Designing the MMFR Collaborative's narrative on Chemical Recycling for multimaterial flexible packaging

Notes from the MMFR Collaborative Chemical Recycling Workshop

April 8 2020

The waste hierarchy

- What is the hierarchy?
  - "**Best and highest use**"- The hierarchy is trying to list things in order of preference to manage waste. Roughly in terms of "best and highest use". i.e. we should focus on waste reduction and reuse before we start talking about recycling or energy recovery. This reflects the concepts laid out in Sustainable Materials Management (SMM).
  - **Define highest best use <u>within</u> recycling** – should it be based on yield or GHG emissions (or will these metrics go hand in hand)?
  - **There is misunderstanding about the waste hierarchy** and the way it's supposed to be understood. If there is a way to recover something that is the best option available, why does the hierarchy matter?
- How does this compare to other frameworks?
  - **The circular economy is about recovering the highest value possible** - is this different from the waste hierarchy?
  - **Circular vs recyclable**: What is the difference between recycling and circularity? Circularity may be a bigger frame for chemical recycling. Perhaps we need to socialize an understanding of why circular and recyclable don't have to put products back into exactly what they came from.
- Where does chemical recycling (CR) fit into the hierarchy?
  - **Differentiate the different technologies**: We don't need to modify the hierarchy to include CR – but rather we need to better differentiate the different technologies currently lumped together under the CR umbrella -conventional mechanical recycling vs purification and conversion and plastic-to-fuel.
  - Most of the "confusion" around CR is centered on those processes that might make energy or feedstocks for recycling, i.e. conversion technologies.
  - **CR is a mix of recycling and energy recovery**, and inherently different than any other recovery process. Composting produces compost; mechanical recycling produces recycled content; energy recovery produces energy; but CR produces a whole bunch of different things. Some aspects can be classified as recycling while others fall into energy recovery or chemical conversion - "A cow is not an ice cream factory" . Maybe the waste hierarchy framework doesn't work well for CR.

- **Purification or depolymerization processes are clearly recycling** by any definition since they produce polymers or monomers.
- **CR probably belongs somewhere near mechanical recycling**, after looking at and balancing the different tradeoffs: Some of its outputs are not recycling, it is more energy intensive (-), but it can produce food grade PCR (+).
- **Chemical recycling should go above composting**, since it seems to save more energy in the product than compost.
- **It is more important to consider fate vs. process when evaluating these technologies** - The sustainability of CR depends on the market uses for its outputs. This is no different than any other form of recovery (e.g. using compost or recycled glass for landfill cover lessens the environmental benefits).
- Some felt like there is nothing to be gained by adding layers – or even differentiating between mechanical and chemical recycling – or mechanical and advanced recycling. Recycling = recycling and plastics to energy = energy
- **Narrative should be more specific but not too specific.** Specific enough to get the technology to scale but not so specific that you limit chemical recycling's ability to evolve with the economy and market needs.
- **Plastics and other outputs are desirable to fuels, but fuels still have a place.** Why is that bad if part of the end product goes to actual fuel? If it's displacing "virgin" fuel? → Circular Economy thought leaders feel we need "more" reuse(s). History of the waste hierarchy comes from a time when companies tried to sell burning garbage as "waste to energy". It will take time to heal that wound. We can't let our excitement overshadow people's feelings.

- Is this discussion different for MMFP?
  - **For MMFP, chemical recycling belongs above mechanical recycling.** Chemical recycling is the only way to deal with multi material flexibles, so it is different for these versus other materials, as they cannot be mechanically recycled. CR represents the only option for recycled content input into flexible packaging
  - **Films and Flexible have no home in the waste hierarchy**. We need to focus on successes. Pyrolysis and gasification are not new, but we're using them in a new way.

Definitions:

- **It's important for technologies to fit into definitions of "recycling"** from many different aspects: from permitting a plant, to accounting for materials, to consumer claims around recycled content, and financial incentives and program requirements defined by policies.
- **Change use of the term "chemical recycling"** - Concerns over negative connotation of "chemical." Proposed alternatives: Feedstock recycling, Molecular recycling, Enhanced recycling, Advanced recycling. Concerns that Advanced recycling sounds superior to mechanical.

- **Need to redirect focus on circularity** - 'Chemical recycling is not recycling' sort of misses the point, rather focus on how easy/effective/impactful it is to 'loop' the material and disrupt the existing linear pathways. This is an opportunity to bring back products and be more circular.

Positives to include in our narrative:

- **CR Potentially solves a lot of issues around food safety and FDA compliance for PCR**. It will be virgin quality, enabling a non-virgin stream of food-grade plastics.
- **CR is complementary to mechanical recycling.** It must be made clear that this is not for everything. There are recycling players who are mechanically recycling PE film into many things. PCR from film plastics is not suitable for food packaging usually and so CR will not steam-roller the PE recyclers.
- **Chemical recycling is an opportunity to create shared knowledge space** – education across the value chain.
- **CR is a driver of economic growth** - Adds jobs to the system, advanced technologies, and additional economic growth

Negatives/challenges to address:

- **Higher recovery rate is essential.** There is a shortage of recycled content available now.
- **Need to better understand carbon footprint** - Need to understand LCAs of processes. Everything needs to be taken into account, GHG emissions- Recognize that LCA's will change as our energy mix evolves to be more renewable. Maybe technologies with higher GHG footprints are lower on the hierarchy.
- **Address and avoid negative media**, i.e. that chemical and plastic have been pushing more plastic. Need to ensure chemical recycling is not seen as industry greenwashing.
- **Address the issue of downcycling/bigger loops** - Track materials to make sure the content is going towards higher value outputs in the waste hierarchy. CR can lead to upcycling but also to downcycling (fuels).

Other considerations for future discussion:

- **Traceability**
    - Traceability needed on a molecular level to determine how much is recycling. Mass balance methods and recycled feedstock can be useful for consumer trust.
    - How do we allow for/ account for co-products and co-uses of chemical recycling facilities?
    - How will a pyrolysis plant capture metrics for recycling vs energy production and how will that roll up to EPA or other metrics efforts (like The NPE pacts)

- **Outputs from different conversion technologies**- Naptha is a good feedstock but the main USA feedstock is ethane from natural gas. May not be as easy to use Naptha for plastics in the USA. What are all the various markets and outputs?

- **The role of Design**

- Will chemical recycling inhibit innovation on performance monolayer recyclable polymer alternatives to MMFP?
- Balance this with need to avoid unintentional consequences of switching to mono material substrates- don't want reduced food safety or increase food waste.

- **Timeframe**:
  - Do we discuss our narrative in the present or the projected future? Should it be both? People tend to talk about CR as if it's already at scale and already a feasible recovery pathway, when it's really not.
  - Mechanical recycling is what we should focus on in the short term.

- **Contextual based on stakeholder:**
  - Perhaps we should have different messaging for gov't, consumers, brands, suppliers, etc.
  - For consumers: Do consumers they need to know or care about mechanical vs chemical? Their concern is making sure they are not causing harm like using more resources (energy, etc.) to recycle.
  - Make it digestible to consumers. This level of conversation would be challenging.