

## **Corrosion, wear and corrosive wear; the story of lubrication systems in large technology object storage and use**

### **David Hallam, David Thurrowgood and Col Ogilvie - Question and answer session**

**Davina Bonner:** I'm just interested in your concept of the economic life of objects. At what point do you find that an object reaches the end of its economic life and what do you do with it then?

**David Hallam:** You mothball it.

**Davina Bonner:** Is that deaccessioning?

**David Hallam:** No, no - the economic life thing actually came from someone who was a conservator at the Henry Ford (I forget his name), in the mid 1980s. He's now somewhere down in the south, I'll remember his name. And it was used to describe the useful life of an object in the world. And what I'm saying is that if something is within that economic life then we can maintain it. We can put it into a maintenance cycle and use its functionality to preserve it. Once it gets outside that economic life it is worn out and any function will damage it.

**Davina Bonner:** So you'd look to stabilize....

**David Hallam:** I would look to mothball it.

**Davina Bonner:** Thank you

**David Hallam:** Using military mothballing techniques.

**Dave Rockell:** We actually run our - we don't actually have a working car fleet as such anymore - but we have 15 years ago mothballed our whole collection. But two particular cars have been silicon brake fluid treated, plus inhibitor oils and have been suspended in the museum's roof for 11 years. This year we actually got them out of the roof and reversed our processes and within two hours were driving around the car park. Which is what we thought, because everything's theory up until you actually try to fire one up again.

**David Hallam:** Okay, I personally would not use - ever - silicon fluids because I believe that traditional fluids are more maintainable. And I think that we need to do some more work there, we need to do some electrochemistry on what actually happens with traditional fluids. But I do have concerns; I'm pleased that you can do that, but I do have concerns with the use of silicon brake fluids.

**Alison Wain:** Could you say why?

**David Hallam:** Because if they're not applied properly you will end up with pitting corrosion and very, very rapidly totally stuff your brake system. And it's much simpler to stay with what they were designed for and to add corrosion inhibitors.

**Nick Langford:** To support your ...what you were just saying about silicon brake fluids; we've had many disasters with silicon brake fluids in a short space of time, in cars which we've prepared for either historic racing or just the, sort of, enthusiast type use. We are getting severe corrosion in aluminium cylinders, with the result that you end up with no brakes whatsoever, which is not very good for the conservative attitude of the motorcar when it hits the tree or something. We've found that the best thing to use is the conventional brake fluids - the higher temperature brake fluids are much better than the lower temperature brake fluids for use in drum brake vehicles (which are the cars of the thirties). And the best thing to do with brake fluids is to use [the vehicle] and get the brake fluid hot, and then all of the moisture which has been absorbed into the brake fluid is boiled off and you don't have any problems. If you use conventional brake fluid on a regular basis it lasts for a long time, and if you look at the service instructions on modern cars for instance the modern brake fluids have a shelf life I think of about two years. So if you take your Volvo, or whatever you choose to drive, in to get serviced, you'll see that they will change the brake fluids on a regular basis. So it should be treated the same as changing the oils. Thank you.

**David Hallam:** I agree with that.

**Nikki King-Smith:** I've got two V16 turbo-charged power plants in the object that I'm supposed to be conserving. I think I'm going to be having a bit of trouble firing those up! They're of recent vintage. Would you consider that keeping the parts moving (to move the lubrication systems) with an ancillary engine or motor of some sort would be a better case scenario than just mothballing? I mean, I just don't think that I'm going to be able to turn these things on and maintain them.

**David Hallam:** The problem is, in order to mothball them properly, they need to run. So really what should have happened was the last time that they were run (and this never happens), is they should have been mothballed properly, if they weren't going to run.

**Nikki King-Smith:** What do I do now?

**David Hallam:** I would tend to use lubricating oils and circulate them through. And I think if you can rotate them, as part of a maintenance program, I think that would be useful. You also should consider dehumidification, dropping the RH inside the actual engines themselves. Using a Munters system or something. I mean how big are they?

**Nikki King-Smith:** Locomotive engines. They're in the submarine.

**David Hallam:** Yeah, I think you need to consider some dehumidification.

**Alison Wain:** If you do mothball something, even mothballing - if we're talking about preserving something for decades, hundreds of years potentially - you've got to renew that mothballing at some stage. So what do you do then, particularly if you can't fire your object up?

**David Hallam:** You've got a bit of a problem. That's why in a lot of ways I consider mothballing to be second best. Mothballing becomes part of your cyclic restoration

phenomena, which is why a maintenance program where you can actually kick the thing over is far better.

**Alison Wain:** Even if that's not firing it up?

**David Hallam:** Yeah, even if that's not firing it up. That would be my preferred, because at least then you can change the oil.

**John Kemister:** Another suggestion, if you can't fire it up, is maybe you can throw a few cc's of vapour phase inhibiting oil in the top end. Now you've got to watch that, because if you crank it subsequently you can get a hydraulic block. But usually over the years a few cc's usually trickle down through the ring caps anyway. Put it in the top and spray it around with a little nozzle.

**David Hallam:** One of the things that you'll find with an oil that has a decent inhibitor package in it, is it has vapour phase inhibitors and surface inhibitors. So I would suggest that it's best to go with one package rather than mix and match, because you don't know what's in there and you really have to be careful with vapour phase inhibitors. They're wonderful, but I think you've got to be careful because they attack things like lead, cadmium, and a few other things like that which you may have in your bearings. So you need to find out what's in there. What the materials are.

**Gillian Mitchell:** David, I'm interested in your idea of the monitoring and the idea of Just Noticeable Wear and wondering - have you got to the point where you're thinking about how you might actually go there, and what indicators, where you'll be looking at and how you'll measure them?

**David Hallam:** No, we've just floated the idea at the moment and we're very interested in any input, but basically we think it's a useful way of describing things.

**Colin Ogilvie:** The unfortunate thing about Just Noticeable Wear is for 50 years being a mechanic it's easy, I'll have a listen to it, and have a smell of it, and have a feel of it, and yeah, it's bugged or yeah it's okay mate she'll be right. It's easy for me, but how do you get feel, smell, taste, over to people? You can't. It's an experience, so we've got to measure it. As a mechanic and an engineer, I can measure most parts of a car in one form or another and I can tell you whether it's good, bad, or indifferent - it's longevity, they're reasonably easy, but I've got to do some handling. Now if I had a 16 cylinder turbo charged engine that weighs around about eight and a half tonne I don't think I'd be looking to dismantle that tomorrow afternoon. So I've got to have some form or some way of knowing. You must start off with a base line and that's where we're really at now, is where do we start from? That's our Just Noticeable Wear beginning. Another year, we might be able to tell you.

**Andrew Pearce:** A few years ago when we were first talking to you about vehicles and oils and things like that and you were in the early stages of involvement with Penrite - we were talking about spectroanalysis of engine oils, which was one of the features that they were offering to you. I'm in an interesting position, where originally I was actually working with the South Australian railways - funnily enough on big 16 cylinder turbocharged diesel engines - and spent about six months of my electrical apprenticeship working in the chemical testing laboratory in the railways,

where funnily enough every week we were running big spectroanalysis test runs on all of the engine oils from the locomotives in the fleet. Are you planning on using things like the spectroanalysis results you're getting back from engine oils to pick up the early stages of wear? Because that was one of the things that we were doing with the oils - you could see when the lead and copper and things like that started appearing.

**David Hallam:** In theory it sounds great, but if something is corroding and it's not moving, how do you analyse it? In order to use spectral analysis it needs to be running continuously. So I mean yeah, great, if we've got something in a display fleet that's fine, but if it's the prototype Holden and it's on display in the Nation Gallery and it's not running at the moment, how do we monitor it?

**Andrew Pearce:** You don't get the materials building up in the oil and you definitely don't build up the base line enough to get a fingerprint of what's normal.

**David Hallam:** No. And it's only done eight miles since it was rebuilt. So it most probably isn't worn in. So you know, you'll still be picking up all that first piece of a peak. So, we've got a long way to go. We're just flagging it.

**Joanna Barr:** Just a quick question. Is a maintenance regime such as you and Alison described going to work where there isn't museum quality climate control and there are known condensation problems?

**David Hallam:** Yes, it will, you just make it more often. Basically, well, it depends on your environmental corrosivity, so really you need to get some idea of that. You need some measurement of your environmental corrosivity and then you can start looking at that.

**Joanna Barr:** Yeah, so in a regional country area where.....

**David Hallam:** Yeah, well, six monthly, yearly, you know, up it like that. This is where you know, we think we'll be down to five yearly maintenance cycles here, but we don't know. We're not there yet.

**Joanna Barr:** So we are potentially looking at a system that is very manageable for a very volunteer [organization]?

**David Hallam:** Yes, that's the great thing

**Joanna Barr:** Yeah.

**David Hallam:** Yeah, it's not new tech.

**Joanna Barr:** It's low tech.

**David Hallam:** Yeah, you just change the oil, just use a different one.

**Joanna Barr:** No, that's great.