rather than incineration of most waste solvents would benefit the environment with the key determinants being yield loss and levels of purification attained. Two studies performed in the US in 1993 and 1994 show that if material that is currently marketable and recyclable --- which is typically burned in a modern trash incinerator --- was recycled instead, some 3-5 times as much energy would be saved. The reason: Incineration can only recover some of the calorific value contained in the waste stream; it cannot recover any of the energy invested in extraction, processing, fabrication and chemical synthesis involved in the manufacture of the objects and materials in the waste stream.

We will review how hybrid distillation/pervaporation membrane-aided solutions will allow for a much broader spectrum and volume of waste chemicals to be recovered than hitherto possible thereby allowing for a far greater role to be played by recycling in the disposal of waste chemicals.