



**Transcript of Question 5**

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## Engine Builder Engine Bearing Summit Participants



**Bob Sturk**  
Federal-Mogul Corp.



**Dr. Dimitri Kopeliovich**  
King Engine Bearings



**John Havel**  
MAHLE Clevite



**Raymond King**  
Federal-Mogul Corp.



**Michael James**  
King Engine Bearings



**Bill McKnight**  
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**Doug Kaufman**, Editor  
*Engine Builder* magazine



**Brendan Baker**, Senior Editor  
*Engine Builder* magazine



**Larry Carley**, Technical Editor  
*Engine Builder* magazine

To answer questions and allow an open discussion about engine bearings without falling into a “pizza wars” debate we convened the inaugural *Engine Builder* Engine Bearing Summit on March 31 at the Babcox Media corporate headquarters. We invited participants from the leading bearing manufacturers to participate in a roundtable discussion on pre-determined topics.

To say the day exceeded expectations would be an understatement. Participants were prepared, cooperative and frank about engine bearing technology and applications.

The following industry experts participated in the Summit. From Federal-Mogul Corporation: **Bob Sturk**, Chief Applications Engineer, Bearings: North America; and **Raymond King**, Director of Global Engine Parts. From King Engine Bearings: **Dr. Dmitri Kopeliovich**, R&D Manager at King’s manufacturing facility in Israel; and **Michael James**, with King’s export and high performance programs. From MAHLE Clevite Inc.: **John Havel**, former Director of Aftermarket Engineering (Retired); and **Bill McKnight**, Team Leader – Training.

**Brendan Baker**, senior editor and **Larry Carley**, technical editor of *Engine Builder* joined editor **Doug Kaufman** in moderating the discussion.

**Question 5: From your perspective on the installer side, what are the biggest installer-focused issues and concerns regarding bearing installations? In other words, what are installers doing wrong? Are there some generalities you can make? And what should they be made aware of?**

KING (Federal-Mogul Corp.): Well, maybe if I can speak to that.

KAUFMAN (*Engine Builder* magazine): Being a former installer, right?

KING: Being a former installer. But also remembering that these are also the decision makers of a lot of our product. I want to make sure I’m not making a broad statement about all installers. I think the number one thing we are seeing on the aftermarket side with the – let’s say – “more independent” engine builder and installer (I’m not necessarily talking about the larger remanufacturers, they function a little more like an OE), is the willingness to simply accept that dimensionally all of the parts they are installing are correct. It’s so important to confirm that the bearing clearances are within some range of a manufacturer’s recommendation.

Even on top of that, we are seeing a trend where more and more it seems to be economically better to buy a new aftermarket crankshaft than it is to have a crankshaft remachined or re-sized and surfaced by a machine shop. But you can see a pretty significant amount of variation. And assuming that side clearance, which has a huge affect on that oil pressure and oil film that will stay there, is correct, to assume that if the crankshaft says it’s standard size I can put a standard size bearing in the main or the rod, requires it to be the right clearance.

I don’t know we necessarily see as many issues of assembly problems. Parts are torqued to specification and parts are installed generally correct. But this almost lack of awareness that “I still have to be responsible or make sure that the collection of parts I’m putting together fall within some general clearance and guidelines that are fairly easy to

find,” is troubling. It’s not about being able to find the information, it’s applying that information. Do you have the right gauge and tools and all to make some preliminary checks? So maybe my reference would be pre-assembly. Is that pre-assembly procedure being followed correctly? We see a lot of problems with that.

CARLEY (*Engine Builder* magazine): Are you seeing any pattern problems? Like, for example, imported cranks were really popular and were flooding into this country. From what I’ve been told, dimensions are all over the place.

KING: Well, somebody was talking about edge wear or something earlier. I think there is a pretty big pattern problem we’re seeing in the aftermarket rebuilding and remanufacturing world where we are seeing issues with the crankshaft running straight, with the parallelism, all those kinds of things going on.

CARLEY: I’m talking more like about a lot of the performance and Stroker cranks coming in from overseas. In some cases they finish them there, some cases people here finish them. I just wondered how accurate they are on the tolerances if that is causing bearing failures because people are assuming, you know, “Gee, I bought this new crank. It’s ready to install. It should be right.”

MCKNIGHT (MAHLE Clevite): We sell more X bearings, which is an extra thousandths clearance, than we did five years ago because of those imported crankshafts which typically run bigger than your standard size by maybe four, five tenths and it’s just a fact of life. And to echo what Raymond said, it all works right back together.

As I mentioned, I answer our online tech questions, and we get a couple thousand a year. The last two years I have been aghast by the experience and knowledge level of the people working on engines. And I know it because of the questions they write me. You know, things like “I have this bearing, it’s out of an engine built in 1976. Here is the part number on it. Tell me what size it is so I can order some new ones.” I have to reply, “Well, sir, don’t you think the engine may have worn just a bit since 1976?”

But the economic conditions have forced a lot of people who never worked on engines before to work on them because they feel they can’t afford to hire somebody. And boy, they are running along in the dark, Raymond. The thought of taking the shaft to the shop and having them clean it, polish it, clean it, measure it and tell them what size bearing is totally foreign to them. And these are the same guys, Larry, who buy that shaft and slap standard bearings on it because it’s brand new and then they don’t have enough bearing clearance. So the scary part of our business is the education level of the end users of our product.

KING: To kind of build on that a little, I think that is a challenge we have dealt with for a while in some of maybe the lesser economic developed areas of the world too is that you have a lot of kind of open field repairs going on. And I know in some applications in some regions we are not necessarily applying what we feel is the latest state of the art. We are trying to apply maybe a little softer bearings, something a little more forgiving and all this because it’s not necessarily to get the like-new performance, but it’s to get a vehicle back in service. And if the vehicle back in service operates, you know, 40,000

kilometers or something, then it's done its job. That whole world is what we're faced with in the aftermarket.

That's a little bit of that unusual situation. I mean, as we talked about, when you supply parts to the OE now, they don't measure anything. When they put everything together, every supplier, every piece within there is conformant to just such tighter targets now as we have ever seen that each engine is more identical and that type.

But there is still this broad spectrum in the aftermarket repair world. There are people out there today, and whether it's a performance shop or it's a shop that's trying to win and retain business with very demanding fleets that are doing work that I think is on par with any OEM in the world. And there is a lot of stuff still being put together with, you know, pretty naive installers with pretty bad conditions that have a good result.

HAVEL (MAHLE Clevite): What you're saying is there is a very broad spectrum out there with which we have to contend with as parts suppliers.

MCKNIGHT: Probably far broader on the aftermarket than OE side.

HAVEL: Oh, absolutely.

KING: No question.

MCKNIGHT: Pretty narrow base there.

KOPELIOVICH (King Engine Bearings): I would like to add something about the quality of the crankshafts that the dimensions may be okay, but I saw crankshafts with some wavy pattern on the surface and I tested the crankshafts, essentially the pattern. The bearing doesn't work at all because of such pattern on the crankshaft it is the result of poor grinding machine that no hydrodynamic regime is realized. There is no force separating the crankshaft from the bearing. Vice versa there is a force pressing the crankshaft to the bearing. It is not feasible to fix.

HAVEL: You are talking about lobing and chatter?

KOPELIOVICH: Yes, exactly, exactly. And this is not visible. It is very, very small.

HAVEL: No. You can't even measure it.

KOPELIOVICH: Yes, you can't measure it. It is very thin. You can see it if you try to polish it with some pressure. You can see the waves. But it is not always visible.

CARLEY: Is that the fault of the crankshaft grinding machine?

KOPELIOVICH: Yes, it is vibration of the grinding machine.

HAVEL: If you have an out of balance grinding wheel or if you have a bad spindle bearing in your work support pits, you will generate lobing and chatter, which typically

always occur in odd numbers. So you will have 3, 5, 7, 9, 11 lobes. So you are always measuring the high spot opposite the low spot. If you try and mic the crank, you think it's grounded. But if you put it between precision centers and check it with – you can't really check it with a dial indicator, but you need some kind of an electronic gauge. That's where you start to pick up the lobing and the chatter.

KAUFMAN: As Raymond said, we can't point the finger at every member of the aftermarket, at every engine builder, but are these kinds of things something that aren't really their fault?

HAVEL: They might not even be aware of it.

I should mention something that we haven't talked about. We for years and years and years have had a page at the front of our bearing catalog where we give recommended tolerances for the component parts relating to a bearing. And we give you numbers for housing and shaft roundness, straightness, surface finish and size tolerance and so on. And we give them separate levels for standard and heavy duty and high performance. And I don't know how many people know that that page is even in that catalog. Because when somebody goes through a catalog, they are looking for an application.

KAUFMAN: They may start about halfway back.

HAVEL: There are about 20 pages in the front of that catalog that give you all kinds of good information that probably a lot of people either don't read or don't even know are there. But we have specifications there for things like lobing and chatter and what is tolerable for a standard engine or a heavy duty engine and so on. And we don't put them there just because we are trying to fill up empty space in the catalog. We are trying to convey information to people that's going to help them in the reconditioning of related parts.

And since we are on the subject now we might as well talk about it: we make bearings. Somebody else provides the crankshaft, the housing, the lubrication and the operating conditions. We make one piece. And we have to rely on other people to provide the support for the bearing, the shaft it runs on, the lubrication for it, the cleanliness of the lubrication and everything else.

STURK (Federal-Mogul Corp.): This is why the replacement bearing insert was developed. It's the sacrificial part – it's the fuse.

HAVEL: It's the fuse, exactly. You beat me to it. But that's what it is, it's the fuse in the system. If something is going to fail, you would rather replace the bearing and regrind the crank and resize a rod or a block than replace the rod or the crank or the block.

MCKNIGHT: Back to Raymond's comment here a couple of minutes ago too, and to point along with that, we have got some outstanding customers in the aftermarket in small shops, CERs and racing shops. And what I see as I visit with those outstanding guys, one thing comes up every time: they take nothing for granted. They don't rely on the manufacturer of the crankshaft's claim that it's the right size. They don't rely on the

manufacturer of the bearing's claim that they are the right size. Those good shops take nothing for granted. You know, they check everything. And I think that's a common point there. One you can point out to your readers if they want to do better? Take less for granted, and check and double check.

HAVEL: There is another issue too that I was thinking about pointing out and that is the fact that especially the imports, we have so many different engine model variations out there. And we frequently have people –

KING: With the wrong part with the wrong engine.

HAVEL: – with the wrong part.

MCKNIGHT: Change in the middle of the model year. That causes all sorts of issues.

KING: Some of that comes back to us in a way. I mean, they may order the wrong part, but a lot of times it becomes more and more important to have it cataloged properly for every detail. Because there is such a variety within the same engine they have minor changes.

HAVEL: How many of your parts men read all of the notes in the catalog? Sometimes they skip over it. Here is the application. Yes, okay, here is a part number for a rod bearing.

MCKNIGHT: I'm so excited about electronic cataloging, you know? Because now we can have an image of the part, we can have all of the specifications for the shaft there.

KING: You're bringing up a great point in that to some extent the paper catalog's outlived its usefulness. The ability to be able to deliver the technical information we need is going to maybe a little more of an electronic world. You were referencing a website or delivering information or images. That's also going to be as big a part of our future in satisfying our customers and making sure the part doesn't fail as the part itself.

MCKNIGHT: Well, we can change it. As soon as we find an issue or we find that there was a split in the model year, with ECataloging, you know, it's changed in a couple days.

HAVEL: You don't have to wait till you print the next catalog for the correction.

MCKNIGHT: Yes. In paper it's a couple years before you ever get that corrected.

**Next question: Speaking of changes, are there specific problem vehicles that you've had to develop fixes for? There are obviously things in the past that everyone can point to. How about newer situations; are those problem engines still around? Not necessarily just in the U.S. Are there problems in Europe or have they been much better? (see Bearings Q6 transcript)**