

Yellow Quill's Drinking Water Part 4: Biology replacing Chemistry

By Dr. Hans Peterson

Background

In a series of recent articles in the PAGC Tribune (June, July, August 2015 issues) I have discussed how Indian Affairs departed from its policies for how to deal with poor quality raw water sources in First Nations communities. For groundwater treatment prior to 2004 there was one technology that ruled no matter how poor the water was: Manganese Greensand. Later we have come to understand that if you have high manganese levels (above 0.5 mg/L) and ammonium in the water this process *simply does not work*. Also, there are so many other components in Saskatchewan groundwater and many interfere with the Manganese Greensand process. For Yellow Quill Indian Affairs did the correct assessment labeling Yellow Quill's groundwater source as "untreatable."

It was untreatable with the available water treatment technologies *before* 2004. But it became treatable with the arrival of the Integrated Biological and Reverse Osmosis Membrane (IBROM) treatment process. Yellow Quill's surface water source was also considered "untreatable" as it was affected by a sewage lagoon discharge. Prior to 2003 Yellow Quill had no choice but to use this sewage-tainted surface water source.'



Blaze Neapetung, of Yellow Quill FN, then 7 in 2004, took about the first glass of water to come from the new IBROM water treatment plant. SUBMITTED PHOTO

The Yellow Quill Project

Facing this dilemma, Indian Affairs' Earl Kreutzer and Jouko Kurkiniemi – two "good" guys – took the unprecedented step of funding the Yellow Quill project. This was originally designed as a pilot study to test existing technologies on the Yellow Quill groundwater, which was a new source of raw water at that time. None worked. It soon became clear that adding chemicals to a very poor quality water source, such as Yellow Quill's, do not work. Sure there are lots of other really poor raw water sources in First Nations communities and, unfortunately, chances are high that with Manganese Greensand treatment these communities are supplied with water that I, for one, would not drink.

Besides, Manganese Greensand only addresses a couple of the 13 or more problems we identified in Yellow Quill's groundwater and later in many other First Nations raw water sources. That should tell anybody that the Manganese Greensand water treatment process is, in a word, useless, in situations like that. Albert Einstein is credited with saying that the definition of insanity is "doing the same thing over and over again and expecting different results."

Testing our Way to Safe Drinking Water?

In the past engineering companies could design whatever they liked and Indian Affairs would only look at total chlorine, free chlorine, E. coli and coliforms to determine if, in their assessment, a water treatment plant worked. It is a requirement in Canada to disinfect water with chlorine and therefore as long as this was done it would pass Indian Affairs' inspection. If you are interested in tracing poor workmanship and engineering in First Nations communities look no further. All that was required was chlorine and you would pass those four tests. No water treatment plant required.

This allowed Indian Affairs to call drilling a well and chlorinating it a water treatment plant. This is more like a water treatment plant without the "t," a water treatment plant. Also, is this really a water treatment plant? Not a very good one, if it could count as one!

This remains a problem even if chlorination by-products that can be carcinogenic have been added some of the time to the list of four tests. The Canadian Guidelines list 77 health parameters, not 4 or 5. My mission for the past year has been to raise the bar for engineering companies – implement the Guidelines for Canadian Drinking Water Quality. Prior to this I tried to get the federal government to do so. The Guidelines exist, but, there are no legal requirements for the federal government to follow any of them.

Health Canada's National Guidelines

This is something I have often wondered about. Why does Health Canada have national drinking water quality guidelines when in First Nations precious few are implemented? Say meeting the Canadian Guidelines would mean you need to jump 1 m. But, if Indian Affairs follows its low cost bid principle, jumping only 0.5 m may get the job because it was cheapest. However, if the guidelines are being ignored, what does it mean for water quality?

Then you look and see companies with no experience in building a particular kind of water treatment plant winning process contracts that Indian Affairs is happy to approve because they were the cheapest. On top of that Indian Affairs can bulldoze their way with any number of First Nation communities essentially dictating that communities use ill-thought-out water treatment processes that tie communities to high chemical costs and poor

quality water. Furthermore, the Bands are stuck drinking this water and paying for truck-loads of chemicals. One thing is for sure: PMT members from *outside* of the community literally turn their backs on the mess they created. Does anybody care? Community members care.

Know What You Get, a Failed Pilot or the Real Thing

There is an old saying that goes something like this: "The proof is in the pudding." What if there is not even a pudding? What if the manufacturer has never constructed a specific plant before? Maybe the contract was awarded because of a mere 3 or 4 month pilot study. Such a short pilot study is woefully inadequate when the following technologies are evaluated: Biological treatment, RO membrane treatment (and nanofiltration), as well as ion exchange. For these technologies the data generated over a 3 to 4 month pilot is of little use.

The key to understanding whether RO membranes can be used in a treatment process hinges on fouling of the membranes, which typically doesn't occur until later. Fouling is the number one cause of the holes in the membranes plugging. You will then get less water through and the membranes need to be cleaned.

It is similar for ion exchange. The ion exchange beads foul and need to be cleaned. The ion exchange beads can also get colonized by bacteria that impart a foul taste to the water. To properly understand this, a longer pilot is required.

When I piloted the IBROM process at Yellow Quill I piloted for 22 months, and at Saddle Lake I piloted the surface water IBROM for 24 months. But, the real proof in the pudding can be found in operating plants of which there are 17 IBROM plants. I am sure that most IBROM communities would be happy to release all test data for their plants or allow Health Canada to share that data with a community thinking about the suitability of an IBROM.

Buying Decisions

How can totally inadequate water treatment processes be recommended to a community? Here is how: 90% of buying decisions for a new water treatment plant is made by Indian Affairs and the engineering company. 10% of those decisions are made by the First Nation. Yet it is community members in the First Nation that get to drink the water for the next 20 to 30 years. I believe that it is only when those numbers are reversed will there be enough care in the selection of both water treatment process and engineering company. 90% of those decisions should be made by the First Nation. Tops 10% for the engineering company and Indian Affairs.

The Birth of the IBROM

Happily, in the end at Yellow Quill we were able to develop a water treatment process that can deal with the most challenging of raw water sources and produce drinking water that meets all global regulations and World Health Organization recommendations. The IBROM also meets aesthetic guidelines like those for iron and manganese. I called the process the Integrated Biological and Reverse Osmosis Membrane (IBROM) treatment process,

Moving Forward

What I am trying to convey in the Yellow Quill series of articles is much more than the experience of one community. To me Yellow Quill was a huge learning experience for how to deal with exceedingly poor quality water



Yellow Quill's biological treatment filters. As described earlier, after the water has been treated in the biological filters it flows to the RO membrane unit. SUBMITTED PHOTO

sources. After Yellow Quill the learning process has continued in many communities as 16 additional First Nations have adopted IBROM plants. Some of what we have learned has little to do with water treatment and more to do with politics. Few dare to talk about this let alone write about it. But thinking of Chief

Joseph's statement in the following page I have tried to incorporate important issues that can prevent First Nations communities from stumbling in their struggle to bring safe drinking water to their communities.

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Open House: James Smith Cree Nation IBROM Water Treatment Plant Thursday, November 19, 2015 10:00 am

Presenter: Dr. Hans Peterson

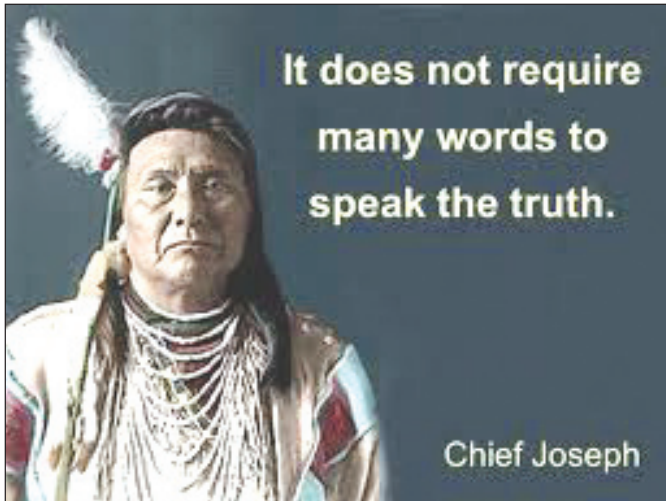
The question of how to treat poor quality Saskatchewan and Alberta raw water sources has nagged me and many First Nations water operators for a long time. Then while doing work with many First Nations operators it has become clear how to do this. We have succeeded in figuring out that we need to use the help of "good" bacteria – trillions of them working 24 hours a day 7 days a week purifying the water. Following this treatment the water needs to be pushed through a tight Reverse Osmosis Membrane (RO) and finally absorbing calcium and magnesium from a mineral bed. A tight RO has membranes with tiny holes in them, these holes are 30,000 times smaller than the width of a human hair. The biologically treated water needs to be pushed through these tiny holes without plugging the holes.

We call this the Integrated Biological and Reverse Osmosis Membrane (IBROM) treatment process and it produces water that is safe to drink, tastes great, is healthy and meets all global water quality regulations. In addition, it removes all food for bacteria so there will be none in the distribution system or in your tap water. This is a quality that I believe is necessary to be able to produce safe drinking water even if it is in nobody's regulations. There are now 17 IBROM plants in Saskatchewan and Alberta and one of the latest being the James Smith Cree Nation IBROM plant. This amounts to more than 20,000 First Nations people with exceptional tap water.

The capital cost of the IBROM has decreased and it is now similar to the cost of other non-working water treatment processes. Then if we look at chemical costs IBROM treated water beats other processes by a mile. Saddle Lake Cree Nation's (7,000 people) chemical costs went from \$15,000 to \$180 per month while several Saskatchewan Bands have seen operational costs drop by close to \$10,000 per month. These costs are born by the Band and should be of great interest to First Nations Leadership.

You are invited to come to an Open House at James Smith Cree Nation to see its IBROM. The Open House starts at 10 am and runs to 2 pm, coffee breaks and lunch will be served. The event is free but you need a ticket to take part in it. Please email: hans.cloudwalker@yahoo.com (Dr. Hans Peterson) for your ticket. This is your opportunity to experience the future of drinking water treatment. Dr. Hans Peterson will give a presentation on how the state-of-the-art IBROM system could work for your community.

Yellow Quill's Drinking Water Part 4: Biology replacing Chemistry

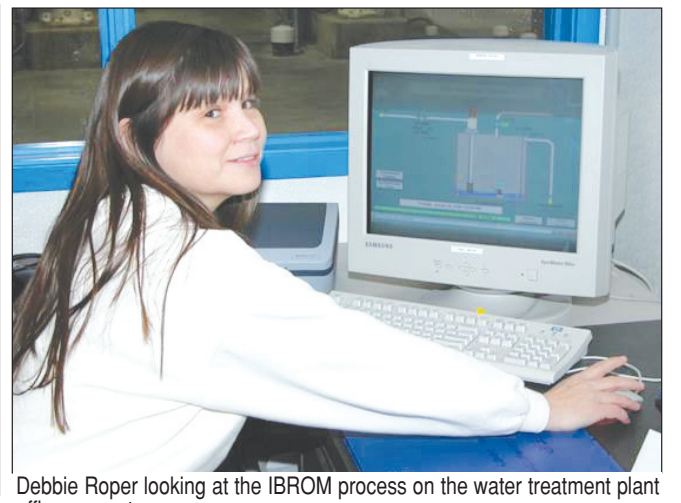


It does not require many words to speak the truth.

Chief Joseph



Yellow Quill's RO membrane skid



Debbie Roper looking at the IBROM process on the water treatment plant office computer.

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Chemistry versus Biology

When I realized what we were able to do with bacteria at Yellow Quill, Safe Drinking Water Foundation (SDWF, I was its executive director) held a conference in 2004 in Saskatoon. The title was "The Future of Water Treatment." It was attended by around 250 people, more than 90% First Nations. I was convinced that in the future we would not be able to afford to use chemicals in water treatment for several reasons.

Number 1, the cost was too high, and Number 2, the treated water quality was too poor. Later I have come to realize that the 3rd point should be, too many residual chemicals in the water, and Number 4, the water simply doesn't taste good. The reason for Number 4 is that in conventional water treatment compared to the IBROM at least 10 times more chlorine needs to be added, and other compounds, such as aluminium, salt, and the remains of algae can get into the treated water.

Now we are starting to talk dollars and cents. The IBROM process uses very low levels of chemicals, and conventional treatment on the types of poor-quality waters that we have require lots of chemicals. Most cities in Canada use conventional treatment but their water is often ten times better than First Nations have, so for cities the chemical costs can be manageable. Many do not need an IBROM system. An example would be the City of Calgary which takes clear mountain water out of the Bow River. Yellow Quill did not have a Bow River flowing by it.

But, while Indian Affairs pays most of the capital costs to construct a water treatment plant it is the Band that pays ongoing costs for the chemicals required to treat the water. Therefore, chemical costs are an annual financial burden for the Band, but would seem to be of low concern to Indian Affairs.

The Yellow Quill Water Treatment Process: Final Touches

We started to create technical evidence at Yellow Quill in 2002-2004 – technical evidence that has continued to accumulate with another 16 IBROM plants following the Yellow Quill design. So, what was this design? Were we done?

Sodium in the Water

Well, the Yellow Quill IBROM plant was finally constructed and working, filling the treated water reservoirs with water. It was working well. We produced really high quality water. But, there was still one bugaboo: After RO treatment the water was acidic. For membranes that have not been damaged the pH after RO treatment is typically 5.5 to 6.0. The pH is called acidic if it is below 7.0, and for comparison squeeze a lemon into a glass and you will have a pH around 4.

If the water has a pH higher than 7.0 it is called alkaline or basic. The distributed water should ideally be somewhere between 7.5 and 8.0 so the water would be slightly alkaline. However, at virtually every RO plant (except IBROM) in Saskatchewan *sodium hydroxide* is used to increase the pH. We did this as well at Yellow Quill before we found a better way. After RO treatment we increased the pH of the water to around 7.5 using sodium hydroxide. The chlorination process followed and the water was sent to the treated water reservoirs.

Who Wants Sodium in the Water?

You don't have to be a scientist to know that sodium chloride is table salt. Have you ever tried to add salt to your coffee or tea or into a glass of water? Does it make the water taste better? Is it healthier than without the salt added? The answer is a resounding "No!" on both counts. The Yellow Quill community had told me they wanted 'safe, healthy and good tasting drinking water.' The "sodium" addition certainly failed on two out of those three scores. Adding sodium is not healthy and generates a water that doesn't taste good either.

On top of that, and what is rarely realized, is that sodium hydroxide pH-adjusted water is still corrosive and can leach lead and copper out of household plumbing! We know what lead in the plumbing did to the Romans. Health Canada, any thoughts? Maybe some testing in communities with sodium hydroxide pH adjustments? What has to happen in such communities is that a corrosion control inhibitor needs to be added to the treated water. Few water treatment plants take this step. So, if you are doing it right yet more chemicals and costs are required to produce the water that you drink.

When Beer is Better than Tap Water

I have asked many people if they want sodium in their tap water and nobody has ever said they want it. But, while sodium can be implicated in poor tasting tap water many other compounds can also contribute to bad tasting water. I am pretty particular when it comes to drinking water and showering in rural Saskatchewan. I have stayed in hotels in towns, such as Punnichy, Raymore and Kelvington. I have tried to drink the tap water there. Once. Sticking to beer in towns and villages may be a wise choice.

Should Tap Water Taste OK?

When I was running a workshop in a First Nation community having a direct RO I got first-hand experience with sodium. Direct RO is when you take groundwater and run it straight through an RO, with the water then typically pH adjusted with sodium hydroxide. After lunch which included juice and pop I was still thirsty and went into the Band Office kitchen, filled a glass with tap water. The water plant pH is adjusted with sodium hydroxide and according to Health Canada this community has great drinking water. I took one sip and spat it out in the sink. To say this community's tap water tasted awful is simply too kind.

Is taste of a community's drinking water in nobody's books? Certainly the federal government does not worry about it. So I asked the provincial government this question. Tap water from the Town of La Ronge's (this water is shared by the Lac La Ronge Indian Band) ion exchange water treatment plant was quoted as "delicious" by one provincial officer from the Water Security Agency (WSA) and Hudson Bay water (another ion exchange treatment plant) was quoted by another WSA employee as, "the community seems very happy with tap water quality."

Is Tap Water Tasting Awful a Problem? Provincial and Federal Government Input

The fact is that few drink tap water in La Ronge because of high chlorine as well as a bitter taste. I then asked somebody that travels across Saskatchewan to comment on Hudson Bay's tap water. His comment was: "Atrocious." He then continued: "Last time I drank the water in Hudson Bay was in February 2015 when we rode our snowmobiles up there and went to the bar. The tap water had that high chlorine, metallic, dirt taste to it."

So are we equal? Nobody worries about how tap water tastes in either the provincial or federal government. This could be something addressed even in a short pilot study, yet, it never is. How much sodium slips through a water treatment process doesn't seem to be addressed by either the federal government or the Province. Even when thousands of kgs of salt is added in the actual water treatment process.

Yet, ask anybody that travels through Saskatchewan how they choose where they are staying. I suggest where the tap water is OK can be a determining factor. It is for me as I prefer to sleep in the offices of IBROM water treatment plants. Conveniently, not only does the tap water taste great there I am also a tea fanatic and my tea tastes great. I make sure I have several thermoses with me so I can take both drinking water and tea with me from the IBROM plant. Every IBROM plant also has a hot water shower so I don't need to skip having a shower.

Engineering Mishap?

The odd time *Yahoo! News* have pictures of engineering projects gone wrong. For example, a major highway is constructed and work is done in each direction with the idea being that they will meet and can be joined. Amazing pictures when where they meet they can be more than one meter apart. A big ship can be constructed just to not be able to get it out of the wharf. What are these? Engineering mishaps? It reminds me of a joke I better not tell.

But, when I was a newbie at water treatment I must say that I was puzzled and in disbelief. Many water treatment plants have only cold showers. Then picture an operator having a shower in 5° C water when a normal temperature shower would be around 37 C! Even in an emergency? I had a really hard time understanding this.

Can you then imagine that some engineering companies prefer to install non-heated showers in water treatment plants? The battle to get a hot water shower can be fierce in PMT meetings. How much is a shower? Tops, \$500 I am guessing. In one PMT meeting the hot or cold water shower was discussed at great length. Looking around the room there were maybe 10 people – First Nations leadership, Indian Affairs, the engineering company, as well as I. We discussed the merits of having a cold water or a hot water shower! There was only one person in that room that had any experience with this issue. And I am pretty confident it was me.

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Two Cold Tests

In my earlier years, being a good Swede I would have a sauna and jump into the Baltic Sea January 1 to celebrate the New Year. Sometimes I had to jump up high to get through the ice slurry and reach water. Even after a sauna it was shockingly cold. How to make your whole body numb in one second? What I am trying to convey is that we have people with absolutely no experience making decisions about a water treatment plant operator's workplace. Zero knowledge.

But, being a newbie I had only seen the tip of the iceberg. Early on I visited another water treatment plant in the same tribal council. It was, again, another Manganese Greensand plant with no hope of ever producing anything other than a liquid good for washing, but not good at all for drinking. In fact, having extremely high manganese levels in the distributed water is a direct health risk. Manganese is an aesthetic concern at levels below 0.050 mg/L, but at levels above 0.5 mg/L it morphs into a health risk and at levels just below 3.0 mg/L I am sort of wondering if it is so good to even use this water for washing.



Water, Biological Water and Wastewater Solutions

Manufacturers of the **SIBROM** Water Treatment System

Tînikê/Ni-na-nâ-sko-mon

We wish to sincerely thank the 17 First Nations that have purchased our Sapphire Integrated Biological Reverse Osmosis Membrane drinking-water treatment system for their communities.

The **SIBROM** system was developed by Dr. Hans Peterson back in 2004 specifically to provide safe drinking water to First Nations. Please see his articles on Yellow Quill's drinking water here in the *PAGC Tribune* for the history and advantages of this amazing water treatment technology.




YELLOW QUILL'S SIBROM WATER TREATMENT PLANT

For more information and a listing of the 17 First Nations using the **SIBROM** system please visit,
<http://www.sapphire-water.ca/products/sibrom/>

Yellow Quill's Drinking Water Part 4: Biology replacing Chemistry



"Got it!" exclaimed former Premier Lorne Calvert as he understood Chief Robert Whitehead's explanation of the IBROM process
SUBMITTED PHOTO



Roberta Neapetung setting a valve in the new IBROM plant.

SUBMITTED PHOTO

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Anyway, I digress. I was working in this water treatment plant doing a bunch of testing when I needed to go to the bathroom. The operator pointed at a door. I opened the door and saw a field covered with snow. Was my experience jumping into the Baltic being tested? Surprised, I looked at the operator who smiled and said: "Our engineer thinks we should drive to the band office if we need to use the bathroom. We don't have one!" I complained to Indian Affairs about this and soon the water operator got a bathroom.

So a water treatment plant can cost millions of dollars and it passes the building inspection without a bathroom! In fact I have seen a \$14 million water treatment plant upgrade with a dilapidated bathroom (likely more than 20 years old). Even after the \$14 million was spent nothing was done about the bathroom. In my books this is so far from acceptable that I have no words for it.

pH Adjusting

Back to pH adjusting RO water. My work at Yellow Quill moved towards pH adjusting with two minerals that the World Health Organization (WHO) wants to see at higher levels in treated water, and has suggested a minimum of 10 mg/L for magnesium and 30 mg/L for calcium. The reason for this is that both RO and nanofiltration will remove calcium and magnesium. There are many *health benefits* of having calcium and magnesium in the water. If you have too much, however, you get hard water, which presents its own problems.

So the idea is to add these minerals so they are of health benefit, but don't add so much that the water becomes "hard." At the levels suggested by the WHO, a non-corrosive water that is healthy and tastes great can be achieved. We solved this by running the RO water through a calcium and magnesium mineral contactor, picking up the calcium and magnesium and making the water taste great while through that process also getting the pH right. The result?

Non-corrosive, safe, healthy and good tasting drinking water! Mission accomplished. The IBROM treatment system was completed. In the spring of 2004 the Yellow Quill IBROM plant was inaugurated and Yellow Quill's 9-year boil water advisory could be lifted.

Yellow Quill IBROM water treatment plant: The very first IBROM

My marching orders from Indian Affairs' Jouko Kurkiniemi had been to develop a water treatment process that could treat "untreatable raw water." With the help of many, especially First Nations water operators, we were able to design a process that is extremely durable and robust. That simply means that if there is ever a problem in the biological part of the process it is strong enough to continue operating as if nothing is wrong. It can then be corrected without generating an emergency. Previous biological and membrane treatment plants did not have this quality (or were not robust) and, therefore, there were disastrous consequences, such as membrane failures and poor quality treated water.

A Saskatchewan First Nation has found out about this the hard way and is in the process of replacing its 5-year-old water treatment plant. It is the case of a company trying to biologically treat a typical Saskatchewan groundwater source. Yet the company had no experience with how to biologically treat our groundwater. The IBROM was developed on Saskatchewan water. We expect an IBROM plant to last 25-30 years not 5. Water treatment processes in First Nations communities had, prior to Yellow Quill, not been designed for durability and robustness, which can only be achieved by using only quality parts and knowing whatever process you are implementing very well.

Most water treatment plants in First Nations communities are now being designed with the criteria of lowest capital cost. Unfortunately, lowest cost and **not technical merit and high quality** is now the main criteria for water treatment plant construction by Indian Affairs. This raises the question for the federal government

as exemplified by several failed plants: "If you cannot afford to do it right, can you afford to do it over?"

I sometimes use the term "Indian Affairs" and sometimes "the federal government" because if Indian Affairs (or Aboriginal Affairs and Northern Development Canada, AANDC) is not working with Health Canada they should. I am also raising legal points, on which Department of Justice may want to comment. So, while Indian Affairs is in the lead they are by no means the only ones that are affected by whatever decision Indian Affairs makes. Now, we must not forget the people that take the brunt of all this – Canada's First Nation communities. Unfortunately, Indian Affairs' scramble to get to the lowest capital cost often ends up costing much more either in replacement costs (federal costs) or operational costs (band costs). How can this be allowed to continue?

The Yellow Quill IBROM

The Yellow Quill IBROM and the 16 other IBROM plants following Yellow Quill are robust, durable, of high quality, and deliver the pinnacle of technical achievement in water treatment globally. One would think that Indian Affairs should be proud of that success, be shouting about the merits of that technology from the rooftops, and be approving funding if a band wants that technology.

A Distinguished Visitor to Yellow Quill's IBROM plant

Shortly after the inauguration of the Yellow Quill IBROM, then Chief, Robert Whitehead, came for a visit. After I explained the IBROM process to him he told me: "You know Hans this is like magic." I responded: "Chief Robert, it is magic." It certainly felt like magic.

Chief Whitehead returned later that day with Premier Lorne Calvert and now Chief Whitehead proceeded to explain the IBROM process to our then Premier. I believe the conversation went something like this: "You know Lorne, the IBROM treatment system is powered by trillions of tiny bacteria, they purify our water 24 hours a day/7 days a week. I think it is better than magic."

Dollars and Cents Treating Poor Quality Water to the Best Global Standards

The IBROM process works amazingly well and Band costs for chemicals in IBROM communities have dropped like a rock. Saddle Lake, a First Nations community in Alberta with a population of 7,000 people switched to the IBROM in 2010. Prior to implementing the IBROM Saddle Lake paid \$15,000/month in chemicals alone! Now with its IBROM process all they add is chlorine costing \$180/month. That works out to 32 cents/community member in chemical costs to produce the water they need for one year!

This is when you realize the unnecessary financial burden being placed on people in communities where they have to buy bottled water. Access to safe drinking water should not cost that much, their money could be much better spent on life's necessities.

Do Your Own Math

So, if your consulting engineer starts to talk tens of thousands of dollars for your water treatment chemicals ask for a second opinion. And, remember Indian Affairs has only a limited interest in this as chemical costs are borne by the band. I don't understand how Indian Affairs can play such a prominent role in determining which water treatment process a community should implement.

The chemical costs alone can amount to more than what the actual water treatment process costs if we look at a 20 year life-cycle cost. Actually even if we only look at chemical costs for 10 years they may be more than the capital costs to build the water treatment process in the first place. If you then get access to Health

Canada's yearly water quality testing you may find that some added chemicals end up in the distributed drinking water. Indian Affairs should get together with Health Canada and regularly review chemical issues in First Nations distributed water.

Even communities with advanced water treatment processes, such as Saddle Lake's previous ultrafiltration membrane treatment process, could not stop water treatment chemicals from ending up in the distributed drinking water. Saddle Lake paid \$15,000 for those chemicals every month. Instead of now with an IBROM, \$180/month.

Can you imagine if Saddle Lake, instead of an IBROM, had selected an ion exchange treatment process? More than 1,000 kg of salt (yes, sodium chloride) would have been required per day, 30,000 kgs/month. That is 365,000 kgs per year. And on top of that they would need at least 10 times more chlorine than what the IBROM is using. Total IBROM chemicals, 4 L of chlorine per day. Ion exchange chemicals, salt more than 1,000 kg/day, chlorine more than 40 L/day plus a string of other chemicals, such as aluminum coagulants etc. Of course if Saddle Lake had taken the ion exchange route it would have never been able to meet any Guidelines.

What about communities that may only have an old Trident filter after all the chemical additions?

The Devil is in the Details

There is a saying: "The devil is in the details". This refers to a mysterious element hidden in the details. To me it is not mysterious. For water treatment plants the devil is in the water treatment chemicals, literally. Chemicals degrade the quality of the water, makes the water have a high chlorine smell and taste, can cause a variety of illnesses including cancer, cost a lot of money and makes the work of the water treatment operator a miserable chore. And, more than anything chemicals cannot stop nutrients that feed bacteria from entering your drinking water. That spells growth of disease-causing bacteria in the community's distribution system as well as water supply lines in your house. Health Canada is not looking at this. Yet.

A question to First Nations Leadership

To Chiefs, Councillors and Public Works Managers, even if you were to accept a process loaded with chemicals I would like to raise the question: When community members find out, will they accept it?

At Saddle Lake this question did not move beyond Chief, Council and the Public Works Manager, and it was a resounding NO! Saddle Lake previously used an advanced ultrafiltration membrane treatment process when it required \$15,000/month of chemicals and Health Canada found out where some of those chemicals went – directly into people's drinking water!

Kudos to Health Canada at Saddle Lake

I missed one question in the previous section and I will add it here: "Will Health Canada accept lots of chemicals in the distributed drinking water?" Health Canada shut down the high-chemistry Saddle Lake process because of high aluminum residuals reaching more than 1,000 micrograms/L. This is really interesting as aluminium does not even have a Maximum Acceptable Concentration (MAC) in the Guidelines for Canadian Drinking Water Quality.

This could have been resolved in a one-day pilot and Saddle Lake could have been saved from building a full-scale ultrafiltration process for millions of dollars. It is not as if this is a fine point that is difficult to ascertain. Health Canada's operational guidance for aluminum levels in treated water for conventional plants is ten times lower than Saddle Lake's distributed levels, 100 micrograms/L.

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JP Mills (junior engineer), left, and Len Beaulieu (electrical and plumbing contractor).

SUBMITTED PHOTO

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When Indian Affairs request that pilots be done the limitations and capabilities of such pilots must be realized. When an engineering company is unable to correctly assess its own pilot and proceeds with building a non-working full-scale water treatment plant who should take the blame? I am searching for an answer to this. Not sure yet, is this lack of ethics or incompetence? It got to be one or the other.

These high aluminum levels would have, for sure, also shown up right away in the pilot that the engineering company carried out. From Day One. Such a pilot can be done in hours, not many months.

If we look at other issues at Saddle Lake at that time then trihalomethane levels were also way above guidelines, something that a simple chlorination test during the pilot would have shown. Also, from Day One of the pilot. So there are technologies where long pilots, even 3-4 months are not required. Coagulation can be done in hours, but with this technology seasonality is important, so instead of a 3-4 month pilot, split the pilot up into the four seasons.

Saddle Lake's IBROM

The IBROM solved all of that and Saddle Lake Cree Nation is very proud of its IBROM process. It is even bringing smiles to people at Health Canada and hopefully Indian Affairs. As should the other 16 IBROM plants.

One Environmental Health Officer exclaimed: "When a community gets an IBROM my work is done, no need to visit the community again as everything will be well." Now, these officers still visit IBROM plants, but a problem in an IBROM plant is very rare. It is a bit like finding an 80-year-old person at a Justin Bieber concert. Extremely rare and likely not there.

Yellow Quill and the IBROM Recognized at the United Nations

So Yellow Quill was finally able to lift its 9-year boil water advisory in the spring of 2004. In the spring of 2005 Yellow Quill placed first in the Indigenous Environmental Network's (IEN) search for positive developments in drinking water issues for indigenous communities around the globe. A runner up was a community from Chile: it too stood out from the crowd bringing a new solution for how to deliver safe drinking water to rural communities.

The IEN invited Yellow Quill's head IBROM water treatment plant operator, Roberta

Neapetung, and me, to present the Yellow Quill story at United Nations (UN) headquarters in New York in the spring of 2005. The head of the IEN, Tom Goldtooth, addressed both the UN and SDWF's 2004 conference, "The Future of Drinking Water Treatment."

The People Who Made Yellow Quill and the IBROM Possible

Again, I turn and look back at the many people that made the IBROM possible. Roberta and Robert Neapetung (water operators), Debbie Roper (water operator), Chief Hank Neapetung, Councillors Verna Cachene, Larry Cachene, Gilbert Kewistep, Leonard Pasanipiness and Lorne Roper, all from Yellow Quill.

From the engineering company were Dan Hogan (senior engineer) and JP Mills (junior engineer); from the mechanical and electrical contractor, Ron's Plumbing and Heating, Len Beaulieu (now circuit rider for the Meadow Lake Tribal Council); from Indian Affairs Jouko Kurkiniemi and Earl Kreutzer; from Saskatoon Tribal Council Carla Plotnikoff; and from the manufacturer of Filtralite, Ole Jacob Sortehaug and Lars Christensson. Photos of several of the people mentioned have appeared elsewhere in the Tribune with JP and Len missing.

Before and After IBROM at Yellow Quill

Yellow Quill Councillor Verna Cachene thinking about what changed at Yellow Quill with the new IBROM system put it like this: "Skin rashes, which were so common at Yellow Quill disappeared when the new IBROM treatment plant was taken into service. I am certain there were other health benefits in individuals which were not as apparent as a direct result of clean drinking water."

Assess your own Water Treatment Process

If I were to sum up how a quick assessment of your water treatment plant could be done it would be: Check the chlorine residuals, total and free chlorine, at the water treatment plant and at the end of the distribution system. If there is a large difference between free and total chlorine then you have a lot of chlorine consuming substances in the water and you don't have a great water treatment process. If you have large chlorine losses between what the operator is adding and what you have in the distribution system then you know that bacteria are the likely culprits. In the IBROM process we add 0.30 milligrams/L of chlorine, total and free are the same. It will not change throughout the distribution system.

Finally, toss a quarter into each of your treated water reservoirs. Check if you can see that quarter the following week or even month. If you cannot, then it is time to think about installing a different water treatment process. In IBROM plants the quarters are visible for many years without reservoir cleanings.

Safe Drinking Water = IBROM

The IBROM is becoming recognized both nationally and internationally as the premiere water treatment process when poor quality water sources are tackled. It is not the only "biological plus" membrane treatment process out there. But, it is sustainable. It has the lowest footprint (lowest use of chemicals) and it is producing superior quality drinking water that also tastes great.

Several restaurants are now serving IBROM treated drinking water including Dakota Dunes Casino (Dakota Dunes IBROM plant) and restaurants in other IBROM communities. And not to forget more than 20,000 First Nations people enjoying great tasting drinking water, tea and coffee IBROM water makes for great showers and it promotes good health. This is what makes me happy. It used to be that I took pleasure in getting scientific papers published according to the motto: "Publish or perish." But, getting kudos from community members that now can enjoy great tasting drinking water makes up for publishing less.

At George Gordon First Nation as in many IBROM communities more people are returning to the reserve and this summer Gordon's faced a water shortage due to almost doubling its water use. Adding to the water shortage was that people that have high quality water use more of it. At Gordon's that has extended to people getting and filling up swimming pools. I was asked to comment on this. To me raising the standard of living in First Nations communities is acceptable and desirable.

When anybody in an IBROM community is asked the question: "Is this water safe?" Community members can answer this with a resounding: "You bet it is."

To read more about why the IBROM was selected to be introduced at the United Nations and why it is different from other biological water treatment systems read Dr. Hans's next article on water treatment in the October issue of the Tribune. Dr. Hans Peterson invites your comments on this article. Please email: hans.cloudwalker@yahoo.com and your comments may be included in the next issue of the PAGC Tribune.