Addendum to report on Texada "goop" used on Gabriola

Magnesium/calcium silicate scaling

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February 20, 2008

The "corrosion" problem—real or imagined?

A technical analysis of the "Texada Gravel" (known locally as "Texada goop" or "Texada slime") used on the Island to surface unpaved roads has shown it to be common limestone with, unusually, a high clay component, together with a small gravel component that is not chemically active.

The clay, which gives the material its objectionable qualities, is probably bentonite, or volcanic ash, which usually contains the mineral montmorillonite, though its presence in the "goop" has yet to be confirmed by X-ray diffraction analysis or other means. The presence of bentonite would not be at all surprising in the late-Triassic limestone deposits of Texada Island as these are conformably underlain with mafic submarine lava flows.

Chemical analysis of surface water that has filled potholes in the roads on Gabriola for several days shows the presence of magnesium (along with the expected calcium) possibly from the goop itself, but also possibly as a result of earlier treatment of the road surfaces with magnesium chloride, a dust control agent. Calcium chloride has also been used on Gabriola for this purpose, I'm told, in the past. Even without such magnesium-rich treatment, the presence of magnesium as a weathering component would not be unexpected as smectite clay (the type of clay montmorillonite is) contains magnesium in its gibbsite-like aluminosilicate layers.

The combination of silica or silica-rich minerals and magnesium in high pH, hot water solutions is a notorious and problematic source of scaling in industrial systems—Google will find many sites discussing this problem. The scale is predominately magnesium silicate or calcium silicate. Magnesium silicate coats cast iron but not stainless steel, which calcium silicate can coat both. Magnesium silicate, when it does not form scale, is a soft slippery substance, which, in its hydrated form, is the main component of talcum powder. Silica-scale is a problem in industrial systems because it is difficult to remove once formed, drastically reduces heat transfer rates, fosters under-deposit corrosion, and if allowed to build up, blocks drainage holes.

The following are some thoughts and results of simple experiments that lead to the conclusion that the formation of scale on the brake drums of cars and possibly (but much less certain) in well pumps is at least part of the “corrosion” problem that vehicle owners who regularly drive the unpaved roads of Gabriola are reporting. The two named environments are especially suited to the formation of scale because they include hot metallic surfaces.

The second aspect of the “corrosion problem” is the sealing of salt-laden moisture on metal surfaces by cakes of hydraulic cement made up primarily of calcite and clay—but I won’t deal with that in this addendum. From what I can gather, this aspect of the “corrosion” problem is a secondary effect, which makes sense given that limestone, by itself, is not generally considered to be corrosive. People use it on driveways all the time without complaint.

A simple experiment

To confirm that I was not going off on a technological tangent, I did the simple experiment of slowly removing the water from a goop sample in a warm wok on the kitchen stove. After the water had gone, I discarded all the powdery material, and was left with a wok with a thin white film on the bottom adhering to the metal surface. This could not be removed by vigorous washing or rubbing with fingers, but it could by using a regular plastic dish scrubber.

I showed my wok to the owner of the Gabriola Automotive Company (Tim Nicklom), who services many “gooped” vehicles on the Island. He assured me that the stuff in my wok had all the physical qualities and appearance of the material he was seeing on the inside of brake drums. It is therefore a reasonable supposition, I think, that part of the “corrosion” problem is silica scaling. Jeremy Baker has observed the formation of a silica gel in goop-laden water, likely initiated by a drop in pH. Smectite clays are, as are all clays, rich in silica.

Conclusion

Nothing is certain in scientific investigations, and clearly more testing needs to be done, but I consider that there may be a firm scientific basis for some of the complaints that are being made to the effect that the road treatment material is “corrosive” and damaging vehicles.

OPINION

It is incumbent open the Emcon to explain why they consider a material with such an unsuitably high clay content be used on Gabriola, and on the Ministry of Transportation to say why they are permitting its use to continue.

END