



### When Water Treatment fails First Nations Communities

This is the first of several articles on drinking water in First Nations communities that will run in consecutive months in the Tribune.



In March 2015 Chief Justin Burns of James Smith Cree Nation said, "It (the IBROM) is a steppingstone for the people of James Smith and also for the future reserves to come here and look at our plant, and hopefully, get something like this in their home communities so that unsafe drinking water will be a thing of the past. What we have here is totally reliable drinking water for all of our membership at James Smith" In a photo taken March 19, 2015, from the left: Mike Marion, JSCN Health Director; Councillor Gerald McKay; John Paul Moostoos, JSCN Health; Edward Stonestand, Chakastaypasin Councillor; Dallas Head, Peter Chapman Band Councillor; Chief Rob Head, Peter Chapman Band; Valerie Whitehead, Peter Chapman Councillor; Chief Calvin Sanderson, Chakastaypasin Band of the Cree Nation; Jason Burns, JSCN, Councillor John Lyle Burns, JSCN; Chief Justin Burns, JSCN; Councillor Alvin Moostoos, JSCN; Devin Marion, Water Plant Operator.

#### By Dr. Hans Peterson

It used to be simple. In times past, if the question was asked about what treatment process to use on how to treat a *ground water* source to make it drinkable, the answer was automatic: Manganese Greensand. For *surface water* the answer would be Chemically Assisted Gravity Filtration. For the past 100 years in Canada these two water treatment processes were "state-of-the-art," but now the ability of these traditional water treatment processes to meet guidelines is challenged.

You will notice that the above suggested answers do not mention the Integrated Biological Reverse Osmosis Membrane (IBROM) process that Yellow Quill, James Smith and several other Saskatchewan First Nations have the good fortune of having. This process was introduced to *Tribune* readers in the March 2015 issue in the article about James Smith Cree Nation's IBROM system and brought up again in the April 2015 *Tribune* in my letter to publisher Ron Merasty. This article will barely touch on IBROM, but it is hard not to keep referring to it because it is a modern and effective water treatment process.

What happened? Groundwater quality in Saskatchewan is typically extremely poor. Indian Affairs, which now calls itself Aboriginal Affairs, has even labeled some groundwater sources as "untreatable." As regulations surrounding drinking water have increased, more water treatment issues are increasingly put on the plate of water operators. For example, arsenic guidelines have gone from first having no mention to setting it at 50 micrograms/L to 25 and now to 10. Most people understand that we must avoid ingesting arsenic.

Then there are trihalomethanes (THMs), which are formed when chlorine is added in the water treatment process. It can react with compounds in the water and form cancer-causing chemicals. When you have too much organic material in the water some of the compounds formed are THMs.

Trihalomethane guidelines have gone from 350 micrograms/L down to 100

micrograms/L with Health Canada suggesting that the right number for THMs is 20. The Guidelines for Canadian Drinking Water Quality also include compounds such as sulphate, uranium and others and neither of the traditional technologies can deal with such compounds. The total amount of inorganic compounds in a water is determined by Total Dissolved Solids or TDS (minerals, salts or metals dissolved in a given volume of water). The best way to be able to decrease TDS is to employ membranes, such as those used in the IBROM process.

We never used to worry about protozoan parasites like Giardia (Beaver Fever) or Cryptosporidium, but outbreaks of these parasites including the latter in North Battleford in 2001 has made us aware of them. In the United States two-thirds of all waterborne outbreaks are caused by viruses, but the problem with viruses has not been addressed in Canada. These problems have really no solution unless more recent technologies are employed. Ammonium is also creeping up as a contaminant that compromises the use of chlorine in water treatment plants. The IBROM's biological treatment removes ammonium to below detection, but the traditional water processes cannot remove it.

Maybe the older technologies can be combined with newer technologies and I will address this in the next two articles that I will write for the *Tribune*. The Manganese Greensand technology just celebrated its 100th anniversary. When it was developed World War I was raging. The technology was developed on high quality raw water sources where it worked to remove iron and manganese. Then water treatment plant designers on the prairies assumed it would work in every groundwater source in First Nations communities.

After having finished the design of the first IBROM process at Yellow Quill in 2004, I was hired by Indian Affairs to try to get the George Gordon First Nation Manganese Greensand plant to work. But, I got stumped. The operator, Bob Pratt, being one of the best operators in Saskatchewan had been stumped for fifteen years. Every



The photo shows two cups of tea. Into one serving chlorine has been added. However, organic material from the tea reacts with chlorine to form trihalomethanes.

five years a new engineering company suggesting they had a better solution for the Manganese Greensand process was hired by the band. None worked. They were unable to remove manganese. I talked to the company supplying the two key ingredients in the process, manganese greensand and potassium permanganate. Bob and I did a string of additional tests based on their recommendations. It still did not work.

It turns out that the Manganese Greensand technology was developed on raw water sources of a much better grade than at Gordon's. Remember, prairie groundwater is of notoriously poor quality. The ultimate verdict from the manufacturer of Manganese Greensand technology was "it will never work on your water." No matter how much we tried to optimize it, it never worked. When the manganese levels are high, the TDS are high, and if there is ammonium in the water this technology may not even be able to remove manganese.

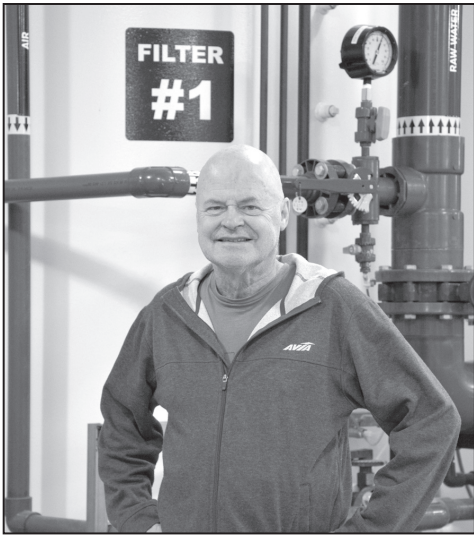
Prodding further into the issues, the Safe Drinking Water Foundation team has identified 13 major issues in groundwater and several major issues in surface water. Instead of trying to address all of these -

and I have pointed out several - often only a couple are addressed when new water treatment plants are constructed. The two traditional technologies that I have mentioned were simply intended to solve a couple of these issues, making it hard to meet *current* guidelines.

There is a simple solution for this: Demand that the engineering company provides your community with a performance bond that the new water treatment plant must meet the full complement of the Guidelines for Canadian Drinking Water Quality and Saskatchewan regulations for Drinking Water Quality. This needs to be legally enforceable so have your lawyer ensure that it is. The federal government has realized that there are more than a few issues in most First Nations' water sources and has during the past 10 years replaced 15 manganese greensand plants with the IBROM process here in Saskatchewan. The manufacturer of the IBROM, Sapphire International, has for years given guarantees that the IBROM process they build meets the full complement of the Canadian Guidelines.

... continued on page 14

# When Water Treatment fails First Nations Communities



Dr. Hans Peterson, 2014, standing in front of the first filter in Yellow Quill's Integrated Biological and Reverse Osmosis Membrane (IBROM) treatment plant.

SUBMITTED PHOTO

...continued from page 13

Otherwise, operators may continue to be faced with a kind of situation where they are expected, as an example, "to remove coffee grounds with tea strainers." You can try this for yourself and you will not be able to catch coffee grounds with a tea strainer. Coffee grounds will end up in the cup. What communities need are water treatment processes that can transform the raw water so that it tastes ok and is safe to drink. Meeting the Guidelines for Canadian Drinking Water Quality is the first step on this path.

But, many First Nations water treatment plant operators are literally forced to use tea strainers. We have ground water and surface water treatment plants where the operators can deal with *some* of the water quality issues they are faced with, but not others. But, surely, if there are contaminants in the water then community members would "see" that there are problems in the treated water? No! Few contaminants are visible and some that are visible can be trans-

formed with one chemical: Chlorine! Imagine pouring two identical cups of tea and pouring chlorine in one of them. Now there, apparent success! The water turned clear in one! Problem solved?

Well, not so fast. As mentioned above, chlorine can react with compounds in the water to form trihalomethanes. When you put a tea bag in water and see the colour of the water change, that's organic material from the tea bag that's causing that change. In our Saskatchewan region, some surface water plants have to contend with water that has drained from muskeg (maybe the surface water is from a lake, but some of that lake water comes from muskeg) and it adds a lot of organic material to the water. That water has the potential of creating trihalomethanes.

Most cities worry about taste and odour of distributed water. Indeed, some cities worry so much about this that they hire "water tasters." The job of these water tasters is to sniff and taste the treated water. To get a job as a water taster you've got to have a keen sense of smell and taste. Maybe Health Canada's water testers should be trained to do this, although at times the problem(s) are obvious.

When I ask Chiefs and Councillors, Elders and community members what they wish for in a new water treatment plant I invariably get the following answer: "Dr. Hans, we would like drinking water that tastes good and that is safe to drink from our taps in our homes." That's it. People in general don't care about guidelines or regulations, but they care about the water tasting ok and being safe.

At La Ronge's new water treatment plant, serving both town and reserve, they try to remove the organic material so they get less THMs. The process they have chosen, ion exchange, does this with limited success. Now, that brings us to another problem. Some treatments currently used cause more problems than they solve! In fact, they solve one problem and cause several others. That is unless you want to trade a great-tasting water for one that few will drink.

When the treatment is supposed to

decrease the likelihood of the incidence of a health problem like cancer, it seems like an honourable goal. But, when in fact, according to Health Canada the treatment has *no measurable effect* on human health is it a good move? What if the water starts to taste bitter like in La Ronge, or "fishy" in some other places? And why does it start to taste bitter in La Ronge and fishy in others? If it didn't taste bitter or fishy before treatment, or with a different treatment, your conclusion that the new treatment is causing this seems like a safe bet. What has resulted is trading a great-tasting water with a bad-tasting water now that few will drink.

*Dr. Hans Peterson will comment further on the numerous drinking water issues facing First Nations in upcoming issues of the Tribune.*

## About Dr. Hans Peterson

Dr. Hans Peterson was the Volunteer Executive Director of the Safe Drinking Water Foundation, [www.safewater.org](http://www.safewater.org), during this organization's first ten years and is now its Volunteer Safe Drinking Water Ambassador. Hans is an avid believer in the Safe Drinking Water Team's ([www.safedrinkingwaterteam.org](http://www.safedrinkingwaterteam.org)) goal of "safe drinking water at every tap." Hans's home is at Stanley Mission and if you are interested in discussing safe drinking water you can reach him at [hans.peterson@yahoo.com](mailto:hans.peterson@yahoo.com).

## An Anecdote by Dr. Hans Peterson

I want to tell you a story from Yellow Quill. We had implemented the IBROM system there in 2004. I was driving down the main road with my Ford Explorer. This road goes south-north right through the reserve. I could see a guy pushing a wheelchair and I realized there was not a house for at least one kilometre, so I stopped and asked them if they wanted a ride. I said, "We can put the wheelchair in the back."

The guy that pushed the wheelchair said, 'No worries,' and that he is used to pushing the wheelchair. Then the guy sitting in the wheelchair said, "Are you Dr. Hans?" (That's what they call me in many communities) and I said "Yes," and he got very excited and said, "Dr. Hans I've got to tell

you something. A couple of days ago I was going to do my wash (he must have had a top loader) and I do as I always do – fill up the washing machine with water, and then I checked the level. But, Dr. Hans I could see the bottom of the washing machine! I have never been able to do that before. So, thank you so much, Dr. Hans, for fixing our water!"