

VIBROL

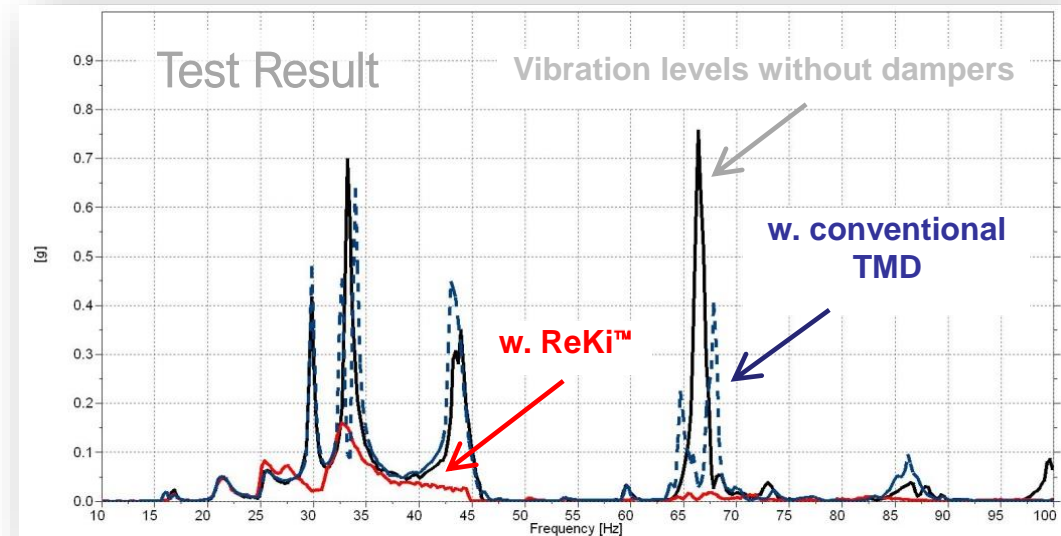
VIBRATION IN CONTROL

ReKi™ • Broadband Mass Damper
Simple • Affordable • Reliable

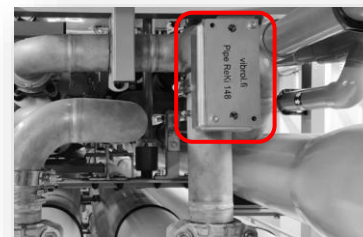
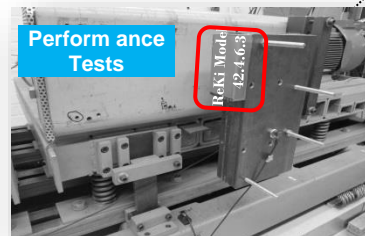
Resonance Killer - ReKi™

Broadband mass damper with benefits

- ReKi™ is a novel broadband passive mass damper
 - Works without input energy or control
 - Low cost solution
 - Reduces disturbing vibrations in broad frequency band
 - All-metal structure
 - Works in 3 directions
- ReKi™ is used in machines, engines, pipes and structures
 - Used in applications from 0.1 kg to 100 ton
 - Frequencies in different applications from 4 to 1000 Hz
 - References available including nuclear plants
 - Marine - Powerplants - Process industry - Offshore - Military . . .



Customer's structure



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Resonance Killer - ReKi™

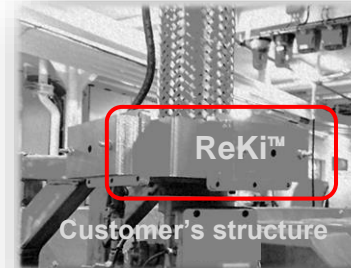
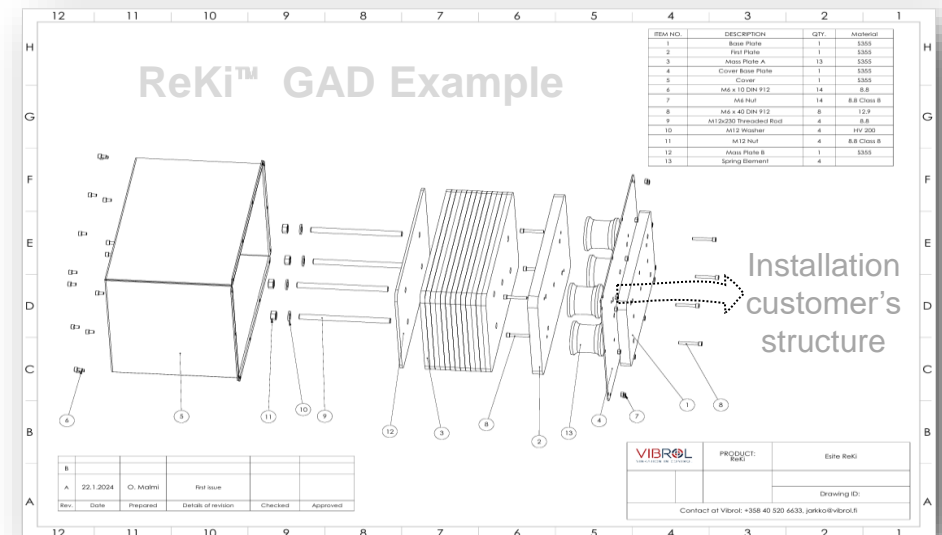
Broadband mass damper with benefits

■ Advantages of ReKi™ broadband mass damper

- Installation simple and fast – only standard tools required
 - No changes to structure
 - Local personnel can do the installation
 - Installation can be done during operation of the target
- Results are available immediately after installation
- No risks – ReKi™ success rate has been 100% – since 2013
- Emergency service if needed – fast delivery
 - Normally 4 weeks from design to delivery

■ Design input for ReKi™ broadband mass damper

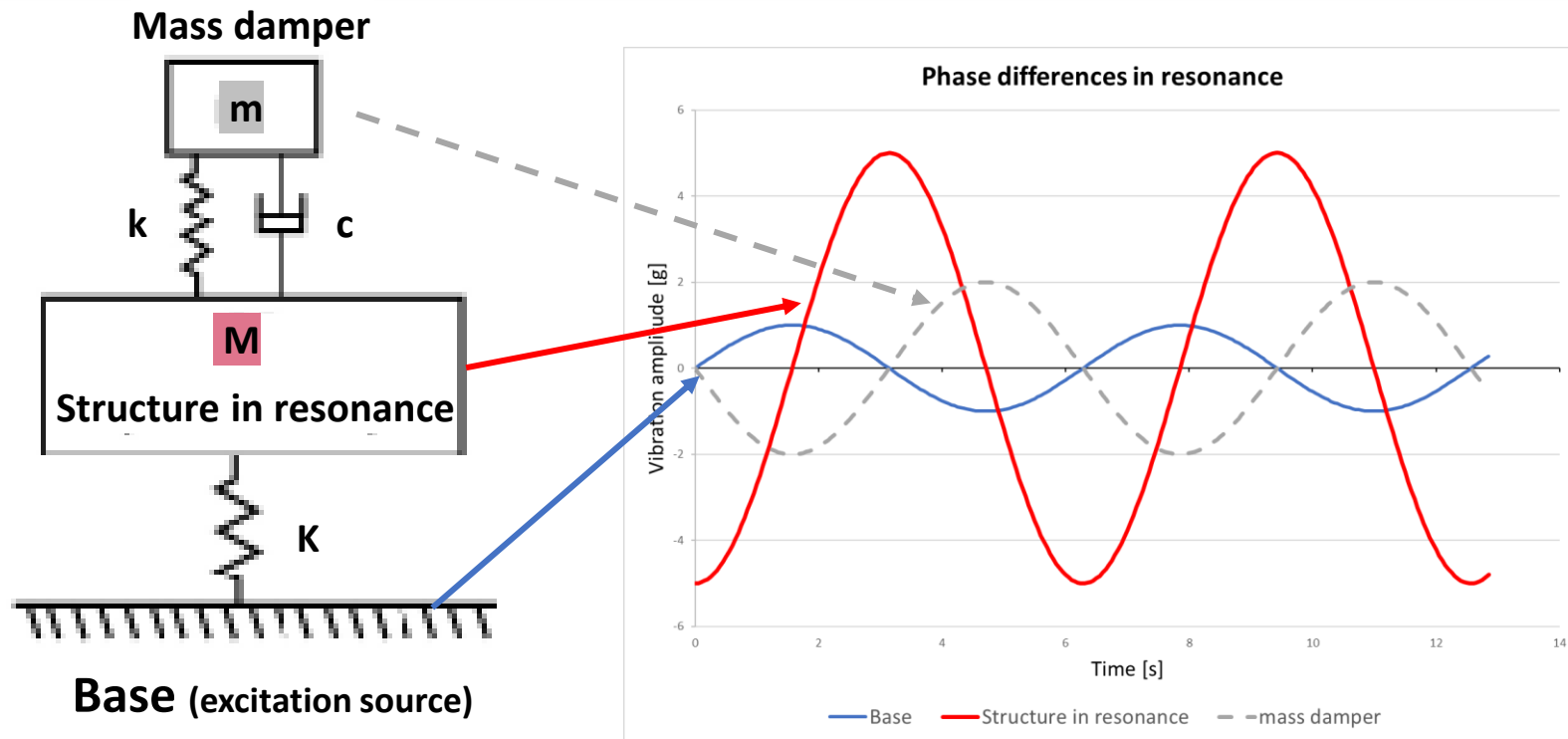
- Confirmation of resonance phenomenon (FEA or measurements)
- Weight estimation of the target mode
- Vibration frequency and amplitude – f f t spectra
- Inform possible installation location



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Resonance Killer - ReKi™

Mass damper – Operating principle



Moving mass / modal mass relation ~ 1-10 %

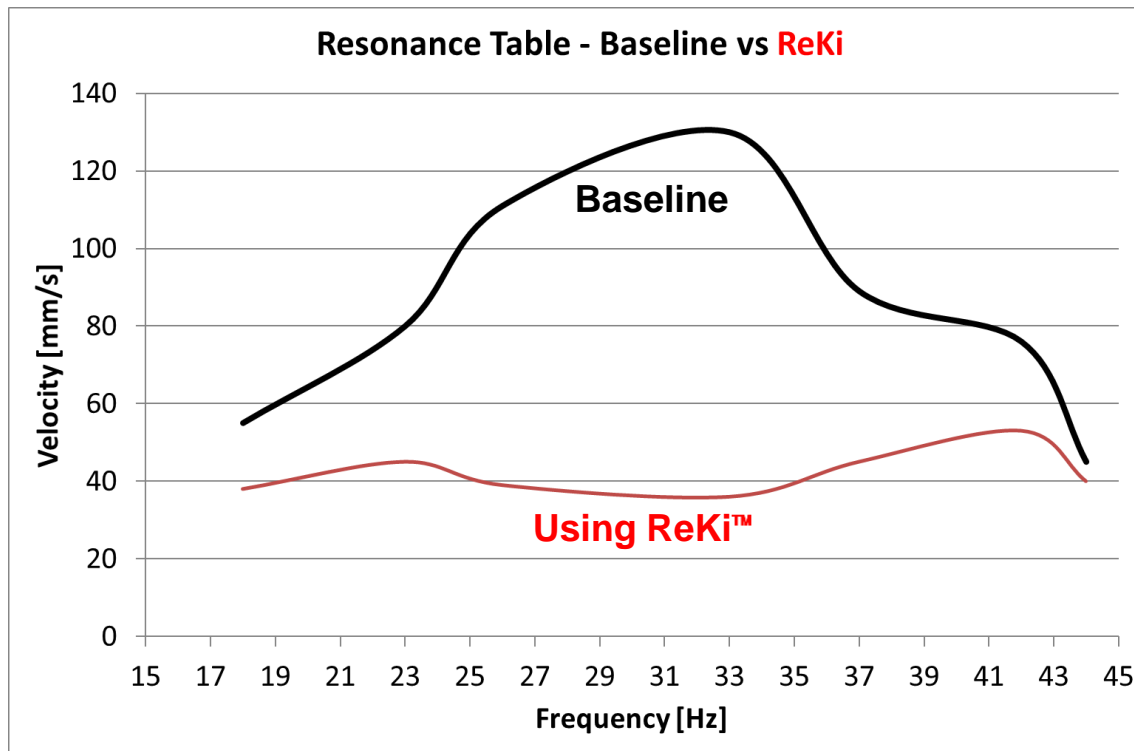
Vibration phase difference at resonance = 90°

ReKi™ damper is broadband – dynamic properties are not constant

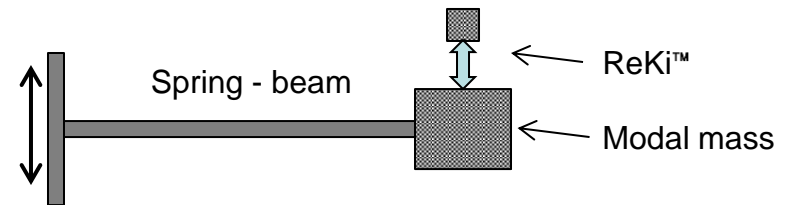
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Resonance Killer - ReKi™

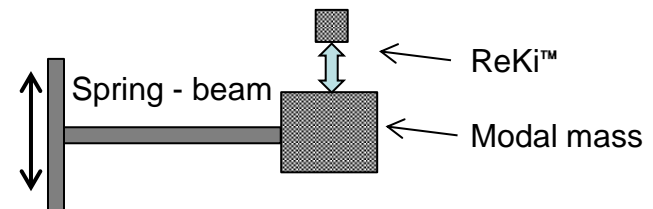
Broadband mass damper with benefits



Test Set-up



The beam length was varied in order to change the resonance frequency



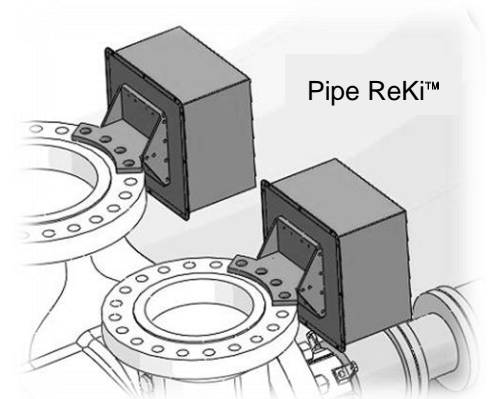
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Broadband mass damper with benefits

ReKi™ Offering

1. Troubleshooting
 - Installation in situ
2. Design phase tool
 - Solution for resonance problem during design phase
 - Mathematical models of ReKi™ available
3. **Optimization of your application**
 - Take full advantage of ReKi's potential
 - Natural frequencies are not limitations of design anymore
 - ReKi enables for example lighter structures
 - Save money with ReKi™



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Broadband mass damper with benefits

ReKi™ Examples



ReKi™ Moving mass: 300 kg
Dampens modal mass: 5 – 10 ton
Total mass of application: 100 ton



ReKi™ Moving mass: 60 kg
Dampens modal mass: 1 – 2 ton
Total mass of application: 50 ton



ReKi™ Moving mass: 2-10 kg
Dampens modal mass: 60 – 200 kg
Total mass of application: 1 ton

ReKi™ can be varied from 0.1 kg to more than 1 000 kg

Needed ReKi™ mass ~ 5% of modal mass

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Broadband mass damper with benefits

Case example: ReKi™ in engine component

Overall vibration RMS level

Original	With ReKi
134 mm/s	49 mm/s



Modal mass: 2000 kg
ReKi's moving mass: 100 kg

Customer's Challenge:

Vibration level of the engine component was over the limit.

Our solution:

Resonance Killer was installed to the engine component.

Benefit:

Customer can run the engines without limitations.
In use as long term solution since 2014.

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Broadband mass damper with benefits

Case example: ReKi™ in District Heating Pump – Clamped Solution

Overall vibration RMS level

Original	With ReKi
12 mm/s	3.5 mm/s



Modal mass: 1500+ kg
ReKi's moving mass: 2 x 37.5 kg

Customer's Challenge:

Vibration level of the pump bearing was over the limit.

Our solution:

Resonance Killer was clamped to pump structure.

Benefit:

Customer can run the pump without limitations.

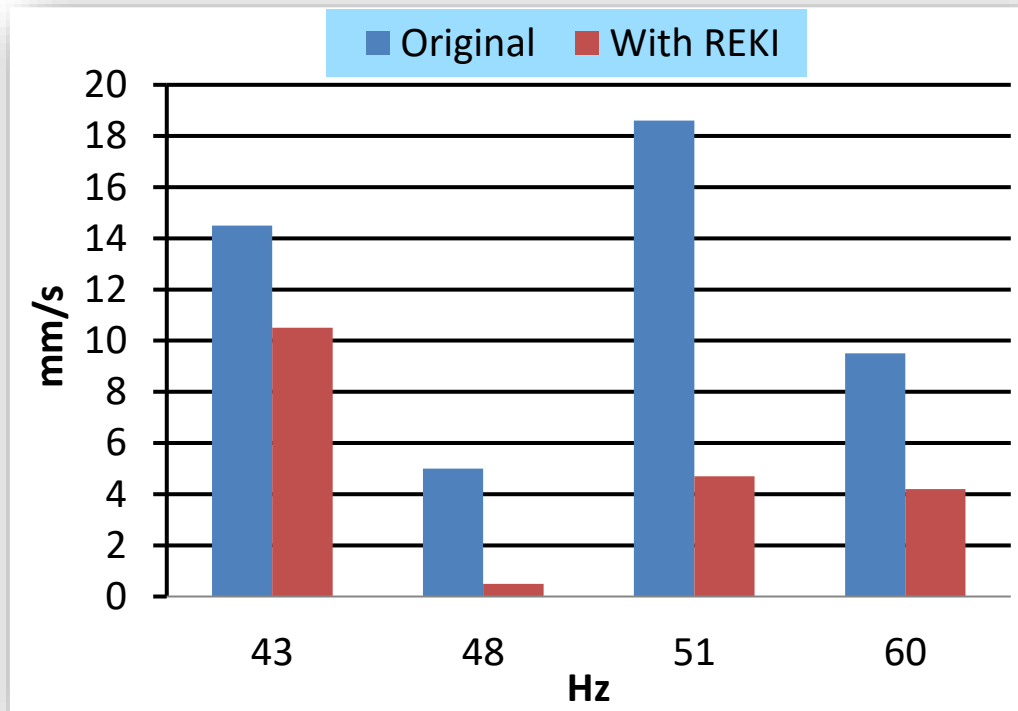
In use as long term solution.

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Resonance Killer - ReKi™

Broadband mass damper with benefits

Case example: ReKi™ in power plant component



Modal mass: 3000 kg
ReKi's moving mass: 150 kg

Customer's Challenge:

Vibration level of the generator bearing was over the limit.

Our solution:

Resonance Killer was installed to the generator bearing.

Benefit:

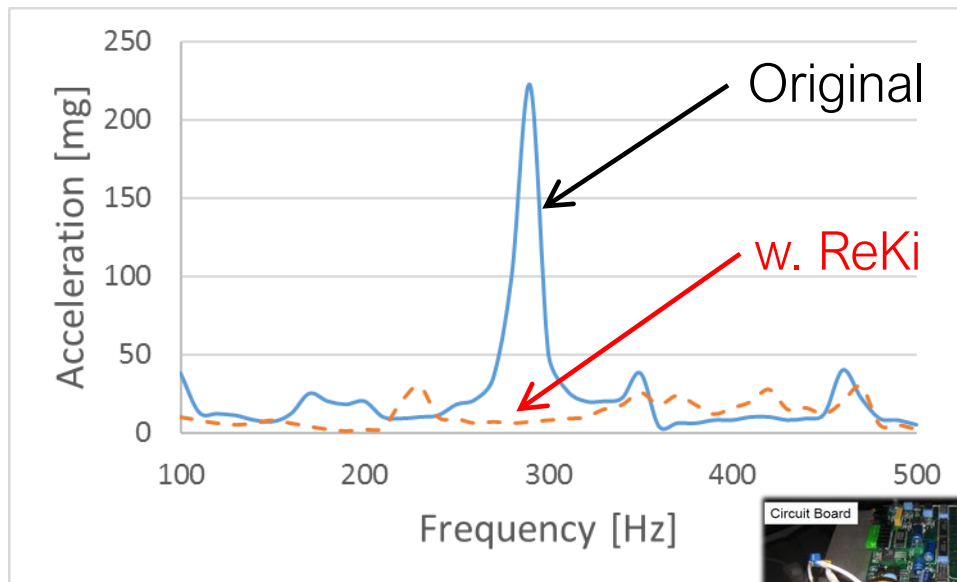
Customer can run the generator without limitations.
In use as long term solution since 2013.

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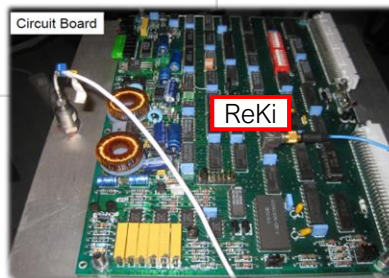
Resonance Killer - ReKi™

Broadband mass damper with benefits

ReKi™ in circuit board - higher frequency band –
ReKi™ can be used for noise control



Modal mass: < 0.5 kg
ReKi's moving mass: < 0.1 kg



Customer's Challenge:

Vibration level of the circuit board component was over the limit.

Our solution:

Resonance Killer was installed to the middle of circuit board.

Benefit:

Vibration level was decreased to acceptable level.

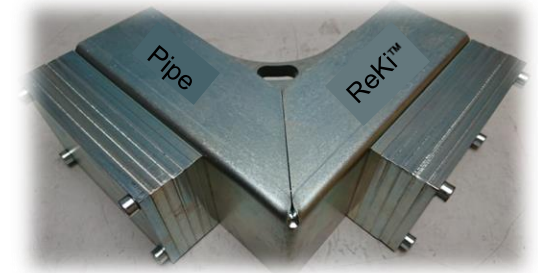
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Resonance Killer - ReKi™

Broadband mass damper with benefits

ReKi™ reduces vibration levels at resonance by 50 to 90 %

- Proven technology
 - Performance tests conducted
 - Long term tests conducted – First ReKi™ delivered 2013
 - Works in harsh environments – all-metal structure
 - Used in nuclear plants
- Ready to install for new constructions and retrofits
 - Applications from arctic to marine environments
- Patented in Europe, USA and Asia



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Interested?

Contacts

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