SECURITIES & EXCHANGE COMMISSION EDGAR FILING

Loop Industries, Inc.

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UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 8-K

CURRENT REPORT
Pursuant to Section 13 or 15(d) of
The Securities Exchange Act of 1934

Date of Report (Date of earliest event reported)
December 14, 2020

LOOP INDUSTRIES, INC.

(Exact name of registrant as specified in its charter)

Nevada	**000-54786**	**27-2094706**
(State or other jurisdiction of incorporation)	(CommissionFile Number)	(IRS EmployerIdentification No.)

480 Fernand Poitras
Terrebonne, Quebec, Canada, J6Y 1Y4
(Address of principal executive offices, including zip code)

(450) 951-8555
(Registrant's telephone number, including area code)

Not Applicable
(Former name or former address, if changed since last report)

Check the appropriate box below if the Form 8-K filing is intended to simultaneously satisfy the filing obligation of the registrant under any of the following provisions (see General Instruction A.2. below):

☐ Written communications pursuant to Rule 425 under the Securities Act (17 CFR 230.425)
☐ Soliciting material pursuant to Rule 14a-12 under the Exchange Act (17 CFR 240.14a-12)
☐ Pre-commencement communications pursuant to Rule 14d-2(b) under the Exchange Act (17 CFR 240.14d-2(b))
☐ Pre-commencement communications pursuant to Rule 13e-4(c) under the Exchange Act (17 CFR 240.13e-4(c))

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	**Trading Symbol(s)**	**Name of each exchange on which registered**
Common stock, par value $0.0001 per share	LOOP	Nasdaq Global Market

Indicate by check mark whether the registrant is an emerging growth company as defined in Rule 405 of the Securities Act of 1933 (§230.405 of this chapter) or Rule 12b-2 of the Securities Exchange Act of 1934 (§240.12b-2 of this chapter).

Emerging growth company ☐

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Item 8.01. Other Events.

On December 14, 2020, Loop Industries, Inc. (the "Company"), issued a press release announcing the Company's release of an independent verification report of its patented Gen II depolymerization technology conducted by Kemitek, a not-for-profit College Centre for Technology Transfer specialized in the fields of green chemistry and chemical process scale-up.

Loop commissioned Kemitek to validate Loop's technology, which turns waste PET plastic and polyester fiber feedstocks into its primary building blocks, or monomers: dimethyl terephthalate ("DMT") and monoethylene glycol ("MEG"), which meet established purity criteria for producing virgin-quality PET.

The report concludes that the quality of the primary PET plastic building blocks meets Loop's specifications for the production of PET resin and polyester fiber.

A copy of the Company's press release is attached hereto as Exhibit 99.1.

The foregoing summary is qualified in its entirety by reference to a copy of the report, which is filed herewith as Exhibit 99.2.

Item 9.01. Financial Statements and Exhibits.

(d) Exhibits.

Exhibit Number	**Description**
99.1	Press Release, dated December 14, 2020
99.2	Kemitek Report, dated December 10, 2020

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, as amended, the registrant has duly caused this report to be signed on its behalf by the undersigned hereunto duly authorized.

LOOP INDUSTRIES, INC.

Date: December 14, 2020

By: */s/ Daniel Solomita*
Daniel Solomita
Chief Executive Officer and President

LOOP INDUSTRIES ANNOUNCES INDEPENDENT REVIEW CONFIRMING EFFECTIVENESS OF PATENTED TECHNOLOGY

Independent testing by respected third-party research center confirms that Loop's Gen II depolymerization technology is effective at producing pure monomers

MONTREAL (CANADA), ACCESSWIRE, December 14, 2020—Loop Industries ("Loop" or "the Company"), an innovator in sustainable plastics technology, today released the report of an independent verification of Loop's patented Gen II depolymerization technology, which allows waste polyethylene terephthalate ("PET") plastic and polyester fiber to be recycled into virgin-quality PET resin made from 100% recycled content. This verification was conducted by Kemitek, a not-for-profit College Centre for Technology Transfer specialized in the fields of green chemistry and chemical process scale-up.

Effectiveness of Patented Technology Producing Pure Monomers

Loop commissioned Kemitek to validate its technology, which turns waste PET plastic and polyester fiber feedstock into its primary building blocks, or monomers: dimethyl terephthalate ("DMT") and monoethylene glycol ("MEG"), which meet established purity criteria for producing virgin-quality PET.

Kemitek established a rigorous and independent methodology for this verification:

I. The Kemitek team was on site at Loop's Terrebonne, Quebec facilities for 16 days to verify each step of Loop's technology at Mini-Pilot (25 L reactor) and Pilot scales (6000 L reactor) from feedstock (post-consumer waste PET plastic) to final purified monomers (DMT and MEG).
II. Kemitek received the feedstock directly from Loop's supplier at their facilities. They then dried, sampled, sealed and shipped the waste plastic feedstock to Loop. The feedstock was also sent to an external laboratory by Kemitek for analysis and characterization.
III. Once on site, the Kemitek team took possession of the feedstock, controlled and secured the entire process to ensure the chain of custody at all times via human supervision and numbered lockouts and seals on the equipment.
IV. Throughout the process, the Kemitek team took samples at key steps for subsequent analysis to confirm there was no tampering by Loop's team.
V. The final purified monomers were secured by Kemitek and sent for analysis to certified external laboratories (ISO 17025). These analyses confirm the purity of the resulting monomers.

The feedstock used throughout the verification consisted of pallets of post-consumer waste PET plastic. In appearance, it was a mix of clear, gray and colored flakes and fines with a PET content varying between 86% and 95%, as determined by a Loop-conducted analysis. Feedstock contaminants identified by external laboratories mandated by Kemitek include printed film, silicone elastomer and polystyrene.

The final report issued by Kemitek, which will be filed today as an exhibit to Loop's Form 8-K, draws the below conclusions:

"The Kemitek team was able to understand, witness and verify the execution of Loop's Gen II polyethylene terephthalate (PET) depolymerization technology from feedstock to monomers.
While the verification was not intended to certify the yields or economic viability of the technology, as these were out of the scope of our mandate, our observations confirmed the production of significant quantities of dimethyl terephthalate (DMT) and monoethylene glycol (MEG) from a post-consumer waste PET feedstock at both mini-pilot and pilot scales.

Characterization of the finished products also confirmed that the quality of the primary PET plastic building blocks meet Loop's specifications for the production of PET resin and polyester fiber, achieving DMT purity ranging from 99.7% to 100.1%[1] *(w/w) and MEG purity ranging from 98.2% to 98.9% (w/w). The useful monomer content for the MEG product is greater than 99.0% (w/w). This is calculated by adding the secondary PET plastic building blocks present in the final MEG product: Dimethyl isophthalate (DMI), Dimethyl Terephthalate (DMT), Diethylene Glycol (DEG), Bis-(2-Hydroxyethyl)terephthalate (BHET), 1-(2-hydroxyethyl)4-methylterephthalate (MHET) and 1-(2-hydroxyethyl)4-methylisophthalate (MHEI). It is reasonable to expect these molecules to be integrated into the final polymer chains of the PET resin and polyester fiber.*

Kemitek's findings through this verification allow us to attest to the capacity of Loop's technology to produce pure monomers within their specifications. Kemitek conducted this verification in an independent manner using rigorous methodology and we ensured process integrity during the three-week testing period via surveillance, sampling and seals."

With the levels of purity confirmed by Kemitek's verification, Loop reiterates that its technology can produce monomers of sufficient purity to create PET plastic and polyester fiber that is 100% recycled and equivalent to virgin PET made from fossil fuels, consistent with previous polymerization trials and testing evaluations by clients and industrial companies.

"Loop Industries enlisted our services to conduct a scientific verification of its Gen II PET depolymerization technology from feedstock to monomers," said Alain Tremblay, M.Sc., Scientific Director at Kemitek and lead of the verification project. "Our findings through this verification allow us to attest to the capacity of Loop's technology to produce pure monomers within their specifications. Kemitek conducted this verification in an independent manner using rigorous methodology and we ensured process integrity during the three-week testing period via surveillance, sampling and seals."

A seasoned and published polymer researcher, professor Jérôme Claverie, Ph.D., from Université de Sherbrooke in Quebec, Canada acted as external scientific expert by observing key parts of the verification and its findings. Dr. Claverie was not compensated in any way by Loop for his participation as an independent expert. As a leading, highly published researcher and the holder of the Canada Research Chair (Tier 1) in Chemistry of Advanced Organic and Hybrid Materials, Dr. Claverie concurred with the conclusion put forward by Kemitek's verification, saying: "After meeting with Loop's team of researchers and engineers, reviewing all of their patents, and observing their technology at mini-pilot and pilot scales, I have absolutely no doubts that the patented PET recycling technology leads to high-purity monomers suitable for repolymerization into virgin-quality PET. Loop's team did not reinvent the fundamental, well-established chemistry underlying depolymerization. However, they optimized a version of this process that provides the ability to effectively depolymerize waste PET plastic at a high purity at below 90-degree temperature, which sets their technology apart."

Certifications and Accreditations

Loop has received from the European Chemicals Agency ("ECHA") a confirmation of registration for its MEG on November 17, 2020, and for its DMT on December 7, 2020. The registration under the *Registration, Evaluation, Authorization and Restriction of Chemicals* ("REACH") Regulation (EC 1907/2006) confirms that Loop's monomers are of a purity equal to what is currently recognized within Europe and entitles Loop to manufacture/import the monomers into Europe. It should be noted that MEG and DMT are on the positive list for plastic materials, which means that the two monomers can be used as food-contact materials.

In addition, as previously disclosed, Loop is in possession of a legal opinion confirming that its depolymerization technology meets U.S. Food and Drug Administration ("FDA") requirements to produce suitably pure MEG and DMT for use in food-grade packaging. The Company has filed for a No Objection Letter ("NOL") from the FDA, which will validate the legal opinion obtained thus far.

It should be noted that the levels of monomer purity confirmed by Kemitek's verification are in line with the data submitted for the REACH registration of Loop's DMT and MEG monomers and the FDA NOL.

Conclusion

"The results of Kemitek's verification reconfirm Loop's belief that we are well positioned to have a transformative impact on the reduction of global plastic waste," concluded Loop Founder and CEO Daniel Solomita. "I wish to sincerely thank the entire Loop team for their dedicated work and ongoing support for the Company, as we move forward with our plans to bring our technology to commercial scale."

[1] A result 0.1% above 100% is consistent with the margin of error of the result.

About Loop Industries

Loop Industries (NASDAQ: LOOP) is a technology company whose mission is to accelerate the world's shift toward sustainable PET plastic and polyester fiber and away from our dependence on fossil fuels. Loop owns patented and proprietary technology that depolymerizes no and low-value waste PET plastic and polyester fiber, including plastic bottles and packaging, carpets and textiles of any color, transparency or condition and even ocean plastics that have been degraded by the sun and salt, to its base building blocks (monomers). The monomers are filtered, purified and polymerized to create virgin-quality Loop™ branded PET resin and polyester fiber suitable for use in food-grade packaging, thus enabling our customers to meet their sustainability objectives. Loop Industries is contributing to the global movement toward a circular economy by preventing plastic waste and recovering waste plastic for a more sustainable future for all.

Common shares of Loop Industries are listed on the Nasdaq Global Market under the symbol "LOOP."

For more information, please visit www.loopindustries.com. Follow us on Twitter: @loopindustries, Instagram: loopindustries, Facebook: Loop Industries and LinkedIn: Loop Industries

Forward-Looking Statements

This news release contains "forward-looking statements" as defined in the U.S. Private Securities Litigation Reform Act of 1995. Such statements may be preceded by the words "intends", "may", "will", "plans", "expects", "anticipates", "should", "could", "projects", "predicts", "estimates", "aims", "believes", "hopes", "potential" or similar words. Forward-looking statements are not guarantees of future performance, are based on certain assumptions and are subject to various known and unknown risks and uncertainties, many of which are beyond Loop's control, and cannot be predicted or quantified and consequently, actual results may differ materially from those expressed or implied by such forward-looking statements. Such risks and uncertainties include, without limitation, risks and uncertainties associated with among other things: (i) commercialization of our technology and products, (ii) our status of relationship with partners, (iii) development and protection of our intellectual property and products, (iv) industry competition, (v) our need for and ability to obtain additional funding, (vi) building our manufacturing facility, (vii) our ability to sell our products in order to generate revenues, (viii) our proposed business model and our ability to execute thereon, (ix) adverse effects on the Company's business and operations as a result of increased regulatory, media or financial reporting issues and practices, rumors or otherwise, (x) disease epidemics and health related concerns, such as the current outbreak of a novel strain of coronavirus (COVID-19), which could result in (and, in the case of the COVID-19 outbreak, has resulted in some of the following) reduced access to capital markets, supply chain disruptions and scrutiny or embargoing of goods produced in affected areas, government-imposed mandatory business closures and resulting furloughs of our employees, travel restrictions or the like to prevent the spread of disease, and market or other changes that could result in noncash impairments of our intangible assets, and property, plant and equipment, and (xi) other factors discussed in our subsequent filings with the SEC. More detailed information about Loop and the risk factors that may affect the realization of forward-looking statements is set forth in our filings with the Securities and Exchange Commission ("SEC"). Investors and security holders are urged to read these documents free of charge on the SEC's web site at http://www.sec.gov. Loop assumes no obligation to publicly update or revise its forward-looking statements as a result of new information, future events or otherwise.

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Note to Media: Supporting Photo Assets Available for Download Here (Link expires December 19, 2020)

Investor Inquiries

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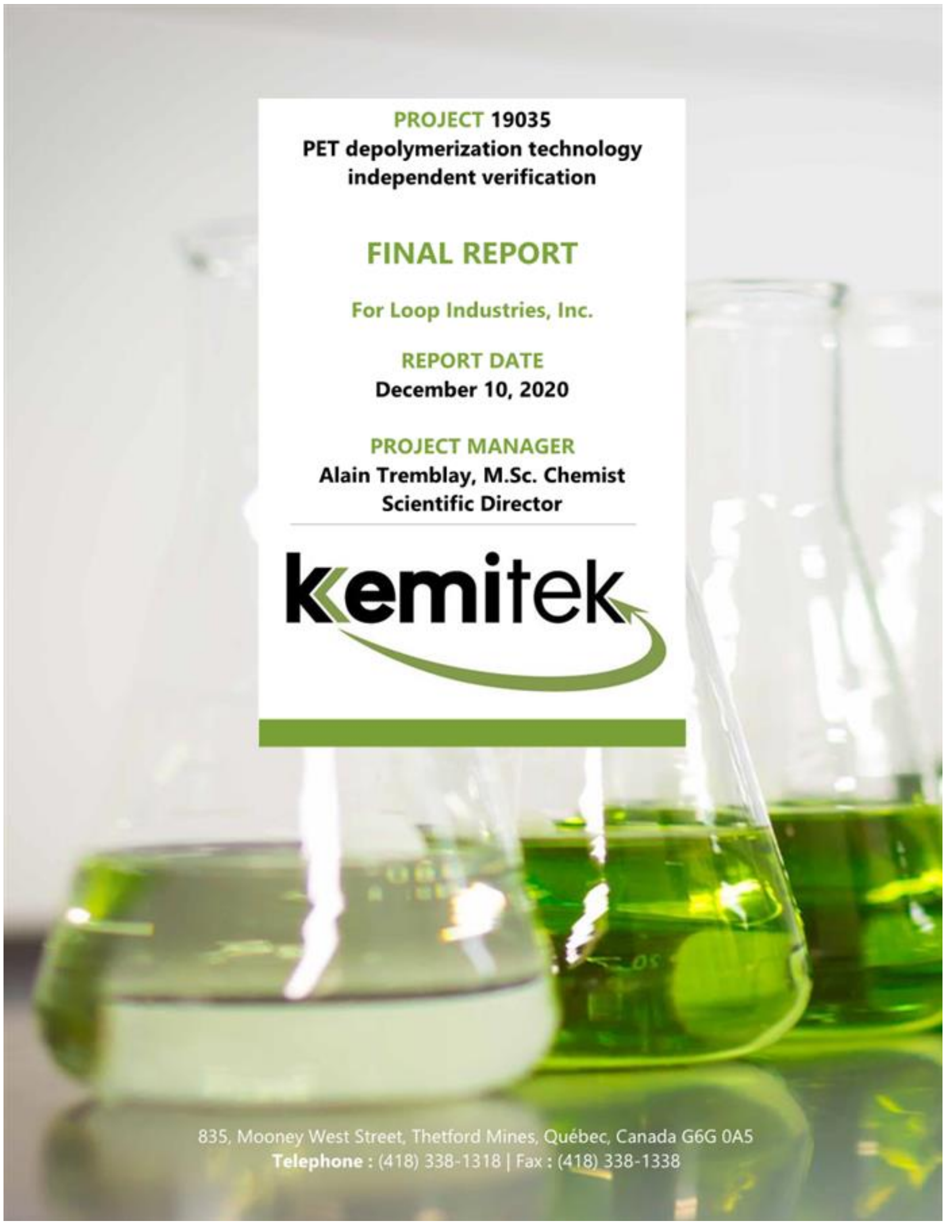
SOURCE: Loop Industries, Inc.

Exhibit 99.2



PROJECT 19035

PET depolymerization technology independent verification

FINAL REPORT

For Loop Industries, Inc.

REPORT DATE
December 10, 2020

PROJECT MANAGER
Alain Tremblay, M.Sc. Chemist
Scientific Director

kemitek

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PROJECT CONTEXT

Kemitek Profile

Established in 2002, Kemitek is a not-for-profit College Centre for Technology Transfer (CCTT) and a Technology Access Centre (TAC) specialized in green chemistry, sustainable chemistry, and process scale-up affiliated with the Cégep de Thetford (Thetford College) in Thetford Mines, Québec, Canada.

Thanks to the expertise of its experienced team of scientists, engineers, and technicians, Kemitek supports companies in their projects targeting the development of innovative products and processes, from laboratory to commercialization in the different niches of the chemical industry. Sectors served are, for example, materials and plastics, coatings and adhesives, cleaning agents, lubricants and mechanical fluids, biofuels and bioenergy, cosmetics, food and nutraceuticals, mining and hydrometallurgy.

Kemitek has a large fleet of equipment that can be used to carry out laboratory-scale chemical synthesis, analysis and testing as well as chemical process scale-up or pre-commercial production in reactors whose capacity can go up to 800 liters. In addition to serving over 400 SMEs and enterprises in Canada and elsewhere in more than 600 different innovation projects, Kemitek has developed research partnerships with multiple universities, research consortiums and centers for technology transfers.

Mandate and Scope

Loop Industries, Inc. ("Loop"), through its subsidiary Loop Canada Inc., approached Kemitek to conduct an independent verification of its Gen II polyethylene terephthalate (PET) depolymerization technology and to produce a report stating an opinion on the ability of the process to convert post-consumer waste PET plastic and polyester fiber into its primary monomer building blocks: dimethyl terephthalate (DMT) and monoethylene glycol (MEG).

The process verification was carried out on two different scales currently run at Loop's facilities: mini-pilot (in a 25-liter reactor) and pilot (in a 6000-liter reactor). The Kemitek team was mandated to understand, witness, control, and verify Loop's technology and characterize the quality of starting materials (post-consumer grade) and end products. The verification was not intended to certify the yields or economic viability of the process.

Independence

From the inception of the project, it was made clear that the verification would be conducted by Kemitek's team in an independent manner from Loop. This was deemed fundamentally important by both Kemitek and Loop for the verification to be relevant and rigorous. The project manager, Mr. Alain Tremblay (M.Sc., chemist, Scientific Director at Kemitek) had full autonomy on how the verification would be conducted. With his team, a verification plan was produced and the project conditions were presented to Loop's management team, who accepted all conditions and restrictions put forth by the verification team.

While the verification was carried out in an independent manner, Kemitek judges important to disclose possible appearances of conflict of interest:

- Loop is compensating Kemitek for the costs of the verification, as any client of Kemitek would. This is common in the verification business (ex. accounting). While we are paid by Loop to conduct the verification of their process, we assure the readers of the present report that we are professionals, that our scientists and engineers are members in good standing of their own professional associations and that we adhere to strict codes of conduct and ethics associated to our obligations as professionals, under the laws of Québec.
- Loop has been an episodic client of Kemitek over the last few years. These prior involvements of Kemitek with Loop were limited to specific tests done at Kemitek's facilities under the direction of Loop's staff for their own analysis. These contracts represented a small proportion of Kemitek's revenue (for example, less than 5 % in 2019-2020).

All things considered, the parties concluded that those elements do not compromise Kemitek's ability to conduct the verification in an independent manner and in respect with the code of conduct and ethics associated with our professions.

Loop PET Depolymerization Technology

Loop's technology is designed to depolymerize post-consumer waste PET plastic and polyester fiber into its primary building blocks, DMT and MEG, and secondary building blocks, such as dimethyl isophthalate (DMI) and diethylene glycol (DEG). These building blocks can then be polymerized into PET resin or polyester fiber. Prior to the on-site verification, Loop disclosed and discussed its technology with the verification team. Below is a simplified representation of the process:

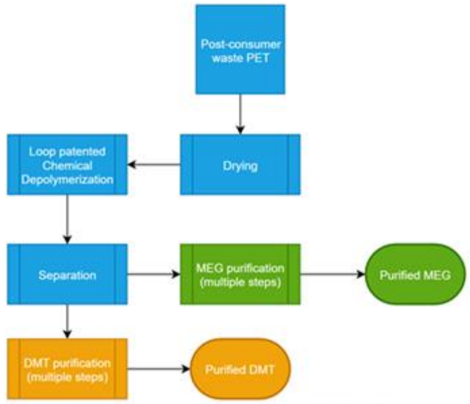

Figure 1: **Loop's Depolymerization Technology**

Loop's depolymerization technology begins with post-consumer PET (polyethylene terephthalate) waste obtained from its suppliers and delivered in bulk in the form of chips, flakes or fine particles. After drying, the feedstock undergoes depolymerization, by which the PET in the feedstock is broken down into its primary building blocks (monomers), dimethyl terephthalate (DMT) and monoethylene glycol (MEG), and secondary building blocks while other non-PET or non-polyester remain whole. From there, the DMT and MEG streams are isolated and purified over multiple steps, resulting in high-purity DMT and MEG monomers suitable for polymerization into PET plastic resin.

METHODOLOGY

General Verification Method

After disclosure of the process by Loop, Kemitek Scientific Director Alain Tremblay, M. Sc., chemist, and Director of Engineering François Marquis, Eng., were dispatched to Loop's facilities in Terrebonne, Québec, Canada on October 26, 2020 to conduct a preliminary visit and to assess the feasibility of the technical verification.

It was then decided that an on-site verification would take place. During this verification, a team of Kemitek professionals (chemists and engineers) would **understand and witness** the process from feedstock to monomers, both at mini-pilot and pilot scale. The Kemitek verification team would also **ensure both process and material integrity** throughout the verification. The execution of the process would be carried out by Loop's personnel, with the exception of the drying step. It was deemed preferable for this step to be done at Kemitek prior to the verification for process integrity control and scheduling purposes.

Process and Material Integrity

An important part of the verification was ensuring that no one could tamper with the process or the materials used within. A particular point of verification was the possibility of a fraudulent introduction of either the final products (DMT and MEG) or virgin PET that would boost the final quality of the products. To ensure the overall integrity, Kemitek used a strategy combining in-person surveillance, strategic sampling and analysis of materials, as well as tamper-evident seals.

In-Person Surveillance

One of the main ways the verification team ensured the integrity of the process was by having a team member in the production area overseeing the production operations while they were being conducted. While it was not possible to have someone in the production area 24/7 for the period of the verification, the team ensured a presence for most of the production time and no operations were to be done by Loop personnel on the process without express consent from the verification team. As such, Loop personnel would always seek authorisation before doing any intervention on the process, like adding product, changing conditions, etc. The verification team made certain to understand the actions that were proposed, assess their coherence with the understood process and give the go-ahead before Loop personnel could proceed. When appropriate, the verification team would inspect equipment (for example, to make sure it was empty before filling) or take one of the other integrity measures (seal, sampling).

Strategic Sampling

All addition of the chemical inputs required to complete the process were witnessed by Kemitek prior to being added to the production equipment. The Kemitek verification team would collect a sample for later analysis to ensure the input was indeed the expected product and not one of the end products.

These samples were under the custody of Kemitek until they could be secured in a locked chest in the verification team's headquarters that were setup in a room provided by Loop. Every weekend, the week's samples were brought back to Kemitek's facilities for safekeeping and eventual analysis.

In some instances, strategic sampling was combined with lockout tags and surveillance when those two measures alone could not ensure a satisfactory level of integrity security. In those instances, the samples taken on the same material over a period of time would be compared with each other to ensure no modification in composition was observed confirming no one had tampered with the material.

Every sample collected was logged on a chain of custody form.

Seals

Another important part of the integrity assurance strategy involved using numbered, tamper-proof seals. Four types of seals were used: wire cables, plastic seals, tamper-evident 3-inch tape and tamper-evident 2-inch labels.

Figure 2: **The four types of seals used (*photo credit: uline.ca*)**

The different seals were procured by Kemitek from Uline Canada. The Kemitek team used them to secure connexions, manholes, hoses, valves in closed positions, plugs and stoppers, containers, pipes, flanges and basically any point where it was deemed possible to have fraudulent product introduction.

Figure 3: **Examples of seals in-use during the verification**

Every seal that was installed got logged and signed by the Kemitek team in a paper registry where the following information was recorded:

- Installation
  - Date and time
  - Name and initials of installer
  - Type of seal
  - Serial number of the seal
  - Comment/location of the seal
- Removal
  - Date and time
  - Name and initials of remover
  - Comment/reason for removal

Loop personnel were advised to steer clear of any such seals and only Kemitek personnel was authorized to remove them. Whenever a seal needed to be removed for process purposes, Loop personnel would ask a verification team member to remove the seal and would need to explain the reason. While removed temporarily, Kemitek personnel visually supervised operations until the seal could be replaced (for example, a valve could be closed after material loading).

Remaining seals were removed by Kemitek's verification team members once the process was complete.

The near constant presence of Kemitek personnel alone would have made it extremely difficult for anyone ill-intentioned to tamper with the process during production. When combined with the other measures (seals, strategic sampling) and the fact that Loop's staff was not privy to the specifics of those measures, the verification team considers that the risk of tampering is nearly impossible.

On-Site Verification

The week prior to the start of the verification, Kemitek received a load of post-consumer waste PET from one of Loop's suppliers. Upon reception of the material, the trailer was secured in Kemitek's parking lot and 3.2 metric tons of materials were dried in Kemitek's pilot plant. The dried feedstock was repackaged, sealed with numbered plastic tags and shipped to Loop's facilities, where they were held unopened until the Kemitek team arrived.

The verification took place over 16 days, starting on November 11 and ending on November 28, 2020. In that period, Loop executed their process on two batches at each scale (mini-pilot and pilot).

Mini-Pilot

Kemitek followed and controlled both batches at the mini-pilot scale. As some parts of the process are done in laboratory glassware in fume hoods, a lot of it was controlled with physical surveillance. Two batches were processed at this scale. Intermediary product would be locked overnight in tamper-proof containers with cable seals. Considering the smaller scale of the material and equipment used and the visual nature of most manipulations at the mini-pilot scale, the extent of the control steps taken made it extremely improbable that anyone could have tampered with the materials or the process.

Pilot

The process was conducted at the pilot scale on two batches. A first batch was executed and verified from feedstock to the end of the process for both purified monomers. The second batch was executed and verified from feedstock to MEG recovery. The DMT purification was not controlled for the second batch, since this batch was only needed to obtain enough material to undergo one of the steps in MEG purification. Both MEG phases were combined and processed together from that point and until the end of the process.

Prior to the execution of each step of the process, Kemitek's senior project team members reviewed all expected operations with Loop personnel. They then proceeded to secure the equipment and confirm the overall integrity assurance strategy for the step, usually the day before the step was to be carried out for the first time. On the day of the operation itself, a final review was done and the process was started under Kemitek's supervision. For example, equipment was verified to be empty, valves and pipes were tracked to make sure nothing was amiss before starting. When production stopped for the night, equipment would be locked with seals and unlocked by Kemitek the following morning before moving to the next step.

Once the process ended for a monomer stream, samples were taken for analysis and the bulk product was sealed in its final container.

Sample Analysis

The post-consumer waste PET feedstock was characterized by another College Technology Transfer Center, Coalia, after being dried, homogenized and extruded. The characterization was based on visual identification, homogenization and extrusion, differential scanning calorimetry (DSC), FTIR, X-ray fluorescence (XRF), ashes determination and melt viscometry.

Non-feedstock input material samples (strategic samples for the purpose of integrity control) were analysed at Kemitek using either infrared spectrometry (FTIR) or nuclear magnetic resonance spectrometry (^{1}H NMR).

Final product samples were sent to external laboratories for analysis. The laboratories for the analysis of the final monomers were chosen based on their certification (ISO 17025 or Good Laboratory Practices) or the fact that the results would be certified by a professional. The method list is presented in the Results and Discussion section of this report. All methods were already carried out by the respective laboratories, except for the DMT assay and related compounds method, which is a method developed and validated by Loop. That method was transferred to the external laboratory and reviewed by their staff, as well as by Kemitek. The external laboratory data showed that the method was adequate.

RESULTS AND DISCUSSION

Feedstock Characterization

Characterization results for both lots of feedstock used confirmed that they were post-consumer waste PET with the presence of contaminants, as expected. Visual inspection revealed that the sample was composed of plastic material fragments of many different colors and printed films (Figure 4).

Figure 4: **Close-up picture of the feedstock**

Homogenized and extruded feedstock samples were analyzed by DSC and FTIR. These tests were chosen for quantification purposes. However, it turned out that these methods were not sensitive enough to quantify contaminants in the homogenized matrix. FTIR results were consistent with a polyester, confirming that the bulk of the feedstock is indeed PET. Semi-quantitative XRF showed low levels of inorganic contamination.

Many elements indicate that the feedstock samples are contaminated. A revealing test was the homogenization procedure preceding the other testing. Homogenized samples visually showed particles that would not mix with the polymer matrix, and the resulting pucks were very brittle, whereas virgin PET is characteristically very strong. Also, the solution used for viscometry was cloudy with unsolubilized black particles. Finally, the laboratory was able to remove a particle that resisted the homogenization process from a sample puck and analyze it by FTIR. The spectra suggest the particle is made from a silicone elastomer. Additionally, unhomogenized feedstock particles analysis by FTIR confirmed the presence of polystyrene.

Consequently, the characterization report concludes that the results are consistent with PET material that is contaminated from the recycling stream, notably with printed film, silicone elastomer, and polystyrene.

Process and Material Integrity

From November 11 to November 28, more than 375 man-hours were spent by the verification team on-site overseeing the process and applying the process and materials integrity strategy. Over this period, approximately 600 seals were installed and removed by the Kemitek verification team, while ensuring a near-constant presence on-site while production activities were taking place.

The 68 in-process samples that were collected during the verification were brought back to the Kemitek laboratory and analyzed for tampering detection. All were found to show no trace of any unexpected products when analyzed by FTIR or NMR. All analyses supported the identification provided by Loop at the time of sampling.

By combining all these strategies, the verification team is confident that the measures taken rendered any tampering nearly impossible.

Process Observations

On a general note, the process ran smoothly at the mini-pilot scale (with the exception of a defective probe that was replaced and worked well for the 2nd run). However, some operations did require minor interventions at the pilot scale. Some steps would take longer than initially planned, such as occasional clogging of transfer lines, but the Loop team would take reasonable action, after obtaining authorization from Kemitek, and carry on with the process. These kinds of adaptations are expected in a pilot plant setting and would have to be addressed at commercial scale.

Loop management has accurately described its process to Kemitek as a pilot of a process that is still being improved, and what we observed is definitely on par with our experience scaling up other processes in our own pilot plant in Thetford Mines. Most of the productivity shortcomings observed can be directly linked to either the size or design of the equipment (ex.: smaller lines block easier) which is planned to be improved.

Even though issues were encountered at pilot scale, Loop demonstrated a working process that produced significant quantities of MEG and DMT from post-consumer waste PET.

Product Quality

The final products were analyzed and compared to Loop's own specifications. The specifications were explained to and reviewed by the senior members of the verification team.

Test	Method	Loop specification	Mini-pilot run 1	Mini-pilot run 2	Pilot run 1
Aspect	Visual	White flakes or powder	White flakes and powder	White flakes and powder	White flakes and powder
Dimethyl terephthalate	HPLC-UV(M-0002)	≥ 98.0 % (w/w)	99.7 % (w/w)	99.8 % (w/w)	100.1 % (w/w)
Other PET monomers[1]	ASTM E2409 + M-0002	≤ 0.6 % (w/w)	0.1 % (w/w)	0.0 % (w/w)	0.0 % (w/w)
Monomethyl terephthalate	HPLC-UV(M-0002)	≤ 0.3 % (w/w)	0.0 % (w/w)	0.0 % (w/w)	0.1 % (w/w)
Elemental Impurity by ICP-OES (ICP-MS)	USP <233>	Varies by metal	Meets specifications	Meets specifications	Meets specifications
Color	ASTM E308-18				
*L**		≥ 94.0	94.97	94.62	95.55
*a**		-2 to 0.5	-0.19	-0.15	0.01
*b**		-3.3 to 1	0.44	0.60	0.35
Melting point	USP <741>	139 °C - 142 °C	142 °C	142 °C	142 °C
Absorbance (at 340 nm)	UV/Vis. M-0009 Ver 1	≤ 0.08	0.01	0.05	0.04

Note 1: 1-(2-hydroxyethyl)4-methylterephthalate and dimethyl isophthalate

Figure 5: **DMT final product analysis results and abbreviated specifications**

Three samples were analyzed for DMT: one from the end product of each mini-pilot run and one from the first pilot run. All samples were found to meet the specifications for every parameter. DMT purity was > 99.5% (w/w) for all samples.

Test/parameter	Method	Loop specification	Mini-pilot run1	Mini-pilot run 2	Pilot run 1+2
Aspect	Visual	Transparent and clear liquid	Transparent and clear liquid	Transparent and clear liquid	Transparent and clear liquid
Monoethylene Glycol Purity	ASTM E2409	≥ 98.0 % (w/w)	98.93% (w/w)	98.65% (w/w)	98.21% (w/w)
Other PET monomers[1]	ASTM E2409 + M-0002	≤ 3.3 % (w/w)	0.7 % (w/w)	1.0 % (w/w)	0.8 % (w/w)
Elemental Impurity by ICP-OES (ICP-MS)	USP <233>	Varies by metal	Meets specifications	Meets specifications	Meets specifications
Monomethyl terephthalate	HPLC-UV(M-0002)	≤ 0.1 % (w/w)	0.0 % (w/w)	0.0 % (w/w)	0.0 % (w/w)
Boiling Point	USP/Ph.Eur.	192 °C - 198 °C	197 °C	197 °C	197 °C
Color, APHA	ASTM D5386	≤ 10	2 Pt/Co Colour	3 Pt/Co Colour	2 Pt/Co Colour
Water Content	ASTM D6304 (Proc. A)	≤ 0.4 % (w/w)	0.10% (w/w)	0.02% (w/w)	0.42% (w/w)
Aldehydes in Mono-, Di-, and Triethylene Glycol	ASTM E2313				
Total Aldehydes (as Acetaldehyde)		≤ 60 mg/kg	14.8 mg/kg	23.5 mg/kg	27.2 mg/kg
Total Aldehydes (as Formaldehyde)		≤ 40 mg/kg	10.1 mg/kg	16.0 mg/kg	18.6 mg/kg

Note 1: Dimethyl terephthalate, Dimethyl isophthalate, Diethylene Glycol and 1-(2-hydroxyethyl)4-methylterephthalate

Figure 6: **MEG final product analysis results and abbreviated specifications**

For MEG, three samples were analyzed: one from the end product of each mini-pilot run and one from the final product obtained from the purification of the combined 2 pilot runs. All samples were found to meet the specifications for every parameter. While the purity of the MEG product is already high (>98% (w/w) for all samples), a useful monomer content can be calculated by adding together six additional polymerizable monomers: DMT, dimethyl isophthalate (DMI), diethylene glycol (DEG), bis-(2-Hydroxyethyl)terephthalate (BHET), 1-(2-hydroxyethyl)4-methylterephthalate (MHET) and 1-(2-hydroxyethyl)4-methylisophthalate (MHEI). Those molecules will foreseeably end up as part of the final PET polymer chain. Their presence in the MEG monomer product, when equal or below the levels at which they would be added at the time of polymerization, is appropriate for the purpose of making PET. Consequently, the useful monomer content of the MEG product is >99.5 % (w/w) for both mini-pilot runs and >99.0 %(w/w) for the combined pilot runs, as calculated by adding DMT, DMI, DEG, MHET and MHEI to the MEG concentration.

EXECUTIVE SUMMARY AND CONCLUSIONS

Verification Mandate and Independence

Kemitek, a not-for-profit College Centre for Technology Transfer (CCTT) and a Technology Access Centre (TAC) specialized in green chemistry, sustainable chemistry, and process scale-up affiliated to the Cégep de Thetford (Thetford College) in Thetford Mines, Québec, Canada, was hired by Loop Industries to conduct an independent verification of its Gen II polyethylene terephthalate (PET) depolymerization technology.

While the verification was carried out in an independent manner, Kemitek judges important to disclose possible appearances of conflict of interest: Loop paid Kemitek for the verification and also was an episodic client of our center prior to this verification mandate. All things considered, those elements do not compromise our ability to conduct the verification in an independent manner and in respect with the code of conduct and ethics associated with our professions.

Process Verification Execution

Kemitek understood, witnessed and verified the execution of the process from cradle to gate – from feedstock to monomers, and confirmed that the final products were obtained entirely from reactions occurring in the planned process, without any fraudulent introduction of other reactants. The quality of the final products met Loop specifications. The execution of the process converting waste PET into dimethyl terephthalate (DMT) and monoethylene glycol (MEG) was carried out by Loop personnel under Kemitek supervision except for the first step (feedstock drying), which was done at Kemitek's facilities prior to the verification.

From start to finish, Kemitek ensured materials and process integrity by combining in-person surveillance, strategic sampling and analysis of materials, as well as tamper-evident seals. From the very start of the process, where Kemitek received the feedstock directly from the supplier to the sealing of the bulk containers receiving the final products on the production line, Kemitek was involved every step of the way.

Four batches were processed by Loop during the verification. Two were done at the mini-pilot scale (in a 25-liter reactor) and two were done at the pilot scale (in a 6000-liter reactors) with the same feedstock. The process was conducted at the pilot scale in two batches. A first batch was controlled from feedstock to the end of the process for both purified monomers. The second batch was needed to obtain enough material to undergo one of the steps in MEG purification. Both batches were combined and processed together from that point until the end of the process.

Over the course of the verification, more than 375 man-hours were spent on-site overseeing the process and applying the process and materials integrity strategy. During this time, approximately

600 seals were installed and removed by the Kemitek verification team while ensuring a near-constant presence on the site while production activities were taking place. Also, 68 in-process samples were collected during the verification and were brought back to the Kemitek laboratory and analyzed for tampering detection, showing no trace of any unexpected products.

By combining these strategies, the senior members of the verification team are confident that the measures taken rendered any tampering nearly impossible. As such, we are confident that the results we observed fairly represent the capabilities of the technology when applied to the material provided.

Verification Results

The feedstock was characterized using a combination of tests, including compression moulding, DSC, FTIR, viscometry, semi-quantitative XRF and ashes determination. The mandated external laboratory confirmed the tests were consistent with post-consumer PET.

Samples of the final products (DMT and MEG) were also analyzed by external laboratories and compared to Loop internal specifications. All samples were found to meet the specifications for every parameter.

Conclusions

The Kemitek team was able to understand, witness and verify the execution of Loop's Gen II polyethylene terephthalate (PET) depolymerization technology from feedstock to monomers. While the verification was not intended to certify the yields or economic viability of the technology, as these were out of the scope of our mandate, our observations confirmed the production of significant quantities of dimethyl terephthalate (DMT) and monoethylene glycol (MEG) from a post-consumer waste PET feedstock at both mini-pilot and pilot scales.

Characterization of the finished products also confirmed that the quality of the primary PET plastic building blocks meet Loop's specifications for the production of PET resin and polyester fiber, achieving DMT purity ranging from 99.7% to 100.1%[1] (w/w) and MEG purity ranging from 98.2% to 98.9% (w/w). The useful monomer content for the MEG product is greater than 99.0 % (w/w). This is calculated by adding the secondary PET plastic building blocks present in the final MEG product: Dimethyl isophthalate (DMI), Dimethyl Terephthalate (DMT), Diethylene Glycol (DEG), Bis-(2-Hydroxyethyl)terephthalate (BHET), 1-(2-hydroxyethyl)4-methylterephthalate (MHET) and 1-(2-hydroxyethyl)4-methylisophthalate (MHEI). It is reasonable to expect these molecules to be integrated into the final polymer chains of the PET resin and polyester fiber.

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[1] A result 0.1% above 100% is consistent with the margin of error of the result.

Kemitek's findings through this verification allow us to attest to the capacity of Loop's technology to produce pure monomers within their specifications. Kemitek conducted this verification in an independent manner using rigorous methodology and we ensured process integrity during the three-week testing period via surveillance, sampling and seals.

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THANK YOU

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