

# Q&A Railway webinar – 25 November 2020

## NEW FRONTIERS FOR RAILWAY MAINTENANCE

- How is the wireless sensor powered? Is it battery? What type? How long does it last?

*SKF Insight Rail is battery powered. The current released version has an expected battery life of 3 years under standard operating conditions. We have several development initiatives at advanced stages which will extend the expected life of the sensors considerably.*

- How long will system last in operation?

*SKF Insight Rail has expected battery life of 3 years under standard operating conditions. We have several development initiatives at advanced stages which will extend the expected life of the sensors considerably.*

*Our SKF IMx-Rail system – does not have the same battery life constraints. Although launched in 2019 – the IMx-Rail system is one member of the long-established IMx family of condition monitoring systems. We have examples of IMx systems in use in industrial applications for up to 20 years. We have earlier versions of the IMx family on trains for ten years already (and still going strong).*

- What about maintenance? What is required?

*With our Insight Rail system – maintenance is not expected to be required during the life of the sensor. Firmware updates are issued “over the air” – therefore system improvements can be rolled out non-intrusively.*

*With the IMx system – routine surveillance of the instrumentation is recommended (synchronised with existing maintenance schedule) to assure the long-term integrity of the installation.*

- Can you please estimate ROI?

*Condition monitoring systems can be used for many different reasons in railway including technical risk mitigation, troubleshooting, condition-based maintenance, maintenance interval extension etc. Return on investment needs to be assessed on a case by case basis depending on what value the system is bringing.*

- How reliable are your condition monitoring systems in the field?

*As part of the design process we performed a FIDES reliability calculation for the electronics aspect of the system using a vibration and thermal cycling profile we defined. This gave us an estimated MTTF based on the number and type of electronic components used. Generally the lower the number of components and higher spec the better the value returned. The MTTF value was >50 years (significantly greater than the projected survival of the battery). When we first launched the product we identified a number of unexpected application-related failure modes (like electromagnetic interference from third-rail applications). We have engineering these initial issues out. After 3 years in operation and thousands of sensors in service globally, we now have a stable and reliable solution.*

- How long does IMX-rail take to install?

*The IMx-Rail system typically takes 3 hours to install for experienced fitters. Considering that this device is a 16-channel device the installation time considered per sensor is directly comparable with similar systems on the market.*

- Is condition based maintenance really workable in railway?

*Railway is conservative – therefore although we may believe that condition monitoring systems will revolutionise maintenance practices – we cannot expect things to change overnight. What I have seen with customers is typically a hybrid approach to maintenance – where some elements of condition-based maintenance are combined with traditional approaches. The classic example is where the decision of where to fit a condition monitoring system is based on reports of noise from technical riders on trains (people who listen for indications of damage in service). Hybrid approaches allows customers to familiarise themselves with the capabilities of the technologies. This experience and knowledge is crucial, if customers want a successful transition to full condition-based maintenance.*

- Do the products only work it with SKF bearings? What if no SKF bearings are used?

*In terms of damage detection and diagnosis, our condition monitoring systems can work with any brand of roller bearing. The vibration signatures we monitor for are a function of the bearing geometry and not the bearing manufacturer.*

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- How widely accepted is condition monitoring systems in railway?

*Railway is perceived as one of the last true frontiers for condition monitoring. Temperature monitoring and noise monitoring are rudimentary techniques that are well-established and accepted in railway. Onboard vibration monitoring is still perceived as new technology for railway. Acceptance of this technology however has started to accelerate in the past ten years and we are seeing this also in the growth in demand for our condition monitoring solutions. The “internet of things” movement has also raised the interest in sensorisation and the benefits associated with operational data. In terms of our own system we have thousands of sensors on rolling stock operating in more than 26 countries globally.*

- What is beyond this customer you mentioned?

*We have thousands of sensors on rolling stock, operating in more than 26 countries globally. Public reference cases include GTR, KLIA and TMB.*

[\*Govia\*](#)

[\*Malaysian rail\*](#)

- What is the return on investment like for such a system?

*Condition monitoring systems can be used for many different reasons in railway including technical risk mitigation, troubleshooting, condition-based maintenance, maintenance interval extension etc. Return on investment needs to be assessed on a case by case basis depending on what value the system is bringing.*

- Does every machine have a unique “heartbeat”? Or do identical machines have identical “heartbeats”?

*The signatures of damage that we monitor for in vibration are related to the mechanical geometry of the rotating components we are monitoring. Therefore detection of damage is common on two identical machines. Where the complication arises is that trains are dynamic and run in different environments which can affect the signals we monitor – for the same reason that our own “heartbeats” change if run or walk or are hot or cold. The diagnosis of the severity of the damage requires experience with condition monitoring of rolling stock and the specifics of that application.*

- What is the reliability of the vibration sensors?

*As part of the design process we performed a FIDES reliability calculation for the electronics aspect of the system using a vibration and thermal cycling profile we defined. This gave us an estimated MTTF based on the number and type of electronic components used. Generally the lower the number of components and higher spec the better the value returned. The MTTF value was >50 years (significantly greater than the projected survival of the battery).*

- Does the condition monitoring maintenance make sense if the wheel life cannot be extended?

*This really depends. Condition monitoring systems should only be used where there is a clear value case and this can vary from one application to the next. Maintenance interval extension is one of the value propositions for condition monitoring and if the wheel life cannot be extended then I don't believe there is merit in pursuing wheelset bearing life extension. However condition monitoring can also help prevent premature failures (yes they do happen unfortunately), can serve as technical risk mitigation and can assist with optimization of the supply chain. We like to work with you first to understand where SKF can help. We have many tools in our toolbox – condition monitoring is just one of many.*

- Did you say 2 minutes for fitting?

*Less than two minutes for fitting AND commissioning the SKF Insight system. The speed of installation is a key factor when considering condition monitoring system – as time in the depot is always at a premium. I've seen entire trainsets instrumented in less than an hour.*

- How have you calculated the 15% LCC savings on bogie maintenance? Are the savings achievable if the bearing's lifecycle is shorter than the wheel lifecycle?

*Yes we have models available for calculating the benefit of maintenance interval extensions. Maintenance interval extension is one of the value propositions for condition monitoring and if the wheel life cannot be extended then I don't believe there is merit in pursuing wheelset bearing life extension. However condition monitoring can also help prevent premature failures (yes they do happen unfortunately), can serve as technical risk mitigation and can assist with optimization of the supply chain. We like to work with customers first to understand where SKF can help. We have many tools in our toolbox – condition monitoring is just one of many.*

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- The bearing sensor is standing out and can easily get hit by a rock or something. How good is it at withstanding hits?

*The sensors were deliberately designed with impact resistant long-strand nylon on their enclosures. Furthermore their mounting position at the top of the axlebox provides some shielding from ballast impact. As with all bogie level equipment – there remains a small risk of damage due to ballast impact. After three years in operation and thousands of sensors in the field, I can count all the sensors damaged by ballast impact on one hand (i.e. less than 5).*

- Hello which train OEM already adopted this IMX-Rail or Insight Rail in industry?

*We have several success cases with Train OEMs – these successes have been entirely with the IMx-Rail system which is well suited for the train manufacture. Unfortunately as all projects are covered under NDA, I'm not at liberty to name the different OEMs.*

- What is the price? Sensor or data as a service?

*The next webinar with Maurizio Giovannelli will address this topic. Click the link below to read more about it and register for the webinar.*

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