TOM BOLON, NOVOTEC

Does Novotec accept non-US origin material? (e.g. Mexico, Central America...) **YES**

Does Novotec have owner financial assurance in place for its facility? **Yes**

I've heard a lot of criticism of smelters, saying that most of the CRT glass just ends up beign landfilled as slag. Can Tom speak to more specifically to the outputs of the smelting process? I have submitted this to Glencore for a response and will forward it tomorrow. To my knowledge none of the slag is land filled.

How is Glencore permitted in Canada to receive and process CRT glass ? Environment Canada (the canadaian version of the EPA) manages the permitting for the smelters. Glencore is fully permitted and in compliance with all regulations.

How do you separate the phosphor powder, and what do you do with it? The phosphor powder is sent to Glencore. We are currently installing a new system to allow us to package this material separately and cleanly enough for processing at a separate facility which is designed to extract some of the rare earth elements from the powder.

Question: How many jobs does CRT Recycling create or does anyone know how many jobs are generally required to operate a lead smelter plant operation? Novotec employs between 180 and 250 people depending on the market conditions and the volume of material. The smelter is a very large operation and although I do not have specific numbers on employment I do know that they are a major employer in New Brunswick.

"Plenty of capacity in smelters now and into the future." What is necessary to bridge gap between the capacity and difficulty in getting the material to the smelter, e.g. Best Buys and other collection points not taking CRTs, recyclers not taking CRTs? Ultimately is comes down to funding and a commitment by those funding and managing the programs to make sure the lead in the glass is recycled back into pure lead. Once the lead is back in its pure form it can be recycled affordably and endlessly in batteries and other products. Since the smelters need the silica now and they return the lead back into the economy we believe that this is the best option. WE strongly disagree that burying the material in a landfill is a responsible option especially since the material is needed today.

dear dan...in my country do not exist CRT recycling program...can you suggest all the companies for partnertship to recover this materials?
Jairo, please refer to the last slide of the intro presentation for known CRT end (destinations).

Tom, what do you do with your panel glass? Our panel glass is used as aggregate in various construction projects and materials. Road base, parking lots. Also in asphalt and concrete.

In follow-up to this webinar, would Tom be willing to share his panel glass characterization regime? The panel glass material is pulled each quarter from the production line and sent for TCLP testing. We have done full chemical composition analysis before but we found that the results were exactly lined up with multiple well documented research articles which reported the chemical composition of panel glass so we do not run the full analysis on a regular basis. The TCLP test assures that there is no lead or other hazardous materials leaching from the aggregate.

Responsible disposal, jobs and creating new products for both programs is the trifecta of resource recovery. Yes, there are jobs at both Novotec and Glencore as well as full recovery of the lead and the silica is used for something that requires silica in order to function. It is a win-win for everybody.

SIMON GREER, NULIFE GLASS

Simon Greer, please give some examples of the products that NuLife's glass end product used in.

Of course our primary value product is lead, which sells into the commodity market and will ultimately end up as car batteries. We also sell concrete blocks, which are made from panel glass and de-leaded funnel glass. We have also made some sample pebbles, which are for decorative gardening from de-leaded glass only. The samples have been tested and we have established a high value and high content market but now we need to perfect the production process, which s in hand but takes time.

Is this going to be the same process that is being used in all your plants?

Yes is the simple answer but each furnace will have changes and improvements over the last, which means each, will be slightly different. We are hoping that efficiency upgrades can be spread across all our planned furnaces. The glass output products may vary according to the market size for whatever we are making.

Where does Simon send the glass to be used in concrete?

We make the concrete blocks in house so our process is complete and we only sell product from our site rather than pass waste on to another process.

Any idea when your facility here in Virginia will begin accepting CRTs?

It is accepting CRTs now. The first year, 2015, was a bit quiet but it is now at full speed and we are recruiting staff and preparing furnace plans for the site now.

Has NuLife encountered any issues with high antimony levels in the panel glass?

No issues. Antimony is a natural partner with lead in that it is often found with it in ore and often ends up as a tiny percentage in lead products. It is typically a component in the blend a battery maker will create for their blades and posts of a car battery and vary the antimony levels to make the lead harder, so I am told. Recent test it was less than 10ppm, which is trace.

How many jobs have been created for the NY plant?

We are currently 29 in NY. We have 8 people to run a 24 x 7 shift rota with 2 people always at the furnace. Dismantling, loading, unloading, crushing, concrete making is about 20 and we have our site environmental manager. I have not included the management team as their efforts are spread across sites.

to Nulife: why clean panel glass does not go to bottle glass?

Bottle glass is a different chemistry and bottle makers are very keen to make sure their machines can run at high speed and efficiency, which is chemistry dependent. For example leaded glass has a long "working range" which means it is flexible for a wide variance in temperature whereas the soda glass, which bottles are typically made of, has a short working range. The hot glass blob, which will become a bottle is cut and dropped into a high speed process and into a mold where it is blown in a second to form the bottle and is instantly set. Although bottle glass can be completely recycled the chemistry, temperature and viscosity for this is an exact science and TV panel glass does not fit. Watch this youtube clip to see bottles being made
https://www.youtube.com/watch?v=on-_oUajNso

Why does Nulife prefer to crush the CRTs opposed to cut them along the frit line?

We do cut them along the frit line but with a hammer and not a laser, wire or saw because a $16 hammer is as quick and equally labor intensive as a $250,000 machine.

If we could completey automate the process it would have some attractions but creating jobs from waste is something we are proud of and the efficiency/cost benefits are not significant enough for me to consider changing yet, but I always look at these machines when someone presents them.

Can you provide an update on your lead testing results - how much lead remains in the CRT glass once it has been deleaded?

Just under 1%.

Do you know if any California recycler have sent CRT's to you and have had their claim approved by Cal Recycle?

No. We are going to need to talk to the California regulators before we engage as they have some different rules they will need to address if they want to use us.

to Nulife: what is the energy required to extract Pb?

Half of one KWh per pound, which costs about 3c. So a 66lb TV will have about 12lb of leaded glass in it, which needs 6KWh of energy which costs about 18c.

Is there any byproduct hazardous waste produced with this process? (asked Rich)

No. The only thing that comes from the reaction of separating the lead out is carbon dioxide. We do have air filters from the CRT breaking room and used PPE, which we regard as hazardous waste.

is the lifetime capacity for CRT tubes or funnel glass

the 200 million pound figure is for tubes. The furnace will melt 20,000lb per day and we plan for a 330 day year for 10 years. 20,000 x 330 x 10 = 66m lb. Funnel glass is 34% of the tube weight, which is approx. 200 million pounds of tubes for the capacity of one furnace.

Do you run into issues with Speculative Accumulation?

Yes we will. Speculative Accumulation says that a business should recycle 75% by weight of what it had in stock the previous year. On that basis and the planned rate of receipt of CRT we will achieve the 75% for the first 5 years and then as we melt from stock and do not receive more CRTs we will fail the rule and need a variance. But so long as there is a process the variance should not be an issue at any time. The variance is a fabulous tool to check up on recyclers to make sure they are doing what they plan to do.

Question for Simon: Do you foresee any issues with meeting the speculative accumulation requirements?

Repeat question from above

Simon Greer, can you give some examples of products that can use NuLife deleaded glass end product? Excuse me if you covered this in your talk as I was out of audio contact for about 5 minutes during your talk.

Repeat question from above

JJ SANTOS, CAMACHO RECYCLING

Q: Since Camacho makes intermediate products, how can their upstream clients know exactly what ultimate products their CRTs are incorporated into?

A: Through Camacho R&D department we help to our clients with the application of CRT glass in ceramic and glazed. Our R&D team work together with our clients to help them in the implementation such as the follow up in the time. We supply the raw material coming from CRT glass and technical support as well.

Q: According to the EPA website, TDA in Calexico CA is the only approved exporter of whole, broken, and unprocessed CRT glass, but what about "proccessed" glass? Is processed glass still restricted to TDA as being the only approved exporter for the glass to somewhere like Camacho?

EPA already approved to export not only processed glass from other US recyclers apart of TDA but also whole CRT units or bare CRT tubes abroad, always according to Basel Convention regulation. Indeed there is a Spanish recycler who has just started receiving both whole CRT units and bare CRT tubes whose CRT glass is sent to Camacho.
TDA is already sending both panel and funnel glass to Camacho, and the glass they produce is completely according to the quality standards requested by Camacho.

Q: are the products that Camacho manufactured allowed for resale in the US?

A: Although ceramic tiles passed TCLP test and accomplish technical and standard requirements in the US, our clients are not sending their tiles to US because they have more demand in EU or Middle East, and not enough to supply to other markets like North America.

Q: When Camacho's tiles become a waste would they fail TCLP for lead?
A: Yes. Indeed we have passed TCLP test by an US laboratory.

Q: Does the lead in the ceramics have an actual function purpose as lead?
A: The lead acts a flux agent when manufacturing tiles.

Q: What is total cost to get CRT glass/cullet to Camacho?
A: Zero cost. We don´t charge any cost in the treatment process, we just receive for free in our sites in Spain. In fact, the global logistics is, in some cases, much cheaper than moving the CRT glass inside the United States. Just as an example the total cost from a eScrap treatment facility placed in the East Cost, door East Coast to door Camacho site is aprox. 8 cents per pound, when loading 44,000 lbs of CRT glass in a 20 foot marine container.

Q: How many downstream ceramics manufacturers do you sell the CRT glass to? How do you ensure that ceramics they produce do not leach lead?
A: We work directly with aprox. 10 ceramic and glaze manufacturers. Our R&D team follow up the process and help our clients to implement the CRT glass in the proper way when manufacturing .We visit and supervise the manufacturing process at least once a year and upon demand as well.

Q: To follow up that question, what is the definition of "proccessed glass"? (??)
A: Processed glass is the one that can be implemented directly in ceramic manufacture process as raw material without further treatment. The processed glass is used as substitute of other raw materials (natural resources).

Q: PbO has no technical function in the tile glazing?
A: As fluxing agent.

Q: Some people have criticized the Camacho process by saying the end products (tiles) canot be imported into the US because of lead content. Can JJ address this?
A: When the CRT glass in used in the right proportion, mixed with the right formula, at the right temperature and the right process, the end products (tiles) can be sold in the US as well. The most difficult is the know how, and it is not reachable after many years of experience as Camacho has with CRT glass and ceramic sector.

Q: what I would like to know is the ceramic made by Camacho within the US EPA regulations for TILE applications in the us and what happens when the tile is broken or at its end of life how if the tile disposed
A: The end of life tile made by Camacho with CRT glass is disposed as any other tile. The lead content in a tile is so few and in addition it is incapsulated/vitrified that does´t suppose any health or environment risk.

Q: What proportion of the CRT material you receive is intact CRTs, broken CRTs, and processed CRT glass?
A: We can only receive clean and separated panel and funnel glass. We can’t´receive and process intact CRTs, broken CRTs or bare CRT tubes. We are a glass recycling company not a eScrap recycler.

California recyclers are NOT shipping to Camacho... legally.
Not because they can't, but because they can't fulfill ERM requirements.

Q: Is leaching of lead an issue if tiles become broken or worn over time during use ?
A: The lead is incapsulated / vitrified in the tile, that is why leaching is not an issue. Nevertheless leaching lead in tile would be an issue when the tile is under a temperature of 1400 Celsius degrees (equivalent a Volcano), then the issue would´t be the lead from the tile, the Volcano, the temperature itself and his gas would be the real issue.

Q: How do you ensure that the processed CRT glass you receive meet your specs (for example, that it's free of Phosphors)
A. First of all, I personally visit the recyclers and their treatment process previous any first load. Indeed the CRT glass is only accepted to be loaded when fulfills our quality requirements. In the case that we receive CRT glass (panel or funnel) with phosphorus powder or any other metal fraction, not according to our requirements, the CRT glass will be sent directly to landfill and charged the landfill fee to the recycler.

Q: Has anyone ever used leaded galss in the tile base itself? I know lead had been traditionally used in glazes but havn'et haven''t heard of it used in the bisque.
A: Although It can be used leaded glass in the tile base itself, nevertheless it is not the common use. Due to the leaded glass acts as fluxing agent and the glaze requests higher temperature, it is more worthy to be used in the glaze rather than in the bisque.

Q: Regarding Camacho, how can we audit Camacho's downstream customers to confirm usage and final product configuration?
A: We preserve the name of our clients as part of the know how and confidential information. We directly follow up and supervise the process with our clients.

Q: Is it mandated that the retailers have to take back the CRT’s.
A: In Europe is mandated, yes or yes, without exception. In US is different, according to the State and the program followed.

Q: For JJ: What markets/countries are you allowed to sell the CRT glass tiles in?
A: All over the world meantime fulfill the technical and standard requirements. Our clients are mainly focussed in markets like Europe, middle East and Africa.

Q: If the capacity exceeds the need, then why are so many places stockpiling material?

A: Good question. We would like to take all stockpiled material around the States. We are working on it and we are willing to cooperate with recyclers, public and private institutions to offer a solution for all stockpiled and arising CRT glass.

Q: Rich mentioned that their tests showed that using Pb-glass as flux agent does not remove the Pb from the silica - so probably it ends up in the slag. is there any documentation about this findings?
A: Yes, theres is documentation about it. I guess that Rich has his own, and Camacho has its own as well.

Q: Can any of these locations take other types of glass? For instance recycled fluorescent lamp glass?
A: Yes, we can take any kind of glass like fluorescent lamp glass, optical glass, lcd glass, PV module glass, cover glass, windshield glass, mirror glass, etc. Whenever they fulfill our quality requirements, they are welcome. Our business is any kind of glass.

Q: Another red flag: outdoor or uncontrolled storage of CRTs?
A: We storage indoor and outdoor. According to EU legislation, no need to be storage indoor, but in case that our clients request only indoor, we can do it. We have capacity for it.

Q: how is the phosphor recovered and how recycled or used, by whom?
A: We receive the glass without phosphor. It is responsibility of the recycler, and they must answer this.

Q: Wondering, If these methods are able to handle the demand, then why are collection sites having trouble finding vendors to take the arts?
A: That is the reason Camacho participates in communication and dissemination of our process. We just started in US one year and a half and we are increasing the volume month by month. We are willing to contact and offer our solution to as much recyclers as possible