The London Bullion Market Association

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Session Seven

Forensic Applications of Assaying

Closing Panel and Concluding Remarks

Stewart Murray

So, ladies and gentlemen, here you see, in all their glory, the referees panel of the LBMA, and you heard yesterday about all the hard work that they do for us, and now they are going to do a little bit more hard work for you by responding to any questions or comments or suggestions that you may have. I think we are particularly interested in any comments or criticisms about this seminar and suggestions for future seminars, assuming that we will continue to have one, which I think is what I would certainly expect. You will be receiving from us, if you have not already, an electronic questionnaire asking you some questions about how you feel about this event. Please do respond and let us have your comments. I think you can do it anonymously, if you want to be negative, but negative is also good, do not worry about that.

So, let us have some thoughts. The only thing I heard, just during coffee, was someone suggested sampling might be a topic for the future; I think maybe we talked about it a long time ago, but I cannot really remember. Another comment was perhaps a bit more on instrumental techniques; I am not quite sure exactly what that might involve, but can we have some feedback from you?

Mike Hinds

Most of our work in talks in this conference have been about fine gold, and fine silver, but what about impure? So, incoming in to the refinery, would there be any impetus to entertain that, since it is something that we all have to deal with in some way, shape or form, and does it impact trade and bottom line and things like that?

Jonathan Jodry, Metalor Technologies SA

I think it is a very good point. Historically we did not cover this field because the LBMA is interested in 995-plus gold, but as you said Mike, before getting 995 gold, you usually have to start with a lower title. There are many new issues that are on the table right now, like deleterious elements that enter your facility, so I think it would be something very interesting.

Mike Hinds

Especially deleterious elements, because it is more of an issue now for all of us to deal with, and how you go about doing it, what standards you use, how reliable your methods are, and how low can you go.

Stewart Murray

I do not know who it was that mentioned sampling; what does the panel think about how, if at all, we should cover the question of sampling?

Alessandro Ruffoni, Argor-Heraeus SA

Of course, we have spent now many years in order to improve the precision and accuracy of our analysis or assaying, and of course, the results are only as good as the sampling is. So, it is certainly an interesting topic to think about at least.

Umberto Magro, PAMP SA

I think we should definitely look at it; as Alessandro said, if your sampling is not good, then your analysis will not be precise.

Stewart Murray

But what are we talking about? Are we talking about bullion, where you can take a drilling or cut off a corner of a bar, or are we talking about something that is less homogeneous? I guess it is non-homogeneous materials that have a sampling challenge, so what would we be thinking in the context of our work?

Mike Hinds

Even in the context of what you are saying – drilling, versus taking a corner, versus taking a melt of the bar and taking a sample from that – all those things could impact. Deleterious elements: do you just take a handheld XRF and put it on the side of the bar, or do you take a drilling? There are a lot of items that we sample and deal with; what about sweeps? Or other by-product materials from your process, if you have to sample those? It all relates to the refiner of precious metals, and there are a lot of challenges with each sample type. And even within a pure bar, depending on how it cools, as we know, there are different grain structures depending on whether it is slow-cooled or fast cooled, and I think it is very important to understand that when you go about setting up a sampling scheme.

Jonathan Jodry

In our labs we had our ISO 17025 audit; it happened ten days ago. Usually, as it is the sixth or seventh time they have come, things are happening smoothly. They look at several of our 20 methods and so on. This time they arrived, and they said, 'Okay, today we will focus on sampling', and they asked us about sampling methods, metallurgy, asked who is the sampling manager, although it was not covered officially by the accreditation. I think there is a general concern that we have pushed analytical abilities so high over recent years that at some point, as it was said, your result cannot be better than your sampling is, so I think it something that is very important.

The second thing is that sampling is quite important, even for gold 995. I can give you a small example: a couple of months ago we had a conversion job, where we were melting bars that were almost 100 years old, and that contained some platinum in them. We noticed that

the homogeneity of the sample we were taking to cross-check the analysis by spark spectroscopy was really an issue; apparently the cooling process was perturbed by the platinum, and even for a high title like this, we had this problem of homogeneity in samples. I think it is a very interesting topic.

Participant

Regarding your silver reference material – maybe Mike might be able to answer this – is there any thought about producing silver reference material with higher impurities; copper [inaudible], 300-400 ppm.

Mike Hinds

Yes, that would be the next one to tackle. I guess everybody only has so much time. I wish we would do them all right away, but I am afraid it takes some time and energy, but certainly that would be a next one to look at, continuing on in the series. So, what you are suggesting is silver with higher copper?

Participant

Yes. Like for instance, most of the bars we produce that go to market contains, 300-500 ppm copper, but the reference that we have got, the highest is only 100ppm, so it is not great. It is good and we are using it, but it would be better if we had reference material which contained 400-500 ppm copper.

Mike Hinds

I will put it on the list. The answer is yes, we will do it. You just may have to wait a little while until we finish RM3.

Participant

The reference material that we have got is very good, and I would like to thank you for that.

Mike Hinds

Great, thank you. Tell all of your friends.

Participant

I was just wondering if perhaps you want to explore detection for counterfeit bars, in particular bullion bars with things embedded in it – ultrasonic testing or that sort of thing. Do you want to have that as a topic to see if there are advancements with that testing a couple of years down the road?

Jonathan Jodry

You are really tackling a difficult question here because technically we would need to have reference material containing tungsten to be able to make comparisons and to have really double blind analysis. The problem is no one in this room is probably going to produce them, because it is such a sensitive issue. One answer could be whether we could ask instrument makers to come at the conference and to present their solution for this kind of problem. I know, Thomas you have some experience on that; would you like to say some words?

Thomas Brodmann

We have been contacted by a manufacturer of physical testing instruments from Germany; actually the basic principle is by conductibility, and they use it normally just to measure the thickness or surface layers. However, modulating the physics in it a little bit further on showed that it is very much possible to see if something is in the bar. The advantage of that system compared to ultrasound testing is that you do not need an interface by means of liquid; you can just pass the instrument over it. However, at the moment this is still in an experimental stage. We have some fake bars which we have stopped from the market – kilo bars with stamps on it, and on those ones it worked quite well. It would be interesting to test that with the big standard bars.

Jonathan Jodry

But just to underline that, referees are well aware of the problem of fake bars. There have been regular discussions on the topics. It is a very, very sensitive question, because we also do not want to give away procedures to make bars that could not be detected, so it is a difficult equilibrium to keep.

Neil Harby

I think, in answer to your question, yes, we are very aware of it, and it is something that if we can share we will share.

Jonathan Jodry

Just one thing: if there is anyone who encounters in the business some material that seems suspect or is frankly fake, it is really worth sending the information to the LBMA. I am sure Stewart would handle that with the highest possible level of confidentiality, and perhaps share something with referees on a no-name basis, so that we could build a database of the issues we are encountering, and we would be more efficient in finding a solution in the future if those problems keep accumulating.

Mike Hinds

We had a little bit of experience a little while ago, looking at impacts of a new technology with a different company, using ultrasound in a completely different way, and in trying to improve this technology we have gained a little expertise in how to make fake bars, but we have got those locked up and put away for testing purposes only. It is not something that we want to become really good at, but I am hoping in perhaps the next meeting we might have something to share with the group on a new testing scheme.

Stewart Murray

Are there any thoughts from the panel, just coming out of the last two days? We covered a much wider range of topics than we ever have before, ranging from new production technologies, all the way through to Responsible Gold. We still had quite a lot on assaying and things related to assaying, such as proficiency testing and reference materials. The topic of proficiency testing for silver has certainly been mentioned to me. This might involve, for instance, looking at several different trace elements in silver, and FAPAS confirmed that, in fact, that is absolutely normal for them. They can look at up to 20 different trace elements if we wanted them to do that. This would of course mean finding an appropriate material to send out, and I am not quite sure if what we have got is suitable, apart from the reference materials, but we already know what the reference materials are, so we cannot use them. The

reference samples that the referees made are, as I mentioned earlier, fairly simple. I think, maybe in one case, one of you just started with an impure material rather than taking five pure metals; that might be a better basis for a proficiency test, if we were to do one for silver. Are there any thoughts from the panel on proficiency testing of silver?

Neil Harby

I think it is a logical extension of the proficiency testing scheme. Maybe we can alternate gold and silver, and not do both every year.

Stewart Murray

What is the feeling of this audience? Can we have a show of hands for whether you would be interested in participating if we had a silver proficiency test looking at various different elements in it? Can you put your hands up if you would be interested?

[Show of hands]

I would say about a dozen.

Jonathan Jodry

I would say it is different, because first you would need to have something scientifically sound. You would need to study trace element by trace element, which would be a lot of work. Then, you can assay wrongly some of the elements and still have a final title that is correct, just because you overestimate one and underestimate another; that is another problem. I think that gold is much more interesting, and we have not really reached a fine level with the gold proficiency testing in my opinion yet; first, because we have had only two compositions, and we know that you do not analyse gold 995 in the same way as 999, or if you do, you might have a bias on one and not the other, so, I think there is still some room for improvement. We still should not forget that still several labs were out of the -2 to 2 z-score – labs that are normally audited via the proactive monitoring. So, once we have all labs in the range we are expecting for gold, we can reproduce that, and we do not have a bias between cupellation, then I think there would be room for an extra one.

Stewart Murray

Is that question of cupellation versus spectrographic something that needs to be explored a bit further, rather than just in the proficiency and, of course, we had a presentation on it here as well. I think – was it Dirk who said something about the precision for spectrographic being better than for cupellation? I think, I have always assumed that of course it is – it is a precise method; you do five trials, they all come out the same, the precision is very high or, as Peter Smith once said, 'It is precise – precisely wrong', which is the possible difficulty with spectrographic assays.

Alessandro Ruffoni

Yes, I think for spectrographic analysis, accuracy I would say is more the concern rather than precision, perhaps inversely, then with fire assay. Of course, until now we just have a couple of compositions, of course, they are fairly close together, so coming from 995 gold to four-9 gold, there is not a world between them, and the problem occurs rather when you are going to jewellery alloy compositions and similar types of alloys. It would be interesting but perhaps remaining with these kind of samples, we will not go much further.

Stewart Murray

Do we need to carry on with proficiency testing forever, or do we get to a level where everyone is below a z-score of 2 and then we just say, 'Okay, that is enough. We do not need to do any more of that', or is it something that should be built in as just a regular service that the LBMA provides to the refining industry?

Alessandro Ruffoni

It is important that this can be carried on for several years. I think after five rounds or more, then each laboratory would then become aware whether they are okay or not – perhaps they could improve their proficiency – so I could imagine that participation could fall away over time. We could in any case keep on for some years and then ask the same question again.

Umberto Magro

I fully agree because, like we in Switzerland, where the government is leading the whole round-robin, I think it should be something that we continue with for a certain period, so we can test accuracy.

Jonathan Jodry

Not to mention that we intend to have new companies on the Good Delivery List, and those companies would be interested to evaluate themselves once they reach the club, as you said.

Hitoshi Kosai, Tanaka Kikinzoku Kogyo K.K

Also, not new companies, but also new assayers at each company – the next generation.

Stewart Murray

What about the idea of allowing, for instance, Good Delivery silver refiners who also refine some gold, to participate in the proficiency testing, because at the moment it is restricted to gold refiners – refiners who are on the gold List. Should we allow silver refiners who wish to participate to do so?

Neil Harby

I do not see a problem

Hitoshi Kosai

I think it is a good idea.

Jonathan Jodry

The limitation was to make sure that companies that are not part of the LBMA are not enjoying the advantage of what we are organising without following the rules. You probably have silver refiners that might one day want to become gold refiners; I think it is a very good exercise. The only thing I would make sure is that results coming from companies which are not on the Gold GDL are clearly identified, to make sure that no bias is coming from such companies.

Hitoshi Kosai

And also this kind of system is just provided by the LBMA to the members, to the providers on the list. But, maybe this system could be applied to prospective members and then it would be a good chance to increase membership.

Stewart Murray

I have the sense that it should be for Good Delivery refiners only and that we should not start allowing aspirant refiners or applicant refiners. I think there has to be a cut-off at some point, and it seems to me that, being accredited, I know of a few silver refiners who also refine gold and they do assay gold and they would be interested in participating, and I think the view of the panel is that would be okay.

Arnold Savolainen, Metalor Technologies USA

One thing is that in our lab I want to be able to have more than one assayer who is able to do LBMA assays. The second thing I was thinking about non Good Delivery companies being able to participate but you covered that. We were on the [inaudible] programme which has been going on for 25 years now, and the participation goes up and down a little, but we are between 30 and 40 labs every year worldwide, so there is enough interest to keep that going.

Jonathan Jodry

Deciding whether a company can order several samples is interesting; I am not sure that it is acceptable with the concept of proficiency testing, since you never know how the company is going to use those multiple samples. Again, I would like to ask Thomas, who is also organising the Proficiency Testing for the International Assay Office, if you allow a company to order several samples for several assayers, for example.

Thomas Brodmann

Usually it is not like that; usually you have to prove the content[?] of your lab, independently. The one who is producing that – we each should do the assay; not the best one, to prove, to monitor the content of the lab, and the organiser should retain some of the sample in order that if you have a problem to investigate what the problem was. That quality system would be by means of a process control chart or something and secondary reference materials, [inaudible] company, but for such a scheme.

Another point I wanted to add about opening up the [inaudible] of proficiency testing to other members: be aware of the statistical impact. If you open it up for non-refiners and you may have a lot of very good labs participating, but if the spread goes on, even if you apply robust statistics, it will impact the consensus value here.

Stewart Murray

Good point. And I think Kate Wilkinson from FAPAS made the point that proficiency testing is not for testing out your three or four different assayers in your lab; she seemed quite definite on that point.

We have not talked at all about defects so far in this session. Now, we are going to be bringing out our visual guide, mark two. I certainly hope that within the next three to six months we will have something that we can tell all the refiners about which will further help to show what is acceptable in London. I get the sense that maybe it is not such a contentious issue anymore, and that you are not getting a lot of cases of bars being rejected. I know there

are still some, and we usually hear about them now; the system in London is that if one of the vaults rejects any bars, it is meant to send us the details, including photographs, which helps us to build up an overall database of what is and what is not acceptable. We had a fair amount of it at this seminar. Is it something that we should be looking at next time? I guess we can wait until we have got the visual guide published before we decide on that, but what is the feeling about whether discussing this kind of thing in this forum is useful or not, or, indeed, should we be discussing it in a different way?

Neil Harby

If I could comment on that, Stewart, I think about two years ago when the button defect became the topic of discussion. I have spoken to a number of other refineries, and there was a lot of focus on where the button defects were coming from: whether it is mould temperature, mould dressing, finish of the mould, the temperature of the poured metal. So, as that defect became the flavour of the month there was a lot of attention put on it, and a lot of people have solved that, or certainly significantly reduced it, and what happened is, when it first came out, the reject rates skyrocketed, and there was a very big incentive to fix it, and a lot of refineries managed to fix it. So, I think in terms of general defects, maybe not so much, but if something specific is highlighted as being a trend, then that could certainly become a topic.

Jonathan Jodry

Do we have anyone from a vault in this room? (Note: No answer from the audience) Excellent. I think one of the good points is that since the vaults are obliged or required to submit back specific information with pictures of why a bar was rejected, this significantly lowered the amount of rejections, and we can see it on the website. I think that first, refiners fixed the problems that were really put upfront, but also, now that it takes work to reject a bar, we do not have what I have seen in the past – a vault that just rejects a bar because, 'Frankly it is not what we would like to have', although it was acceptable for the Good Delivery Rules. So, I think the last session we had two years ago really helped to significantly clean up this issue. It might very well come back in the future but for the moment we are really in a very stable and comfortable position.

Stewart Murray

Does anyone want to say anything else, or ask anything else, or make a suggestion from the panel?

Jonathan Jodry

Yes, I have a general question: one thing we have not talked a lot about this year and two years ago is instruments – specific instruments. I know it is always a concern whether you want to enter into the coffee room and have five instrument makers running after you to explain to you that they have the best ICP in the market, but I still think that there are new instruments coming on the market, and we work in field where, for example, spark spectroscopy is quite common; you do not really go to a conference, even an analytical one and on spectroscopy, and hear about this kind of instrument. So, I was wondering whether there would be an interest to have some updates or some information on the newest techniques that are on the market.

Neil Harby

Does that include hand-held x-rays?

Jonathan Jodry

That includes everything.

Neil Harby

Another thing that has happened over the last couple of years is how many hand-held x-rays are available from a number of suppliers, and what we have found is that it raises expectations of the people using those instruments, and I think it would be useful if we understood just how limited they are compared to the better instruments, and I know we have some situations with customers who use these instruments to analyse a very thin layer of the surface, and then are upset when they then do not get what they expect.

If I can use one example, Rand Refinery produces a coin known as the Krugerrand, and it is quite a widespread coin and one thing we have found is that using a hand-held x-ray to analyse a coin that has been minted is probably not the best thing to do. The handheld x-ray is relying on a perfectly flat surface, and it is also relying on the fact that you are going to excite the l-lines of gold and also the high energy k-lines of silver; often the hand-held x-ray is not the best thing to analyse something like a minted coin.

Stewart Murray

I have got a minted coin here: I think it is a tenth of an ounce, a US liberty coin, and I always thought it was silver, and a chap at the Peruvian Gold Symposium he had one of these things, and I said, 'Well, is that really silver', so he put it on and he said, 'No, there is no silver on that, because it is platinum', which I was very pleased about. I have looked after it since.

Okay, I think we have just about exhausted all of your ideas, and thank you very much for them. Do please still give us the electronic feedback when you receive it. I will just finish by thanking all the same people that I thanked yesterday morning, but now retrospectively, so, speakers, sponsors, panellists, our staff, and all of you for attending, and I hope I look forward to seeing you all two years from now, probably not far from here.

Thank you very much.