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A Decade of Progress in California? Not for Its Recycling Rate

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The volume of post-recycled municipal solid waste (MSW) being placed in California's landfills has been steadily climbing for the past decade, during which time the state's legislature, with its waste management agency following meekly behind, has refused to amend repressive statutes and regulations that prevent the use of non-combustion thermal technologies to address the problem.

These roadblocks that have prevented pyrolysis and gasification technologies from converting MSW feedstocks into biofuels, chemicals and other biobased products have remained in place for over two decades. This despite the fact that in 2011, when the state's recycling rate was at 49% and landfilling was at 29.9 million tons of solid waste annually, the legislature passed Assembly Bill 341 establishing a statewide goal of 75% recycling, to be achieved by this year.

Then in 2016 came SB 1383, which required a 50% reduction in the level of the statewide disposal of organic waste from the 2014 level by 2020 and a 75% reduction by 2025.

The problem is that these goals were to be achieved only through the use of source reduction, traditional recycling practices and composting.

And where are we now?

Millions of Tons of MSW Landfilled in California*									
									Six Months
2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
30.2	29.9	29.4	30.3	31.0	33.1	34.8	37.5	39.1	21.7
California's Recycling Rate									
49%	49%	50%	50%	50%	47%	44%	42%	?	?

* As reported by the landfills for IWM Fee assessment

During the seven years since the passage of AB 341, annual disposal has increased by almost ten million tons, and in the first six months of 2019 (the latest period reported) it totaled 21.7 million tons, an increase of 8% over the prior year.

CalRecycle, the state's Department of Resources Recycling and Recovery, has not issued a formal statement on the state's recycling rate since 2017, when it stood at 42%, down from 50% as late as 2014 – perhaps a tacit admission that its current policies are not achieving its legislated mandates. Monitoring success and failure in meeting its goals is primary to an organization's credibility.

According to the agency's own website, to meet its 2020 goal of 75% recycling, the state this year would have to reduce, recycle, or compost an additional 23 million tons of material currently going to landfills. It estimates that 80 million tons of solid waste will be generated this year. Therefore, to meet its 75% goal, approximately one-half of the post-recycled solid waste currently being landfilled would need to be source reduced, recycled, or composted — an impossibility.

Expressed another way, it has been estimated that, under CalRecycle's current policies, to meet its 75% recycling goal would require the construction of 110 additional anaerobic digestion and composting facilities — and it is questionable whether there would be markets for the residuals.

This goal has been made even more difficult by the fact that, as of this year, credit for landfill diversion is no longer allowed for green waste when it is used as alternative daily cover. This will increase the volume of waste recorded as being landfilled, or worse, force the increased open field burning of these residues.

The potential

The potential for conversion technologies in California, indeed all across the nation, is massive. However, operational certainty will require clear permitting and regulatory pathways based upon standards of performance, subject to environmental standards consistent with other solid waste processing or refinery operations, rather than attempting to define, categorize and regulate these technologies by type.

Theoretically, with today's proven technologies, the approximately 42 million tons of solid waste that were placed in landfills last year could have supported the production of more than 1.6 billion gallons of low carbon fuel.

Since the passage of AB 341 in 2011, no new statute or subsequent CalRecycle policy documents have ever mentioned Conversion Technologies — non-combustion thermal technologies, i.e. pyrolysis and gasification, used in the production of biofuels, chemicals and other biobased products — as playing any role in achieving these goals.

In fact, for at least the past fifteen years CalRecycle's policies have contradicted the definition of recycling in state's Public Resources Code. Section 40180 defines recycling as "the process of collecting, sorting, cleansing, treating, and reconstituting of materials that would otherwise become solid waste, and returning them to the economic mainstream *in the form of raw material for new,* reused, or reconstituted products, which meet the quality standards necessary to be used in the marketplace."

This process, also known as molecular recycling, involves changing the form or structure of something, whereas CalRecycle, in its AB 341 planning and other policy making, has maintained that recycling comprises only material segregation, collection, and sorting.

And who bears responsibility for all of this?

Look no farther than the state's legislative majority, guided by a cadre of entrenched committee staff members aligned with traditional recycling advocates, who cling to the belief that source reduction, re-use and traditional recycling are the only legitimate pathways to zero waste.

Over the past fifteen years, the legislature has blocked all efforts to amend or remove from statute a definition of gasification that is universally acknowledged to be scientifically inaccurate, and which leaves developers vulnerable to spurious legal challenges and possible shutdown due to lack of compliance.

The fundamental weakness of the current approach is that it does not entail an internationally-proven, comprehensive systems engineering approach – on that embraces all proven policy and technologies available to create an infrastructure that can respond to changes in the recycling market, and/or major changes in the volume and types of solid waste being generated.

Currently, pyrolysis does not count as recycling. Further, the definition of gasification restricts the use of air or oxygen in the thermal conversion process (a disqualifying element for most technologies), and requires the entire biorefining process, not simply the gasification step, have zero emissions. This is a physical impossibility that prevents the commercialization of these technologies. It is a standard that would shut down every power plant and petroleum refinery in the state.

In contrast, the California Air Resources Board has long recognized organic waste as one of the only feedstocks that, on a life-cycle basis, can meet the emissions reduction objectives of its Low Carbon Fuel Standard. As early as 2010, its staff declared that, to assist in meeting this goal by 2020, 24 new waste-to-biofuels facilities would be needed in the state —18 cellulosic ethanol biorefineries and six new biodiesel/renewable diesel plants. Not one has been completed.

The projects

However, at least five projects are now in development in the San Joaquin Valley that will apply gasification or pyrolysis to the productive disposal of agricultural residues. This is possible because the State's repressive gasification definition and its regulations relating to MSW do not apply to single stream cellulosic wastes. These projects include major cellulosic ethanol plants by Aemetis and West Coast Waste using gasification technologies from InEnTec and Enerkem. Both of these projects have been supported by grants from the California Energy Commission.

Approximately one million tons of orchard and vineyard removals were permitted for open field burning last year. Finding solutions for the disposal of agricultural residues has become a problem of "life and death" proportions for this $50 billion industry, and conversion technologies will ultimately play a major role in addressing this issue.

Hopefully, these projects in California's Central Valley will open the way for thermal technologies to access a broader array of biogenic wastes and residuals as feedstocks, including many fractions of MSW.

In 2019, recovered fiber exports experienced their largest year-over-year decline on record, compounding the nation's disposal problem. This was due principally to China's ban of all recyclable material imports, and similar bans from India, Malaysia, Indonesia, Vietnam and the Philippines.

In 2016, SB 1383 established methane emissions reduction targets for various sectors of California's economy. Among its goals, it mandated a 50% reduction in the level of the statewide disposal of organic waste from the 2014 level by 2020 (a target that will be missed by a mile), and a 75% reduction by 2025.

It is unlikely that the State will achieve its 2025 goal for organic waste landfill disposal reduction using only composting and anaerobic digestion, because these processes do not address many of the materials defined in SB 1383 as "organic waste." The list has been expanded to include all paper products, carpets, textiles, some types of plastic, manure, and biosolids.

Conversion technologies can handle the entire post-recycled organic waste stream—food and green waste plus all of the feedstocks named above, even fossil-based materials like plastics. These technologies could repurpose underused waste plastics not into fuel, but into new non-fuel, non-packaging and non-container products, helping to reduce the demand for petroleum, and leaving combustion products – fuel or energy — to be produced from the low carbon biogenic components of the waste steam.

CalRecycle's new draft regulations for SB 1383 open the door slightly for conversion technologies if it can be shown that their GHG emissions profile is superior to composting (a fact already well known), and potentially, even for credit as diversion from landfill disposal.

According to a 2019 Jet Propulsion Laboratory survey of 272,000 facilities and components, less than 0.2% of California's infrastructure elements are responsible for 34–46% of its total methane emissions. It found that waste management is the largest methane point source emission sector in the state (41% of the JPL study total), driven by the emissions from only 11% of the state's 270 active or closed landfills. The study also showed that composting facilities can be a significant source of methane.

Latest report on reaching California's goals

A comprehensive study entitled "Getting to Neutral" released in January by the Lawrence Livermore National Laboratory estimated that "To reach its ambitious goal of economy-wide carbon-neutrality by 2045, California will likely have to remove on the order of 125 million tons per year of CO_2 from the atmosphere."

It said that "As a result of the abundant waste biomass resources available in California there is the opportunity to capture and chemically or geologically sequester approximately 96 million tons of CO_2 per year in 2025 or 100 million tons of CO_2 per year in 2045, based solely on the amount of carbon contained in the biomass resources."

The report estimated the total biomass availability in California for 2025 and 2045 to be between 54 million and 56 million tons per year, respectively, and noted that "the majority of the forest biomass is in Northern California, agriculture residue is concentrated in Central California, and the largest amounts of municipal solid waste are from Southern California, giving a remarkably uniform biomass supply across the state."

Of the various strategies analyzed in the report, it concluded that "gasifying biomass to make hydrogen fuel and CO_2 has the largest promise for CO_2 removal at the lowest cost and aligns with the State's goals on renewable hydrogen."

Indeed, conversion technologies will ultimately change the face of the waste industry, and how we think about recycling. It is a regulatory concept worth fighting for.

For additional information, please visit bioenergyproducers.org

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