

momentum

Expert services and solutions within vibration and sound.

simple solutions to complex problems



See what you hear

Momentum Technologies youtube kanal: <https://www.youtube.com/channel/UC7mk92UTDo1teMWKJa8efMQ>

Noisevision: <https://www.youtube.com/watch?v=PnfMwXupQhc&t=5s>

See what you hear: <https://www.youtube.com/watch?v=dBphShCwwOQ>

Vibravision: <https://www.youtube.com/watch?v=re-jSxv1P38&t=16s>

Håvard Johnsen

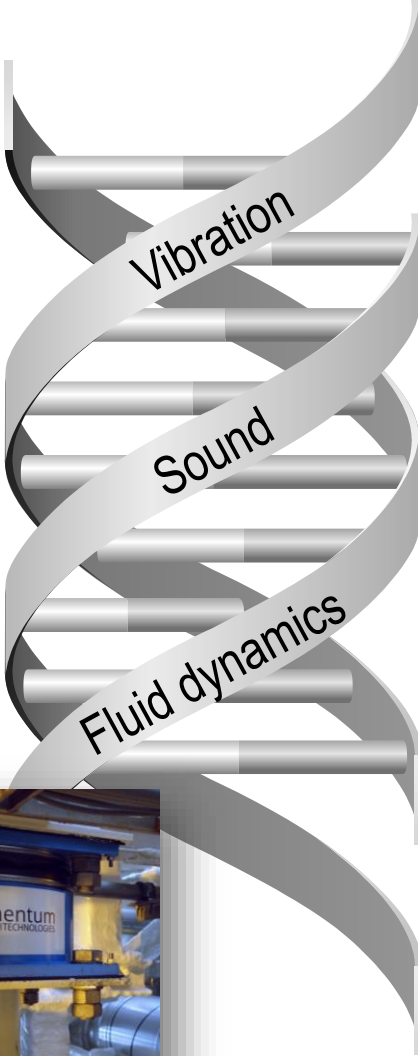
havard.johnsen@momentumtechnologies.com



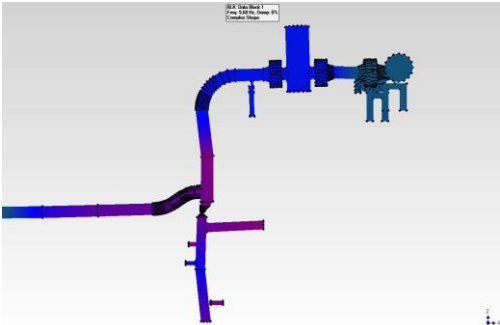
Noisevision



Measurement services



Vibration / noise assessment

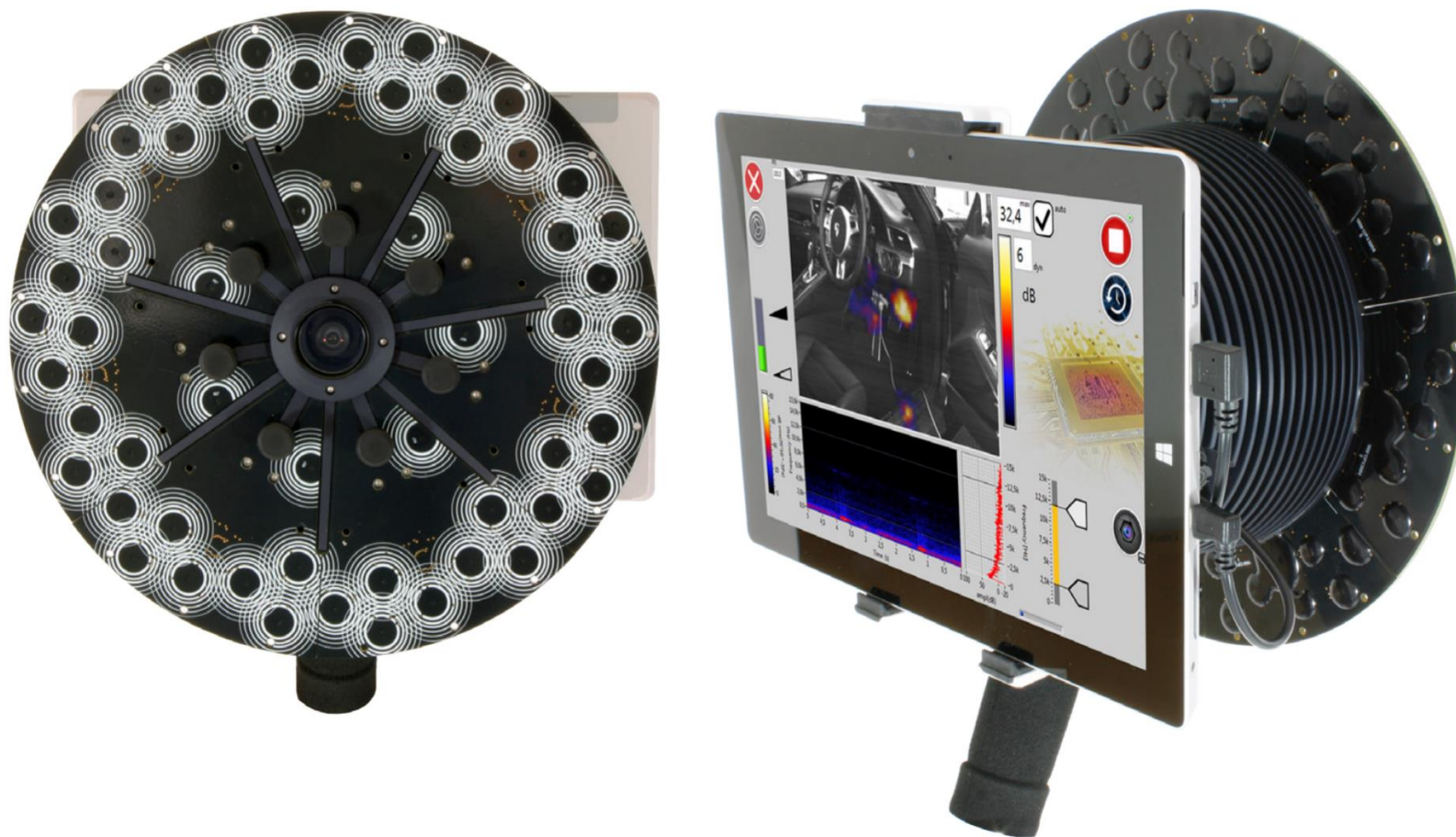


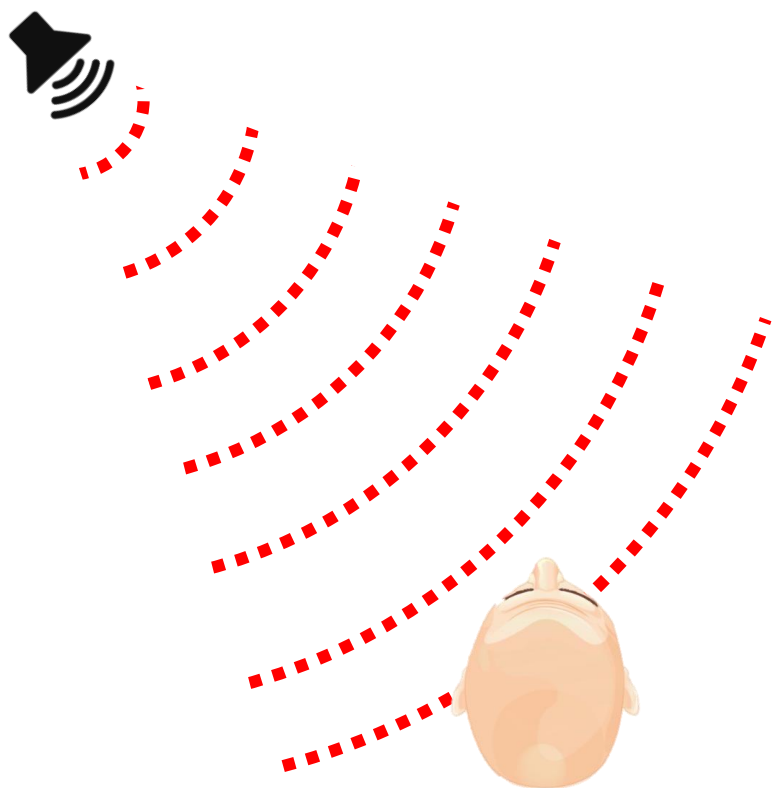
Solutions





Hvordan fungerer et lydamera?

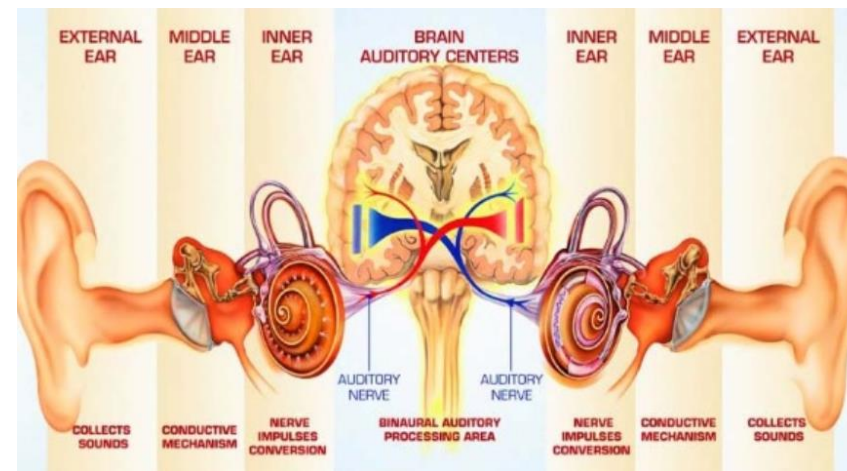
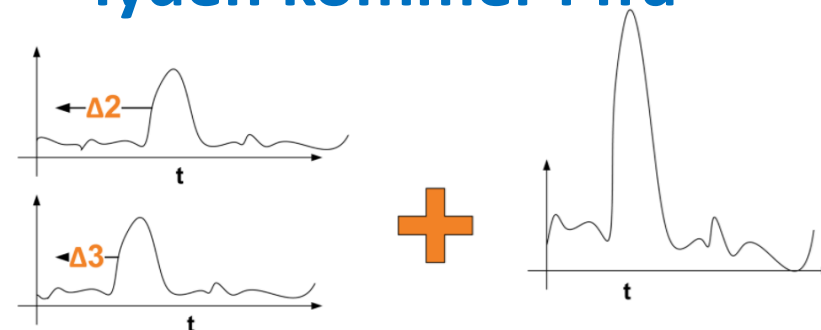


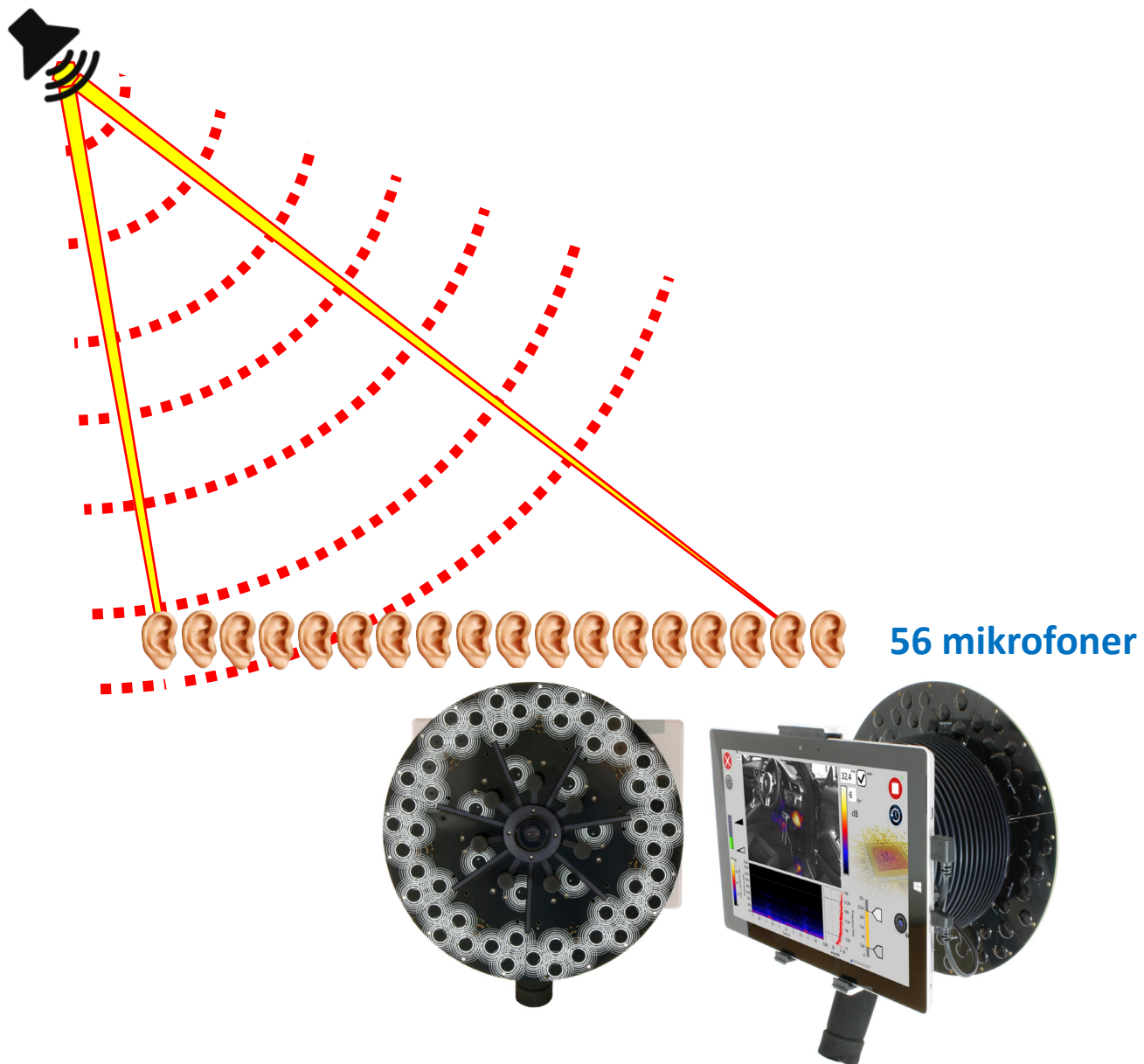


Lyden som øret lengst fra kilden oppfatter er:
- litt tidsforsinket
og
- litt svakere

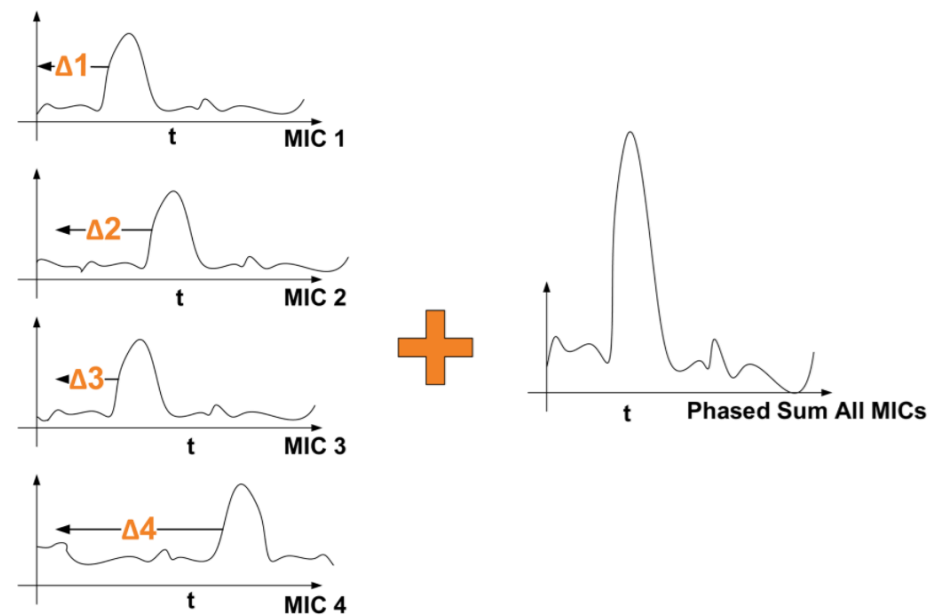
Lyden kommer først og sterkest til øret som er nærmest kilden

Ut fra disse forskjellene, vurderer hjernen hvor lyden kommer i fra



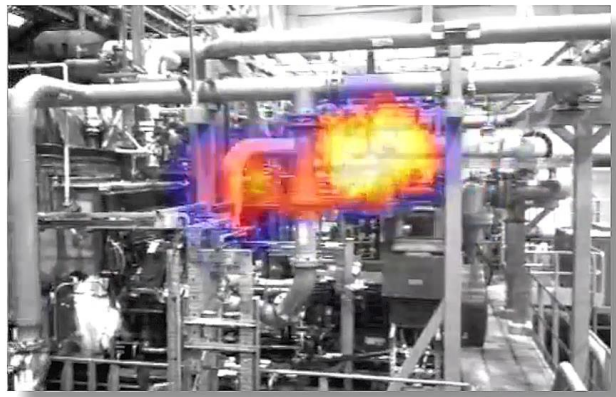
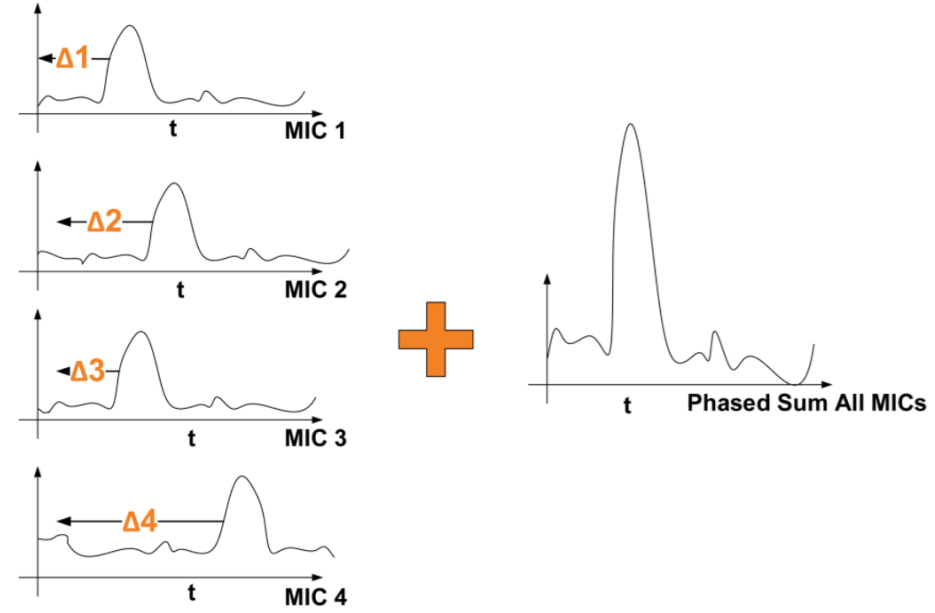
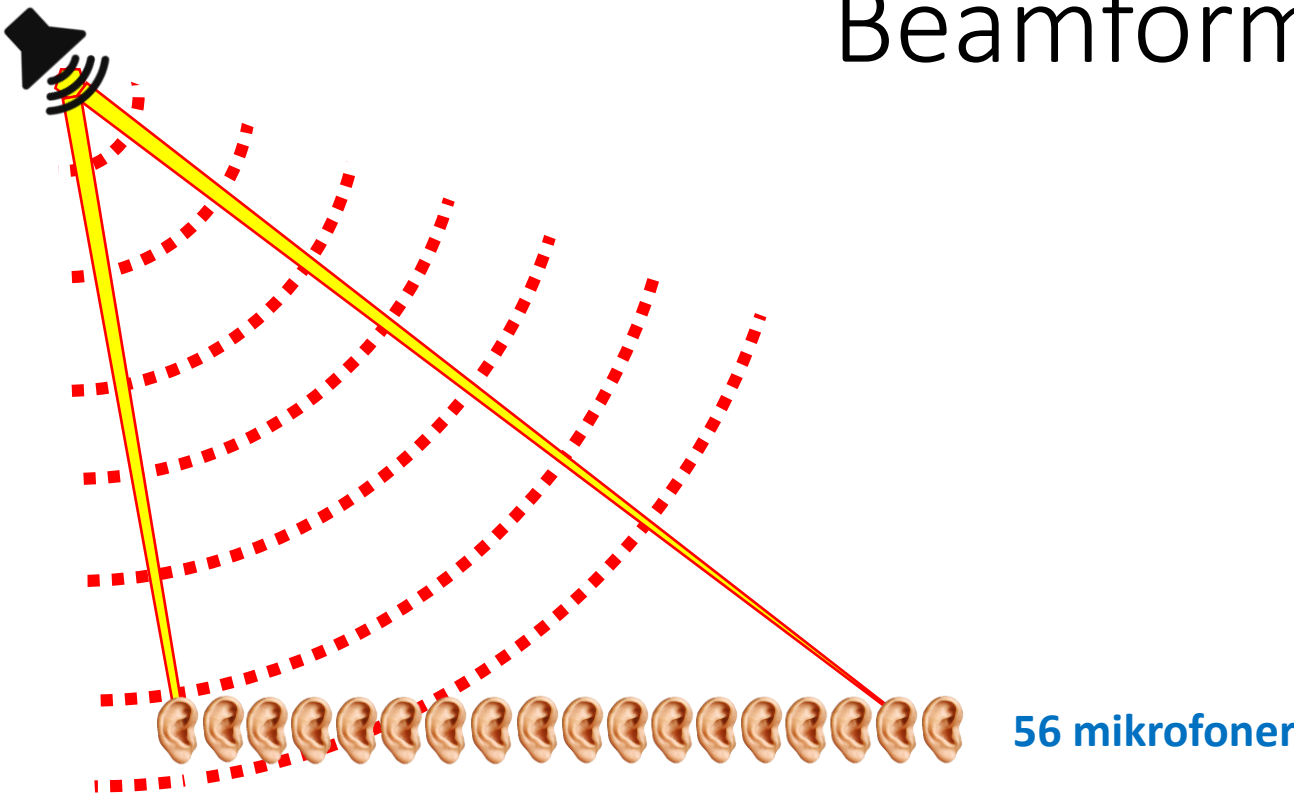


Et lydkamera bruker også disse forskjellene til å beregne hvor lyden kommer i fra, men mer nøyaktig enn hva hjernen klarer

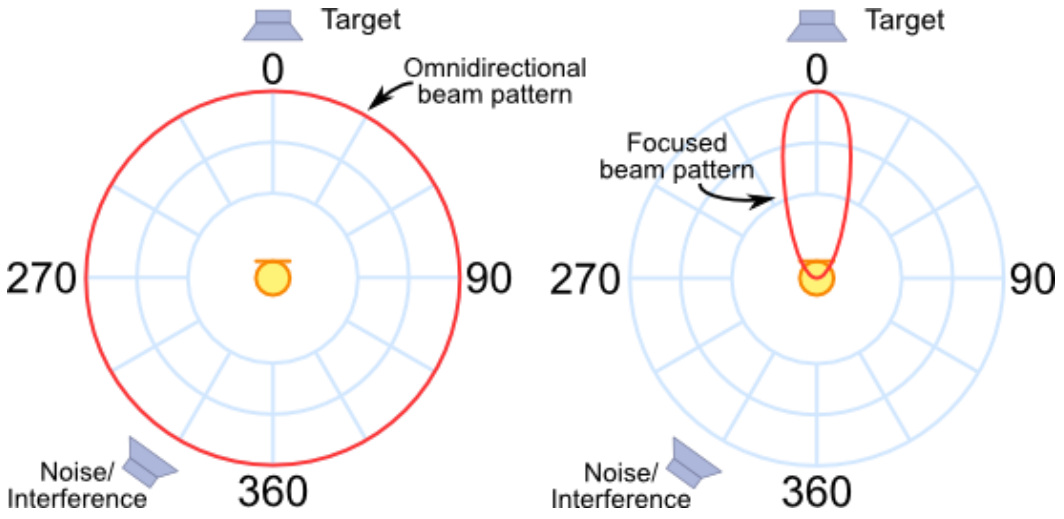


Beamforming

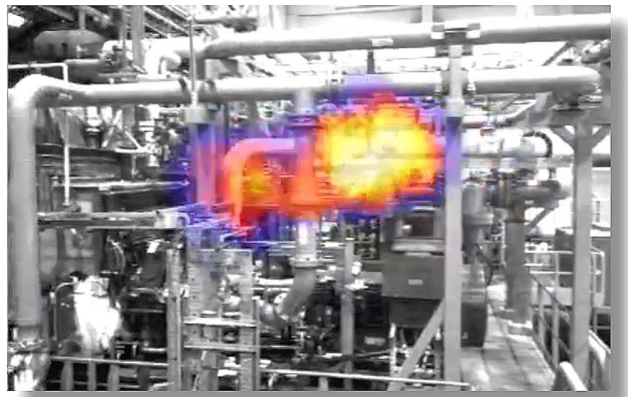
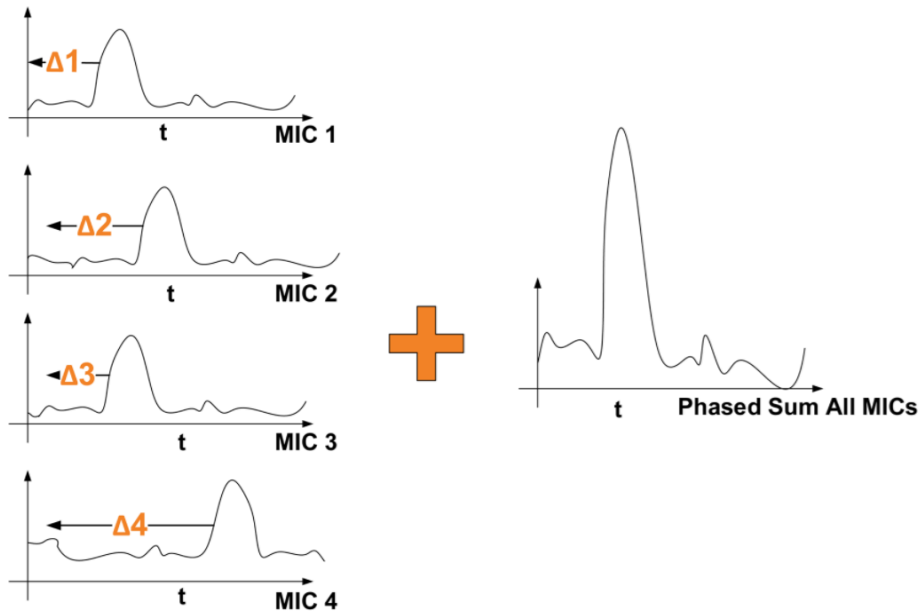
Resultatet kombineres med visuell fremstilling, film.



Beamforming



Resultatet kombineres med visuell fremstilling, film.



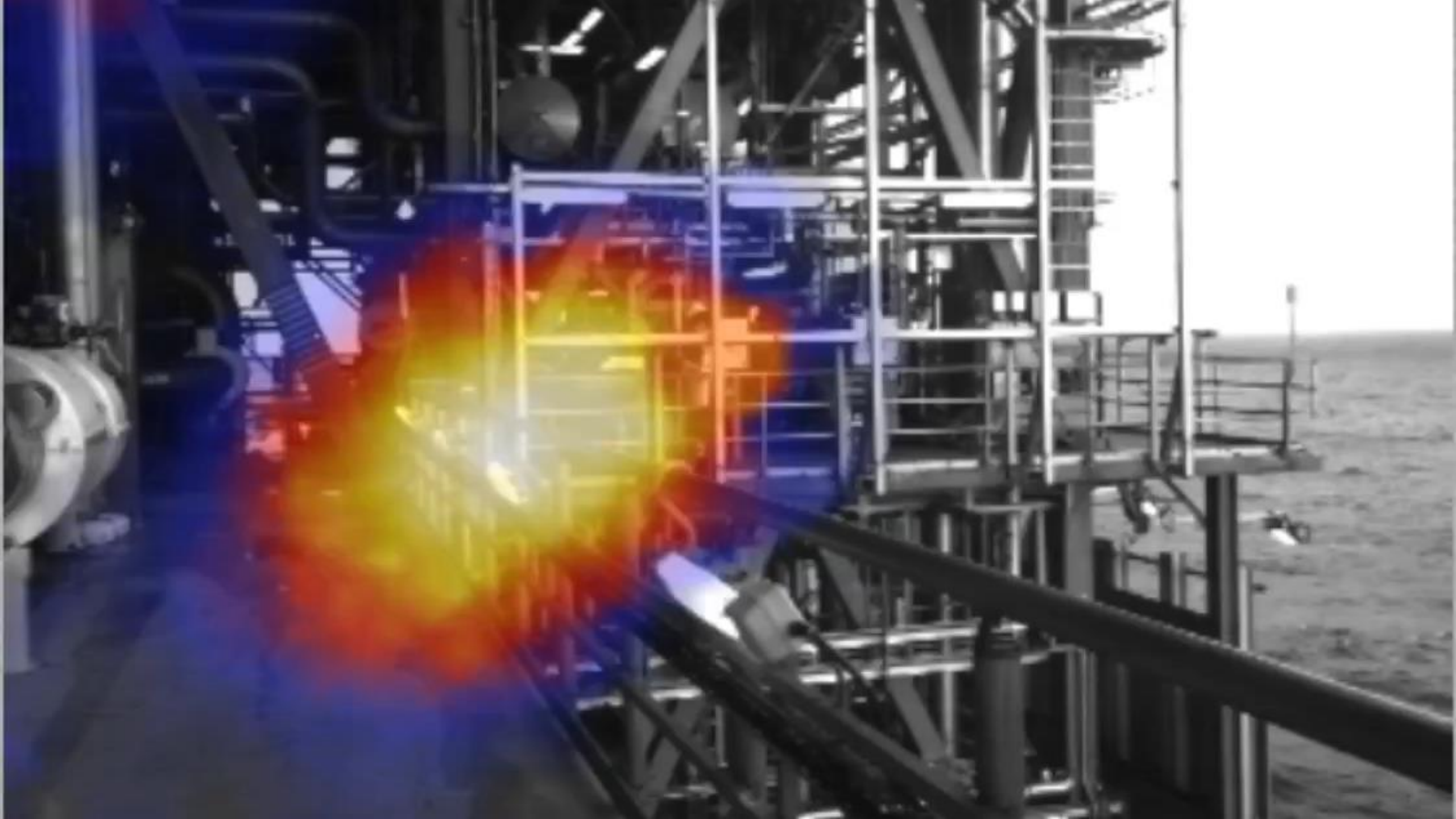
Hvor er synderen



CAUTION
DOUBLE HEARING
PROTECTION
REQUIRED
IN THIS AREA



Rx-Safety.com







En sjette sans?

*Menneskets primærsans er synet
-vi tror det ikke før vi ser det
-tenk om vi kunne se lyd!*

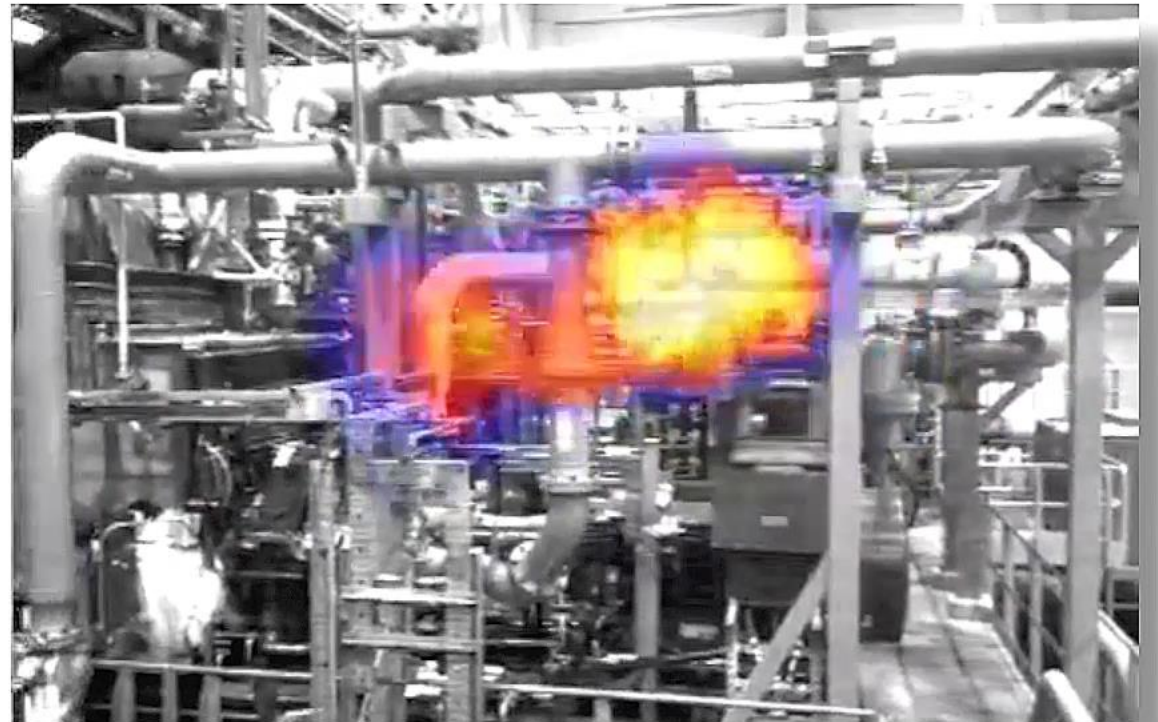


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See what you hear

<https://www.youtube.com/watch?v=dBphShCwwOQ>

Hvorfor er det nyttig å se lyd?





Visualisering

Gjøre støy mer forståelig
for alle som omgås den.

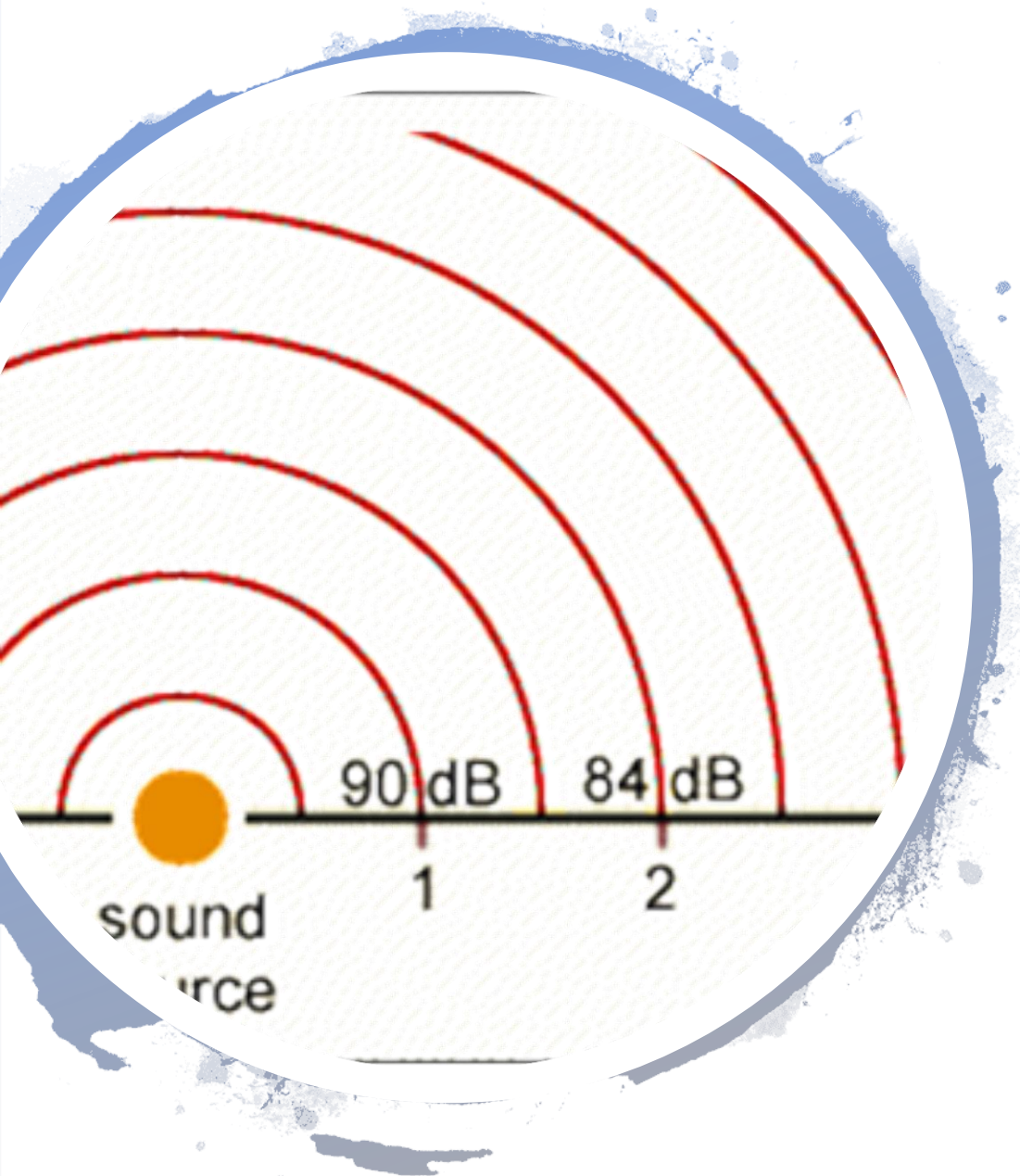
- Bevisstgjøring!



Kommunisere

Gjøre støy mer forståelig
for de som jobber for å
bli kvitt den

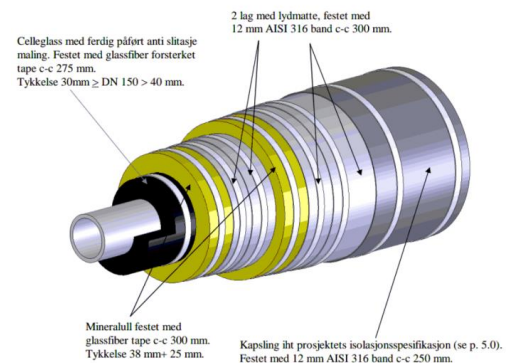
- Beslutningsgrunnlag!



Måle

For å finne riktige medisin, må man kunne stille riktig diagnose

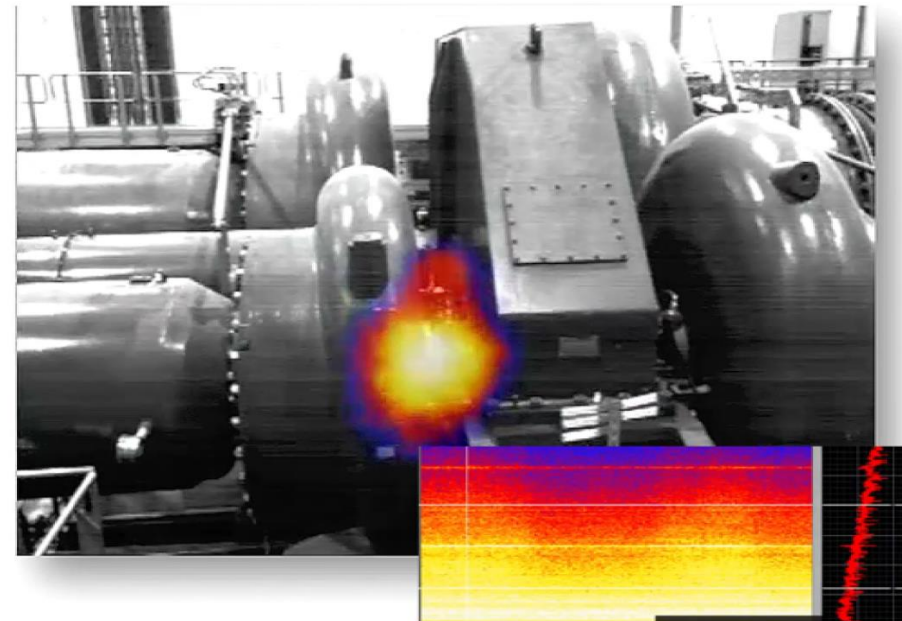
KI.8 Akustisk isolasjon klasse C



Feilsøking

A noise camera is also a tool for...

finding cause of failure



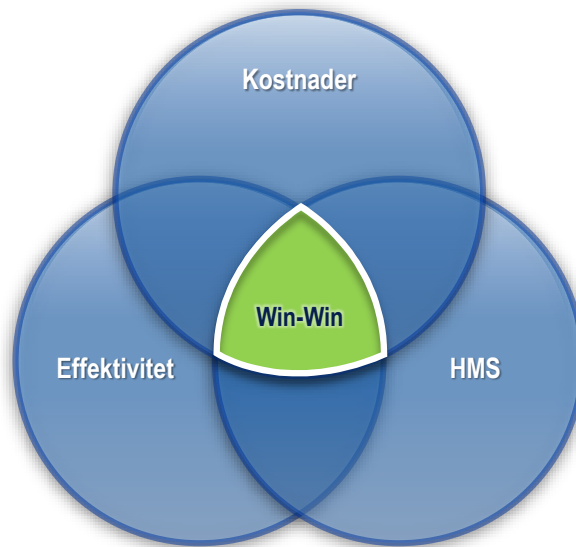
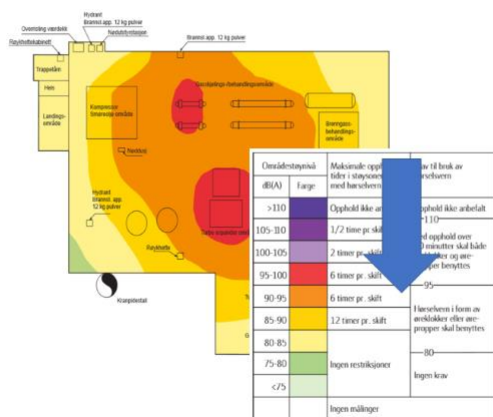
Noisevision – «it's a win-win-win»



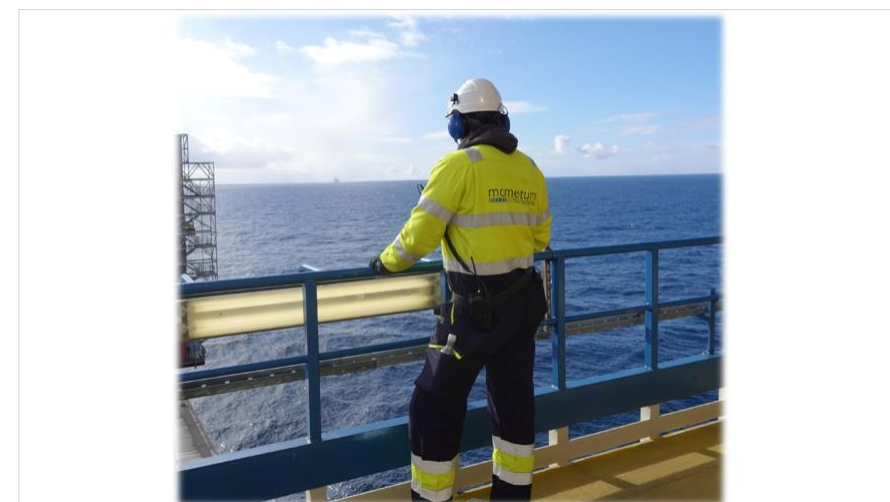
Kosteffektive tiltak

Økt effektivitet

Økt arbeidstid = Økt effektivitet



Godt arbeidsmiljø





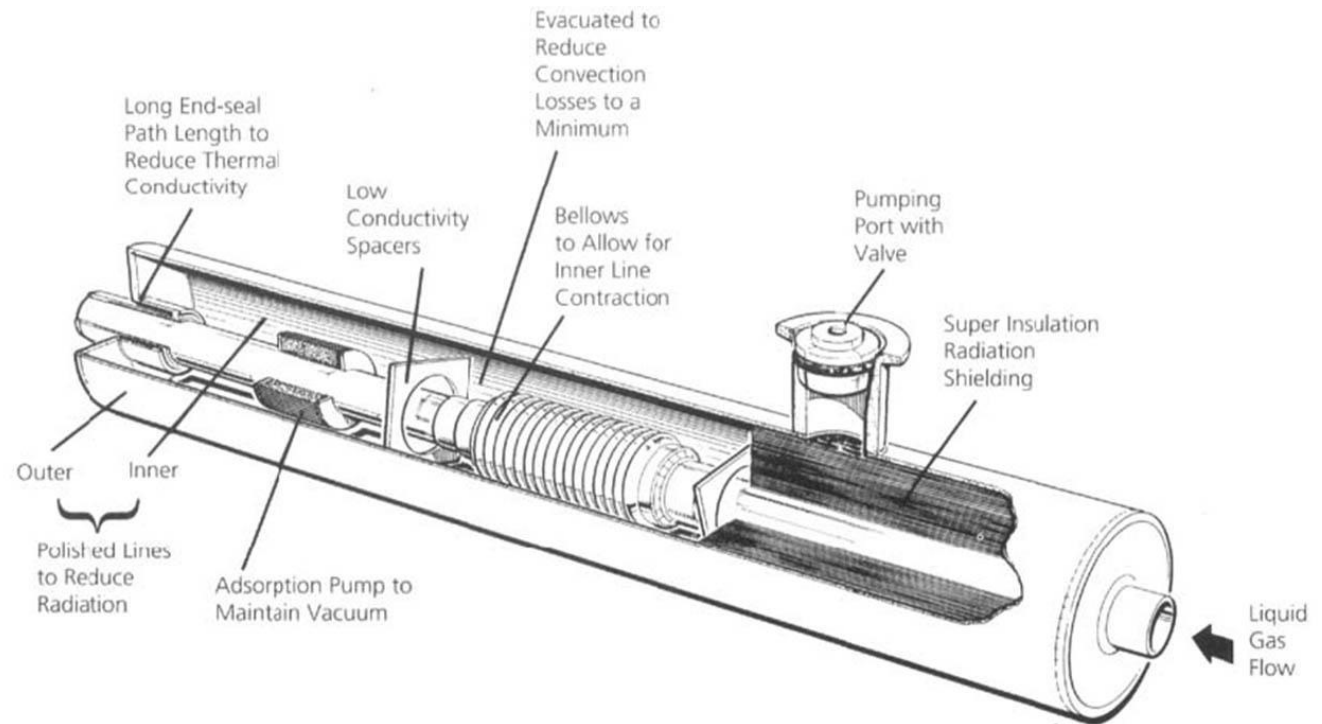
NOISEVISION

See what you hear

<https://www.youtube.com/watch?v=PnfMwXupQhc&t=5s>

Ny superisolasjon?

Det finnes mer effektive måte å isolere lyd på enn de som brukes i dag, men trenger vi det?

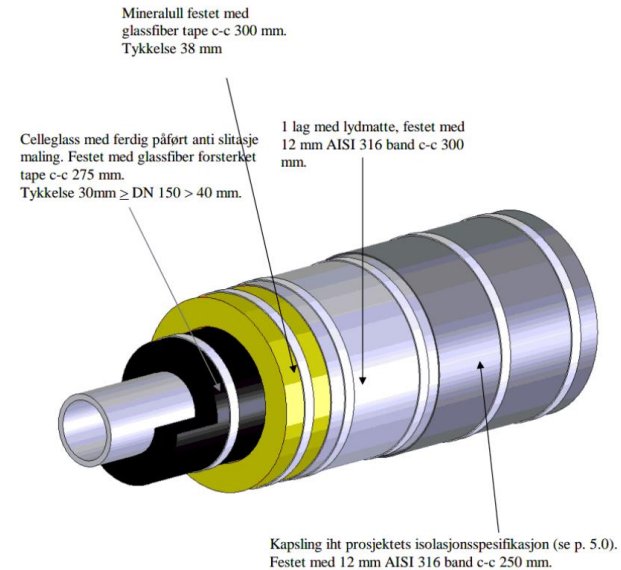


Isolasjonsklasser

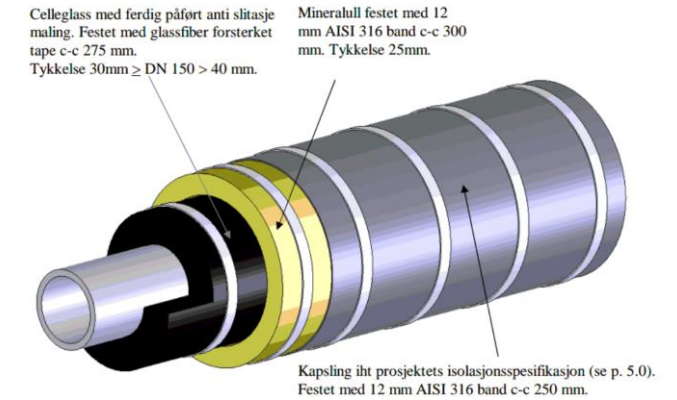
La oss heller konsentrere oss om den isolasjonen som finnes, og legg vekt på å få det installert korrekt

1. Bruk riktig absorpsjonsmateriale, eventuelt riktig kombinasjon av absorpsjonsmaterialer
2. Få det lufttett!

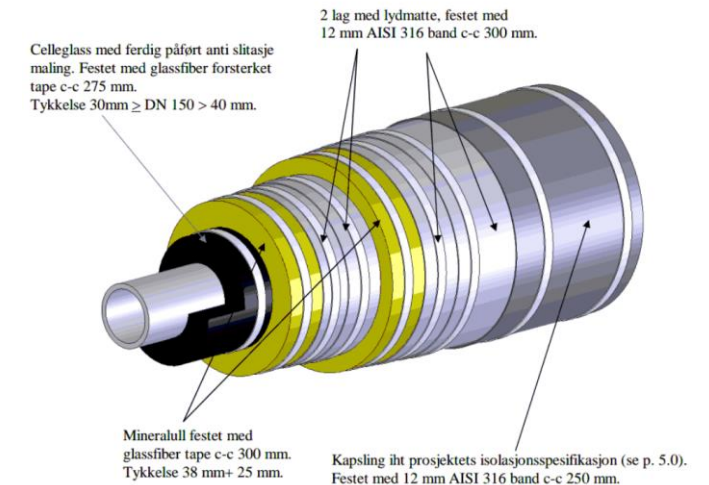
KI.7 Akustisk isolasjon klasse B



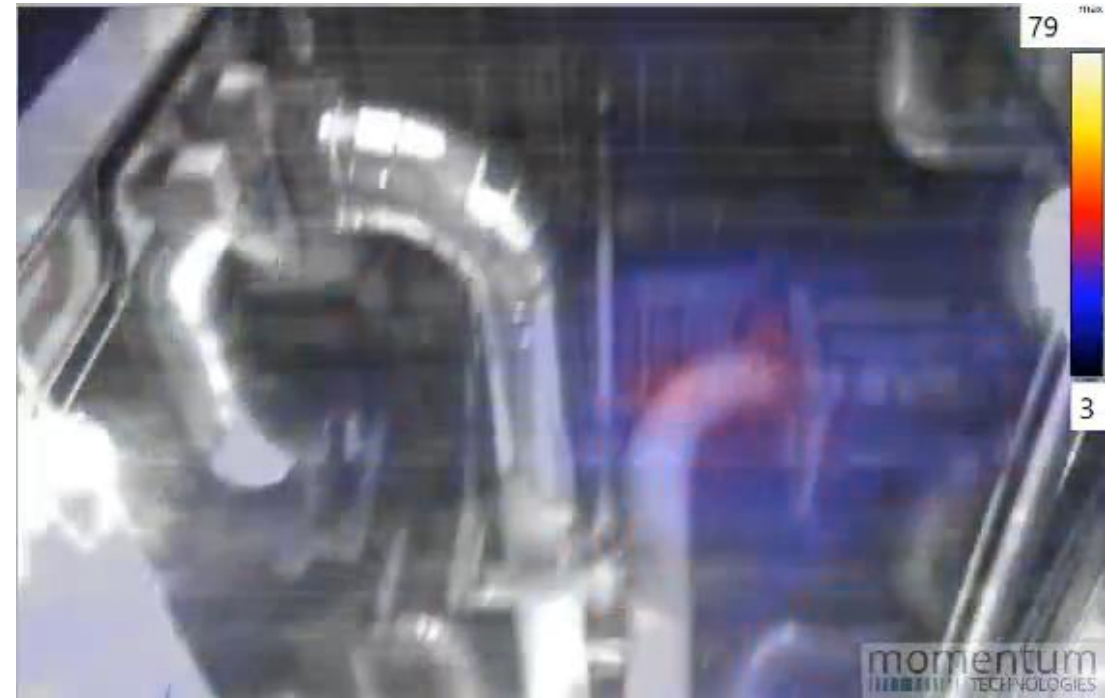
KI.6 Akustisk isolasjon klasse A



KI.8 Akustisk isolasjon klasse C



Før og etter isolering

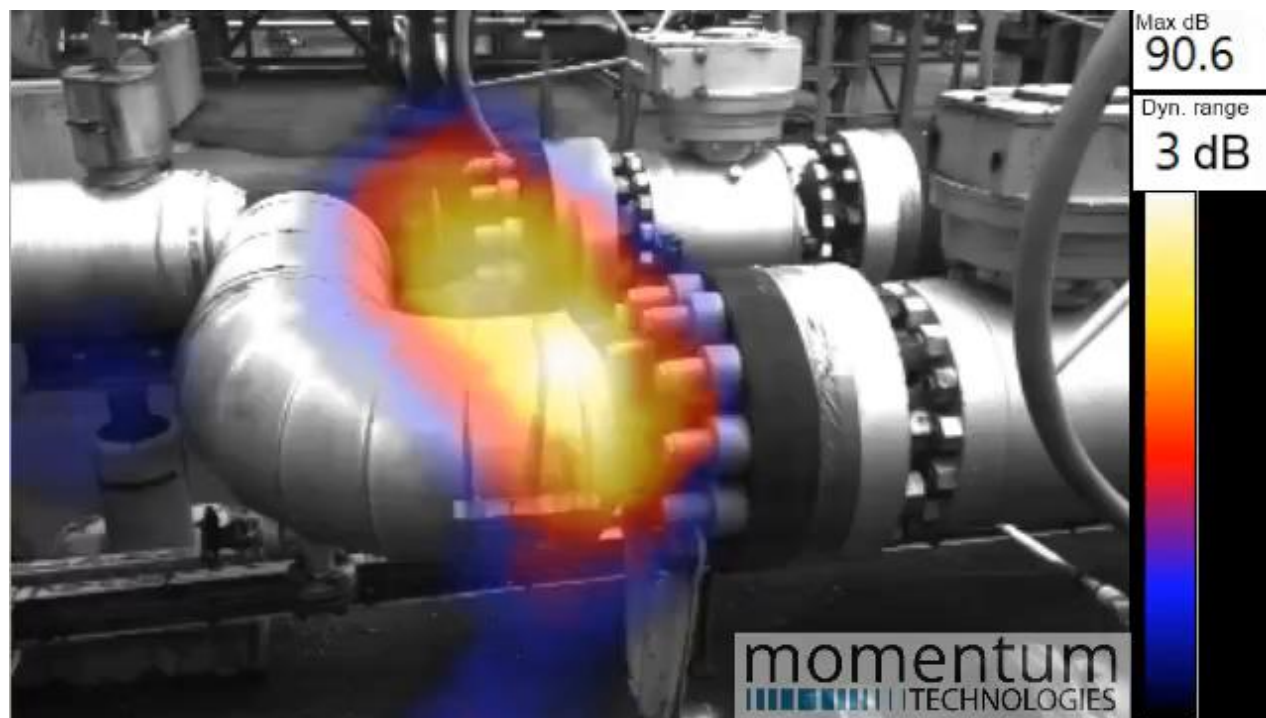


Målrrettede tiltak – billigere, raskere og bedre

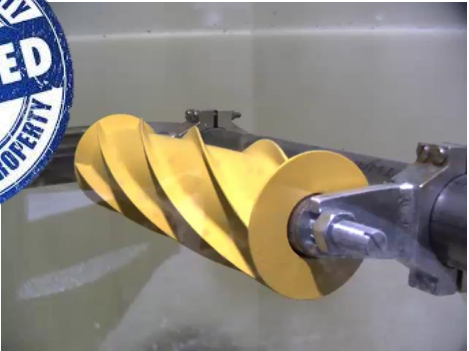
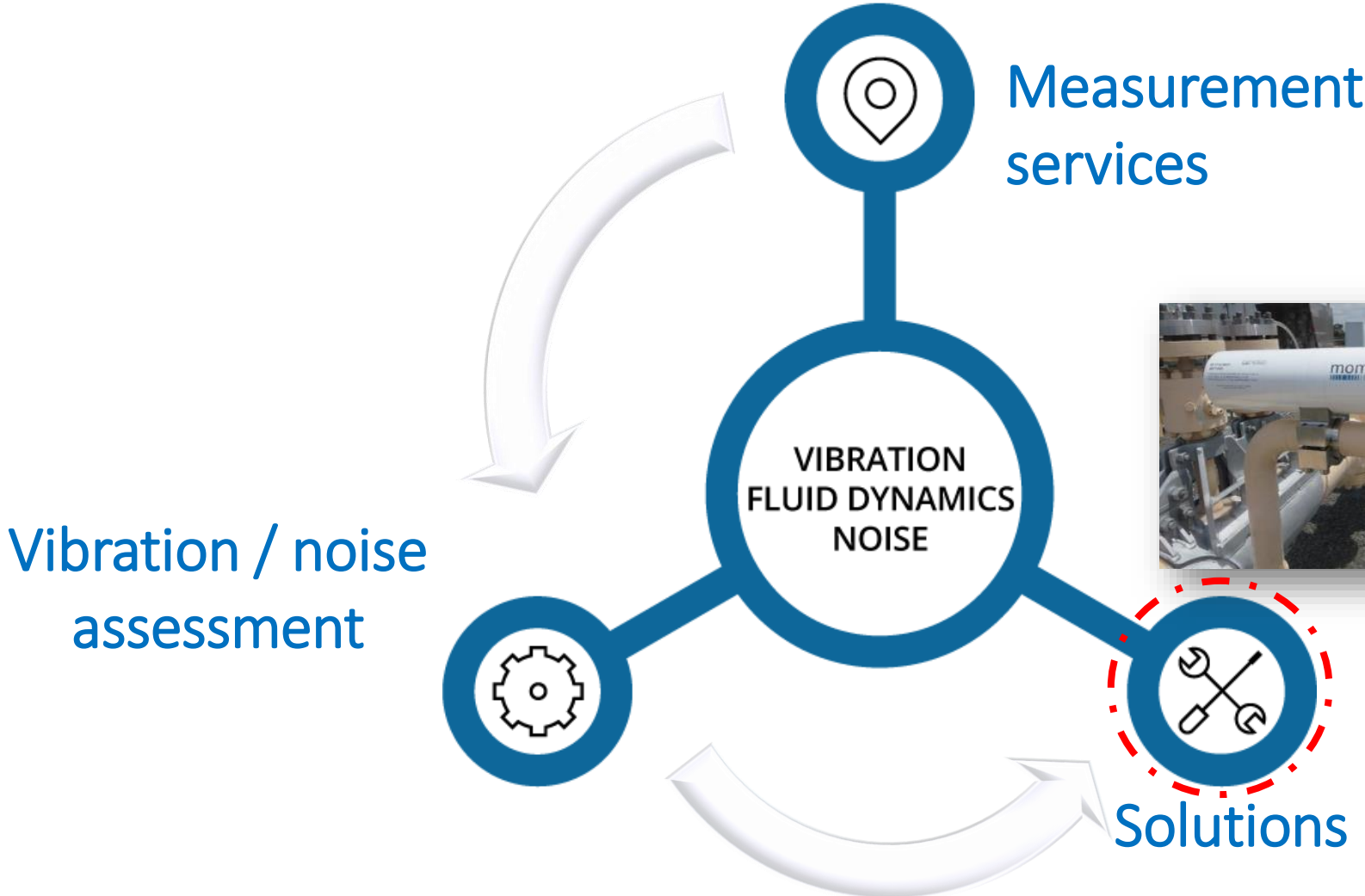
- Nøyaktig identifisering av støykilden sikrer effektiv og riktig isolering / avisolering
- Effektiv verifisering av utførte tiltak

Utsagn fra kunder:

- Vi har isolert i blinde for millioner!
- Fra nå av et blir meningsløst å gjøre lydisolerende tiltak uten å «se» først

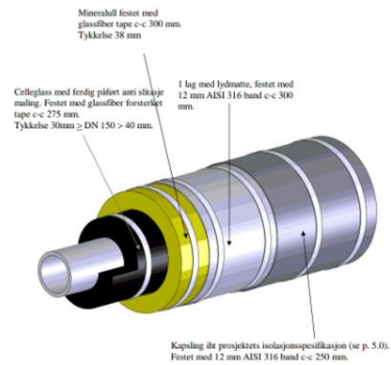


Momentum workflow

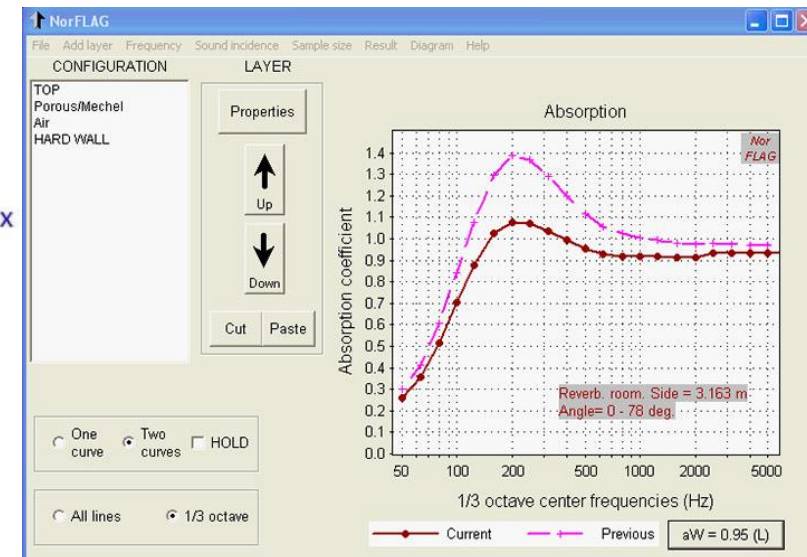
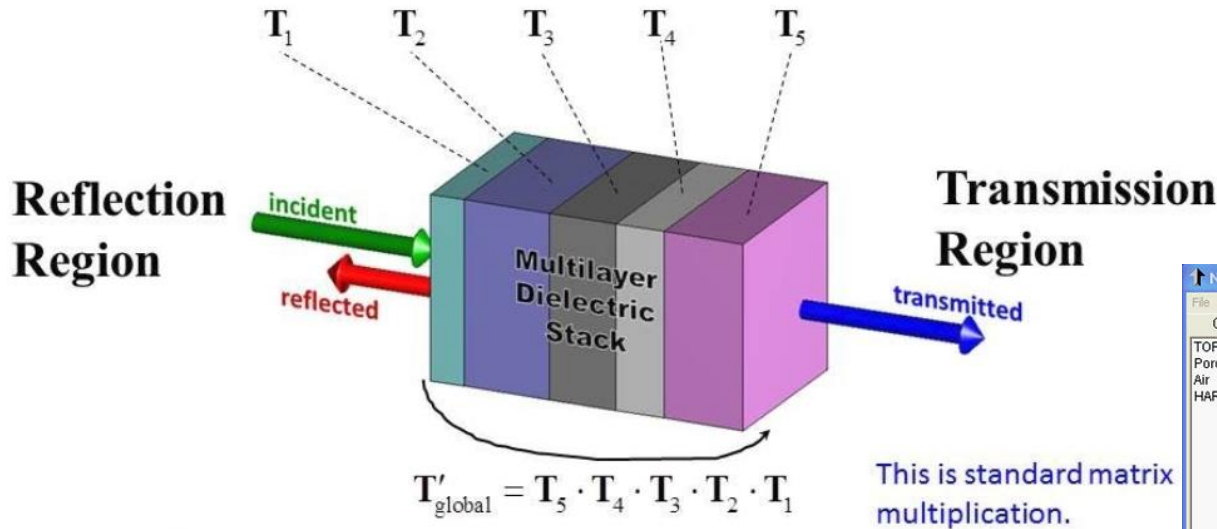
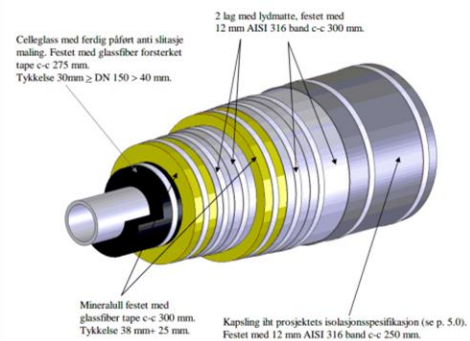


En sandwich av ulike isolasjonsmaterialer kan fungere bedre enn hva de ville gjort hver for seg

KI.7 Akustisk isolasjon klasse B

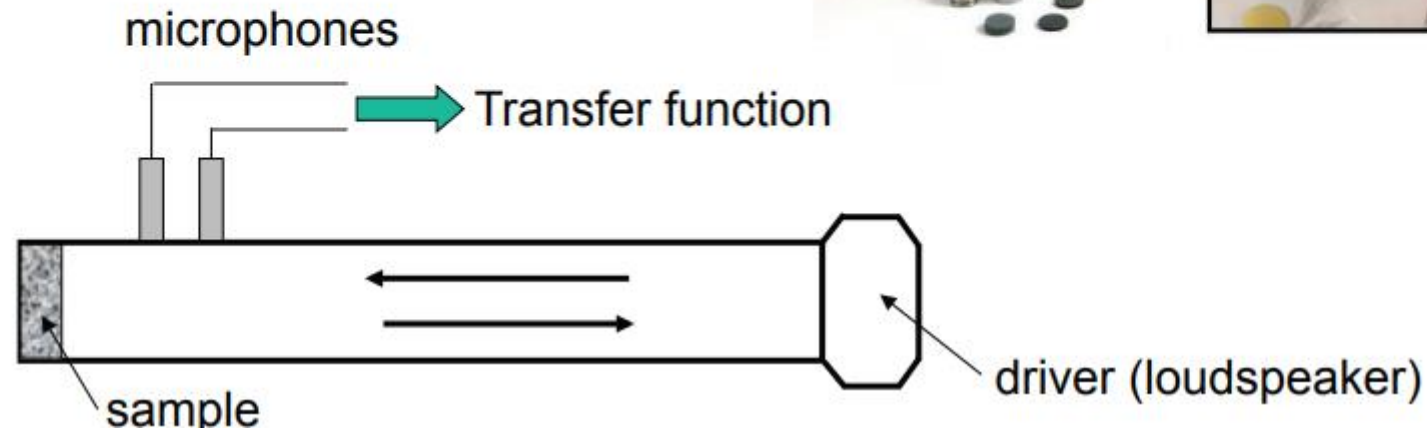


KI.8 Akustisk isolasjon klasse C

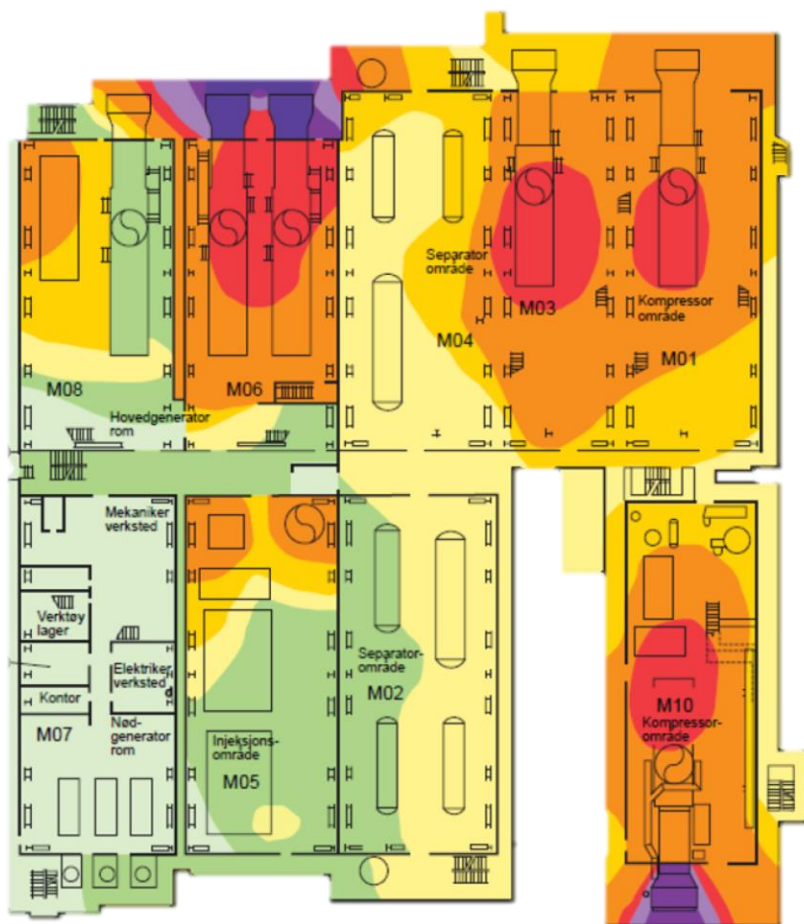


Måling av akustiske egenskaper iht. ASTM E1050 Impedansrør med lukket ende

ASTM E1050-95 (ISO 10534-2) Test Method



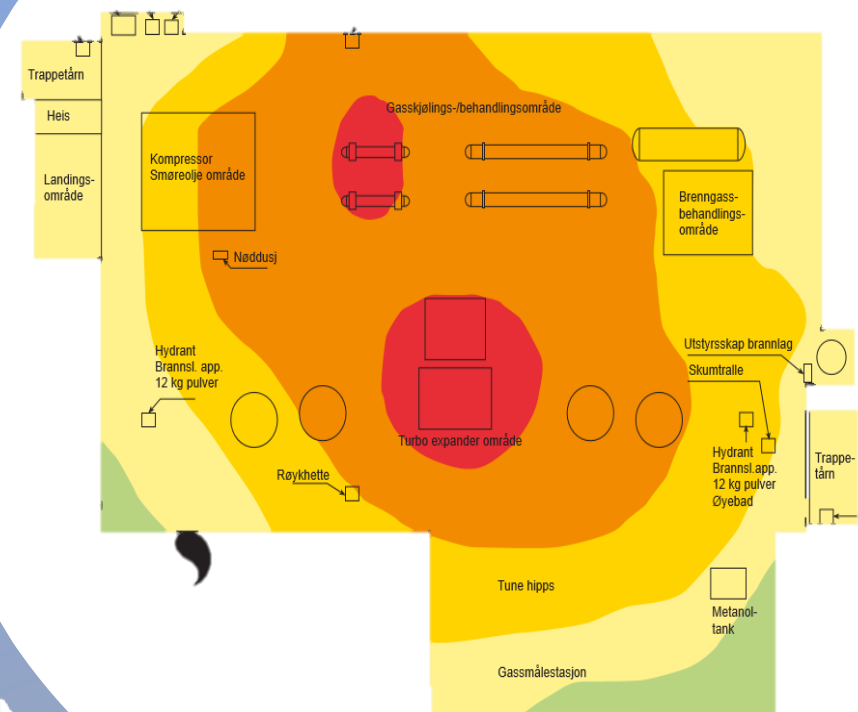




Store kilder = store tiltak



Små kilder = små tiltak



Det er lydtrykket over en gitt eksponeringstid som skader hørselen



= 95dB lydtrykk



Sound Pressure Level	Sound pressure	Permissible Exposure Time
115 dB	11.2 Pa	0.46875 minutes (~30 sec)
112 dB	7.96 Pa	0.9375 minutes (~1 min)
109 dB	5.64 Pa	1.875 minutes (< 2 min)
106 dB	3.99 Pa	3.75 minutes (< 4 min)
103 dB	2.83 Pa	7.5 minutes
100 dB	2.00 Pa	15 minutes
97 dB	1.42 Pa	30 minutes
94 dB	1.00 Pa	1 hour
91 dB	0.71 Pa	2 hours
88 dB	0.50 Pa	4 hours
85 dB	0.36 Pa	8 hours
82 dB	0.25 Pa	16 hours

Størrelsen på kilden er uvesentlig.

- Spørsmålet er hvor langt er du i fra og hvor lenge du er der

Varme / Lyd analogi

Stor flate/lav temp vs Liten flate/høy temp

50W halogenspot:

- Overflate glødetråd: ca 0.000005m^2
- Overflate temp glødetråd: $3500\text{ }^\circ\text{C}$
- = ca $10\text{MW}/\text{m}^2$



Varm nok til å brenne fingrene, men ikke nok til å varme opp stua med

Gulvvarme 100m^2

- Varmekabeleffekt: 3000W
- Overflate temp gulv $25\text{ }^\circ\text{C}$
- = ca $30\text{W}/\text{m}^2$

Ikke så varm, men stor overflate



Stor flate/lav temp vs Liten flate/høy temp

50W halogenspot:

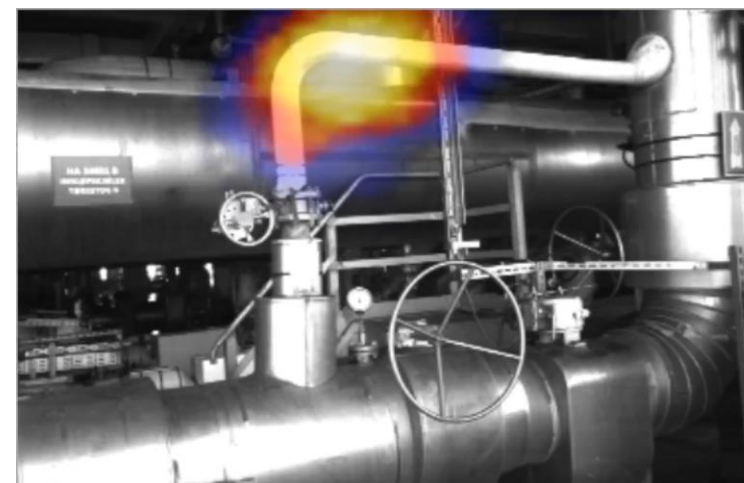
- Overflate glødetråd: ca 0.000005m^2
- Overflate temp glødetråd: $3500\text{ }^\circ\text{C}$
- = ca 10MW/m^2

Varm nok til å brenne fingrene, men ikke nok til å varme opp stua med

Gulvvarme 100m^2

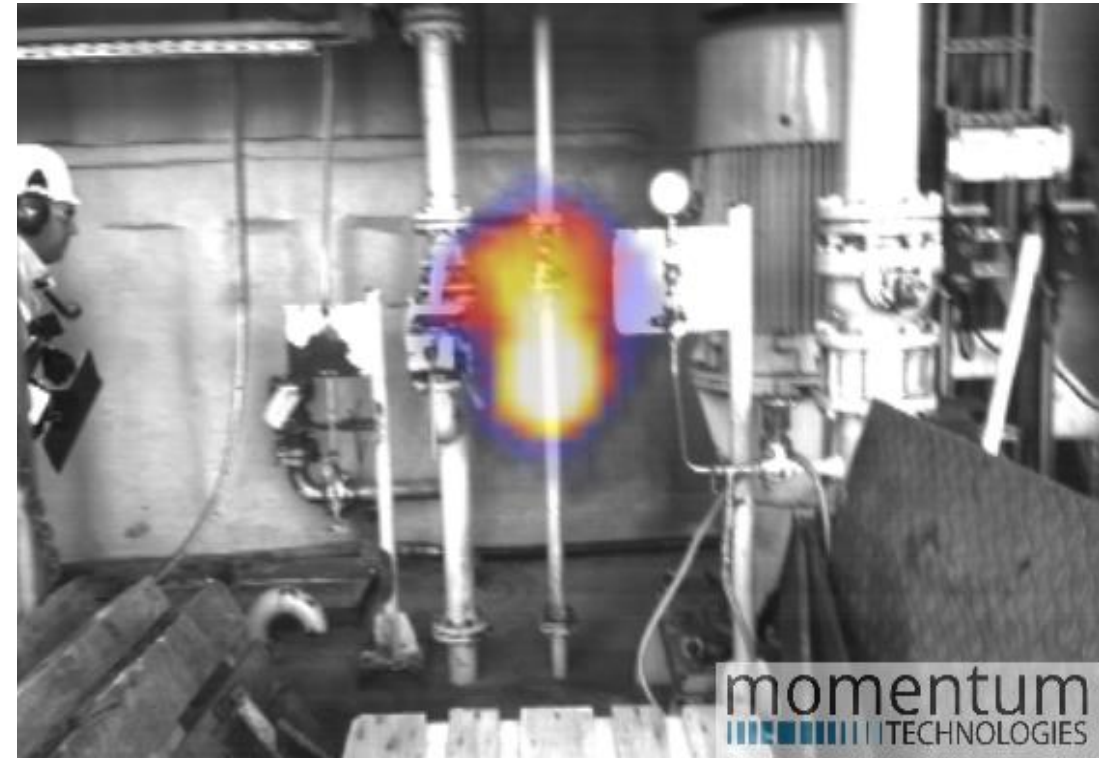
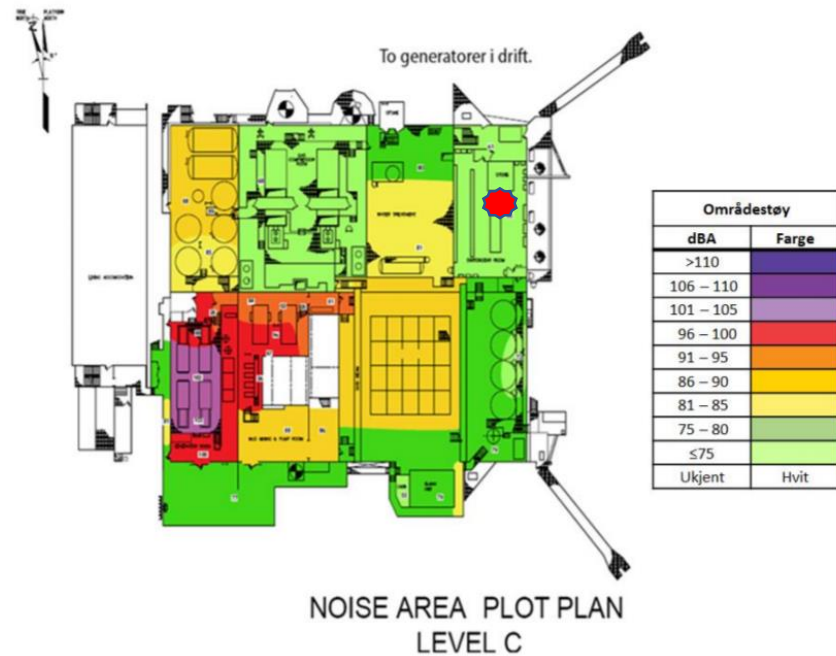
- Varmekabeleffekt: 3000W
- Overflate temp gulv $25\text{ }^\circ\text{C}$
- = ca 30W/m^2

Ikke så varm, men stor overflate



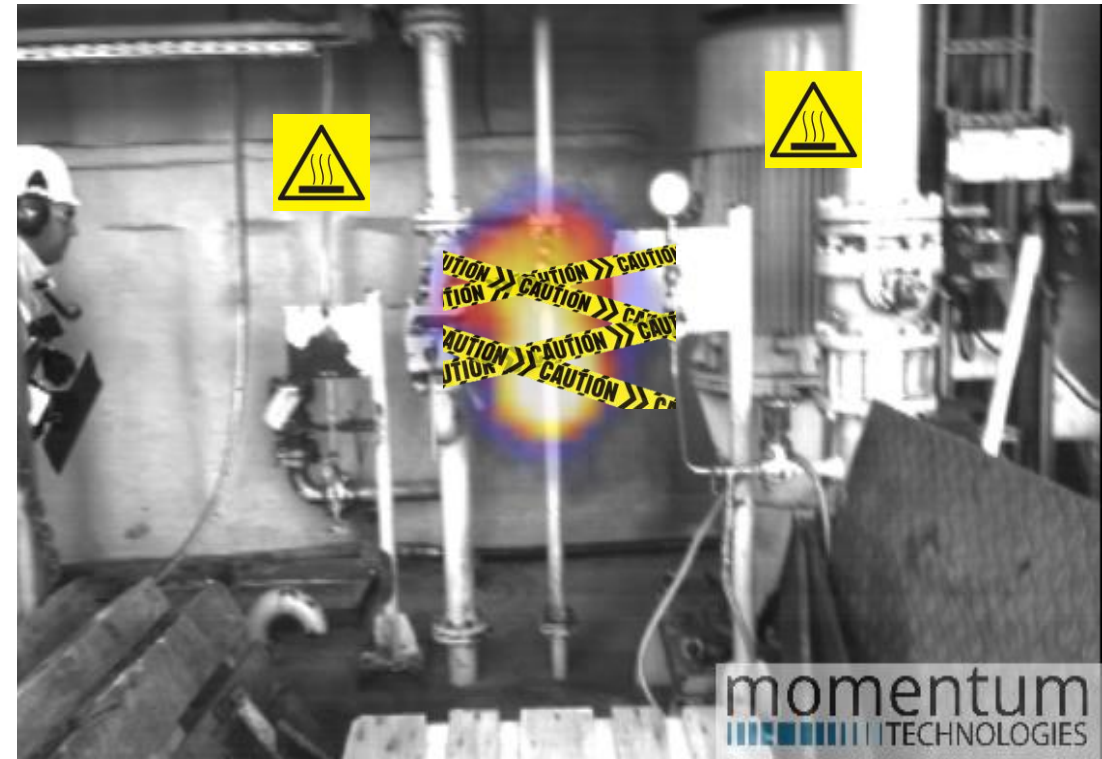
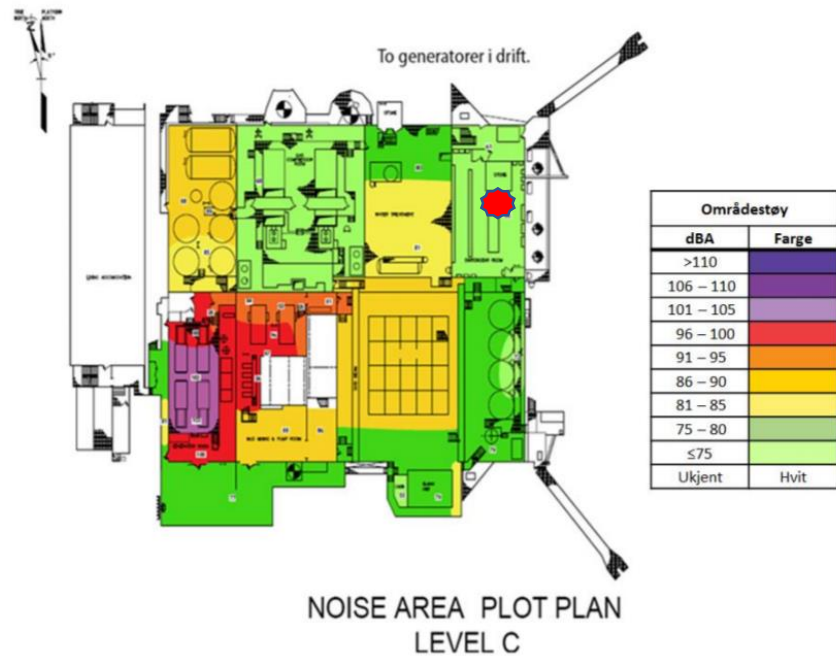
Ikke en stor bidragsyter til områdestøyen,
- men skadelig nok i nærfeltet

Hva om røret hadde overflate temperatur på 300°C



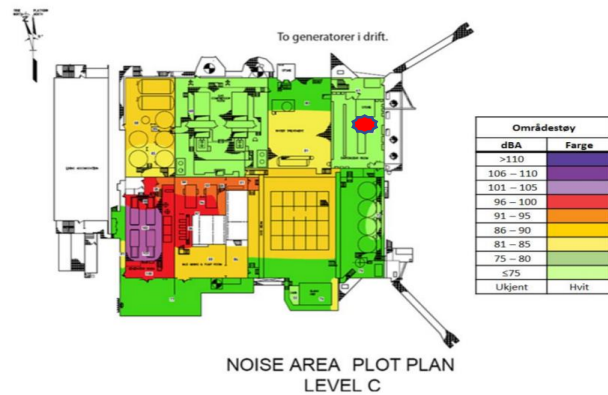
Hva om røret hadde overflate temperatur på 300°C

Hadde man latt det stå uten advarsler?

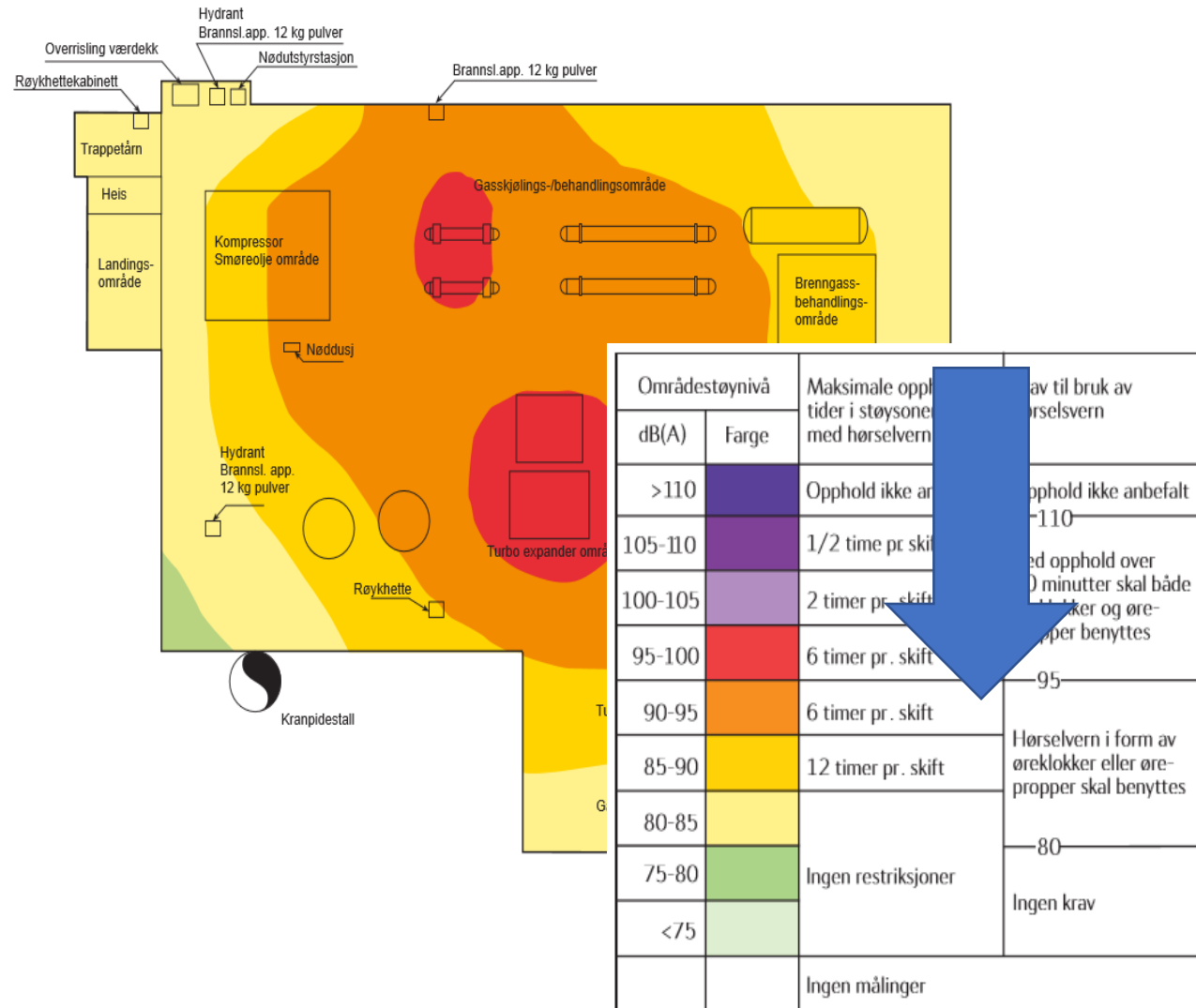


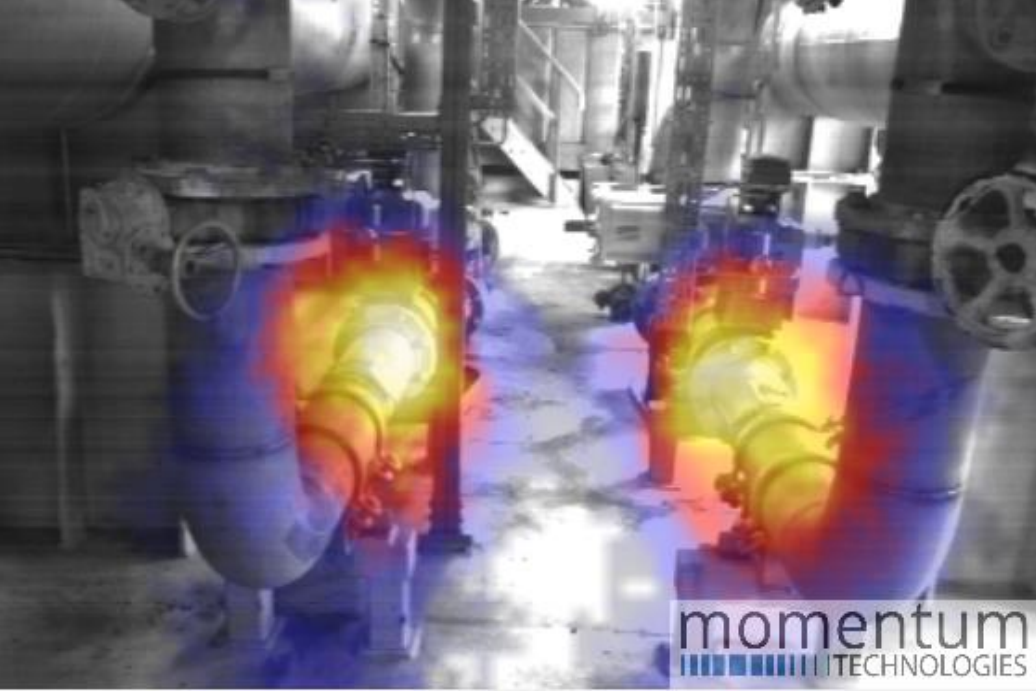
Punktstøykilde

- Lydtrykksnivået i nærfeltet av støyende objekter kan være vesentlig høyere enn hva støykartet tilsier, og hva man tror man blir utsatt for.
- Viktig å huske for folk som jobber utenfor normal høyde



Økt arbeidstid = Økt effektivitet

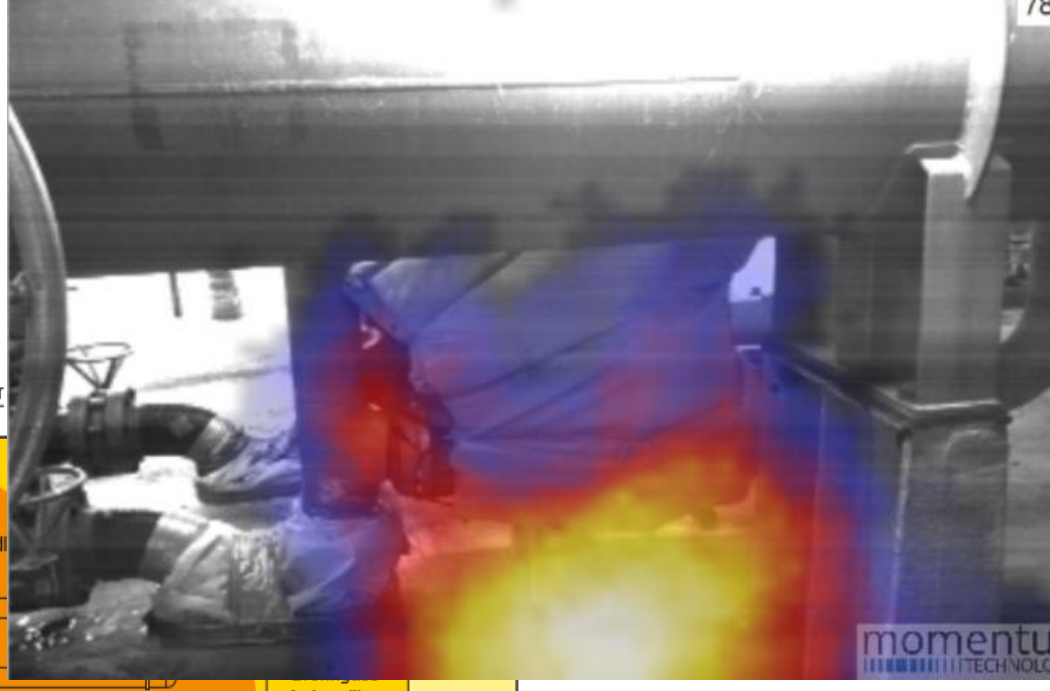




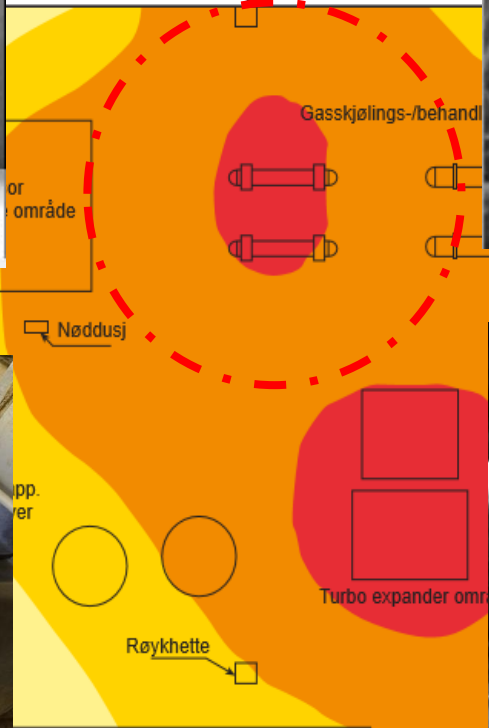
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12 kg pulver
ødstyrstasjon

Brannsl.app. 12 kg pulver



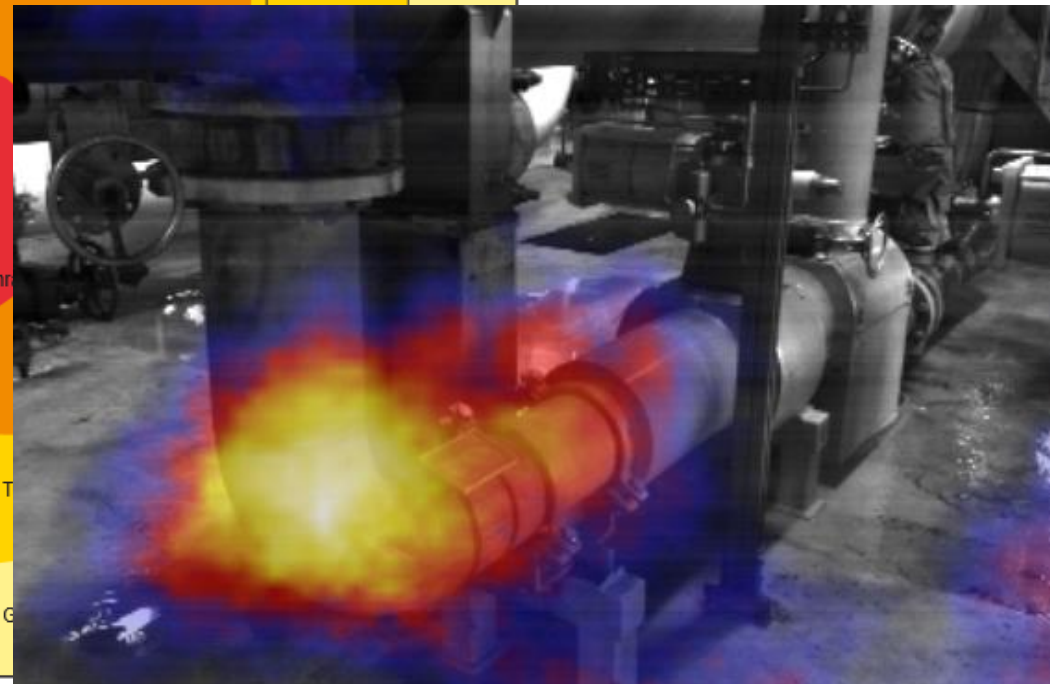
momentum
TECHNOLOGIES

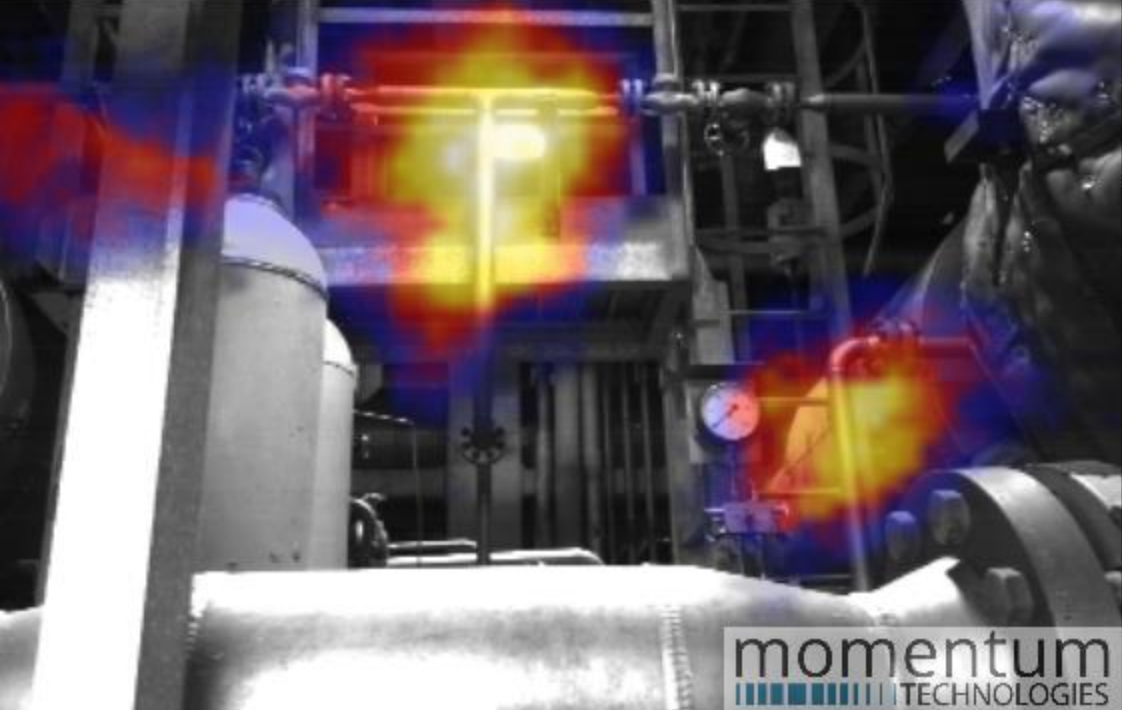


behandlings-
område



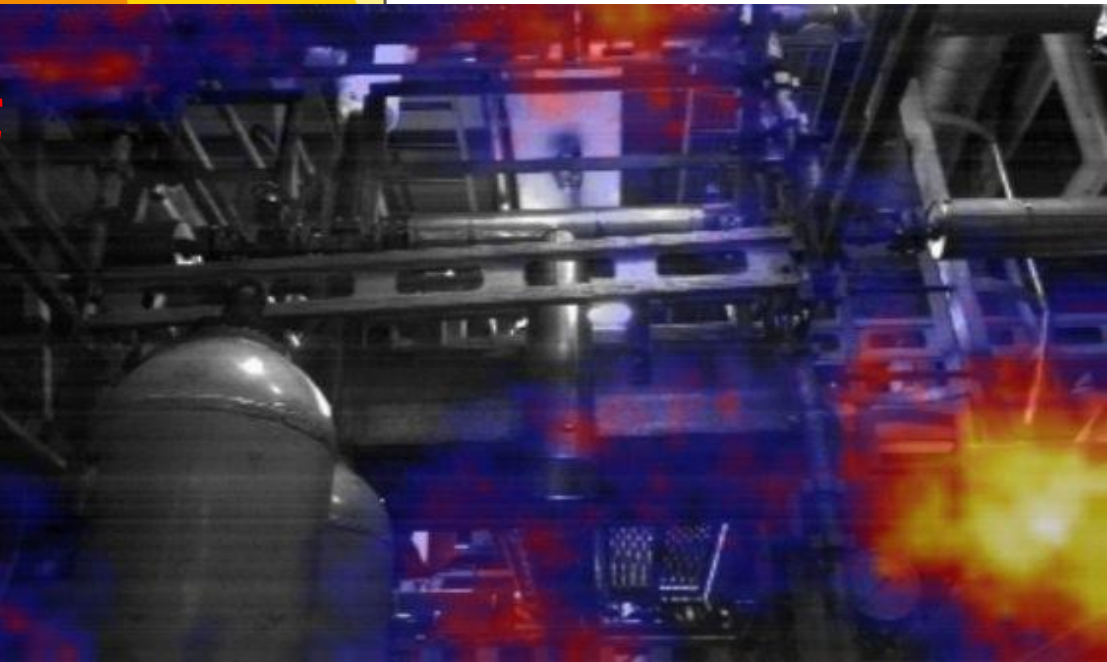
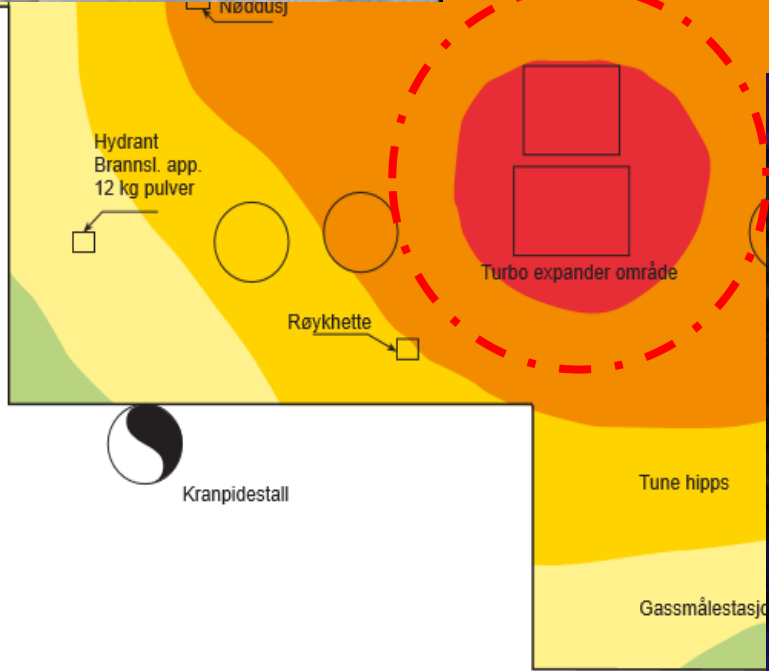
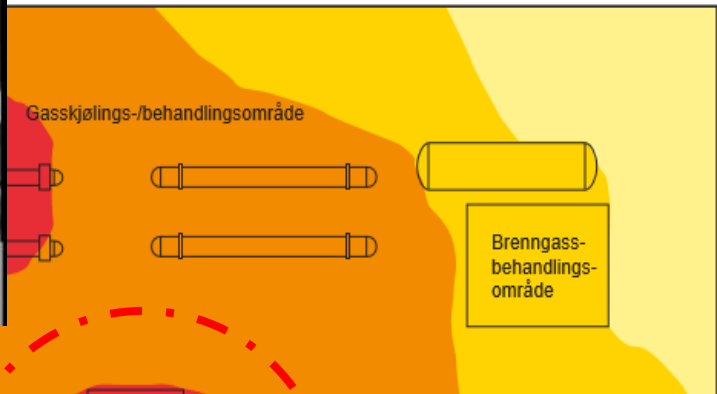
Kranpidestall





Brannsl.app. 12 kg pulver

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VIBRAVISION – BOOSTER COMPRESSOR

Original video

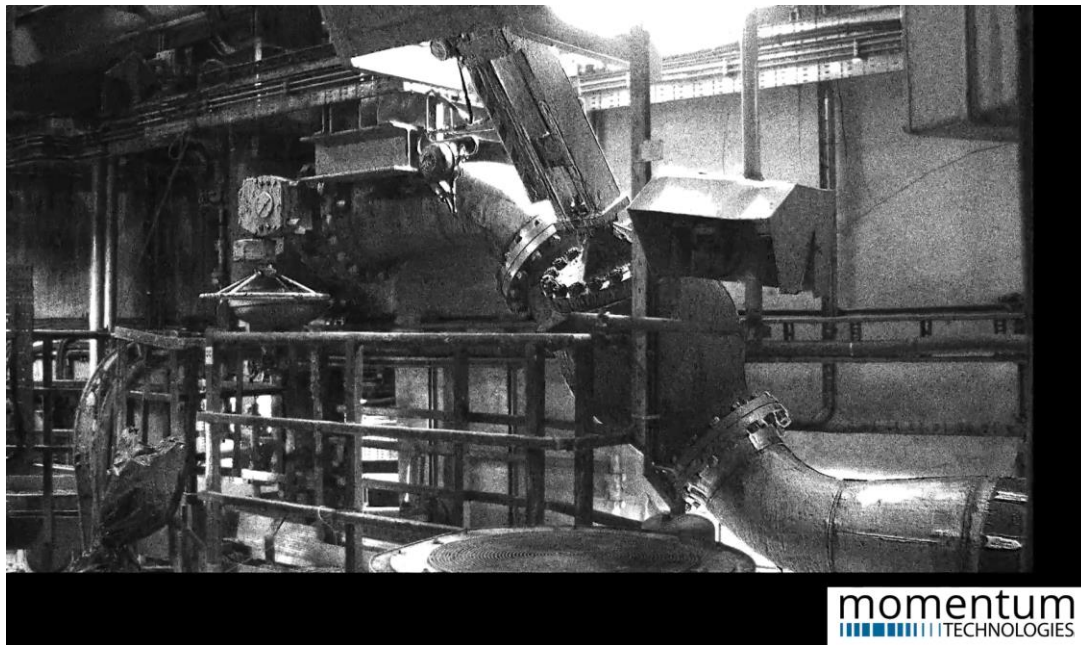


Amplified video



Example of current use for topside piping vibration inspection

Large piping

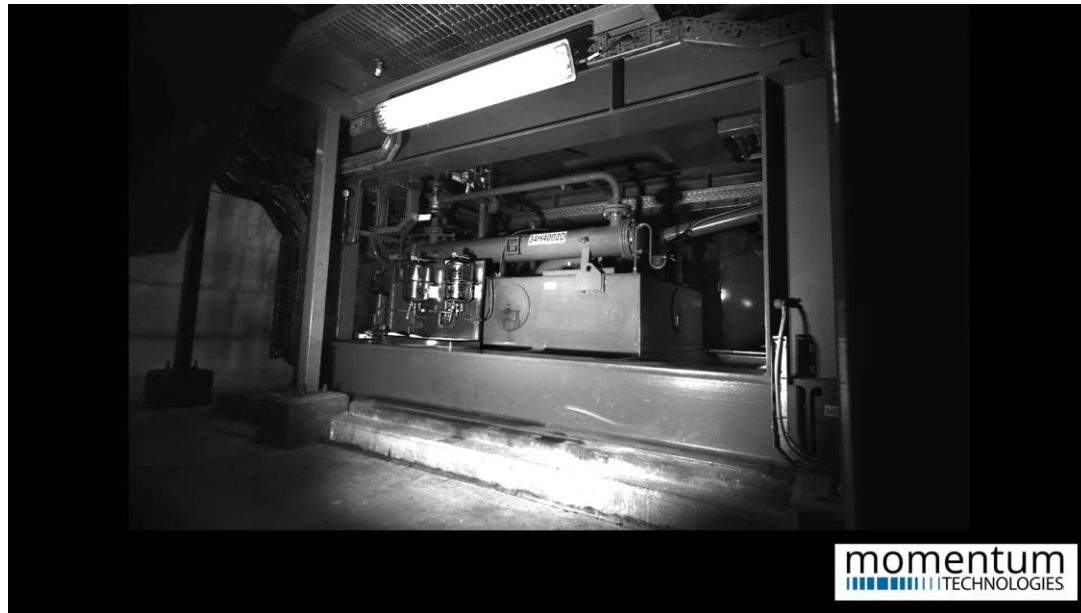


Smaller piping

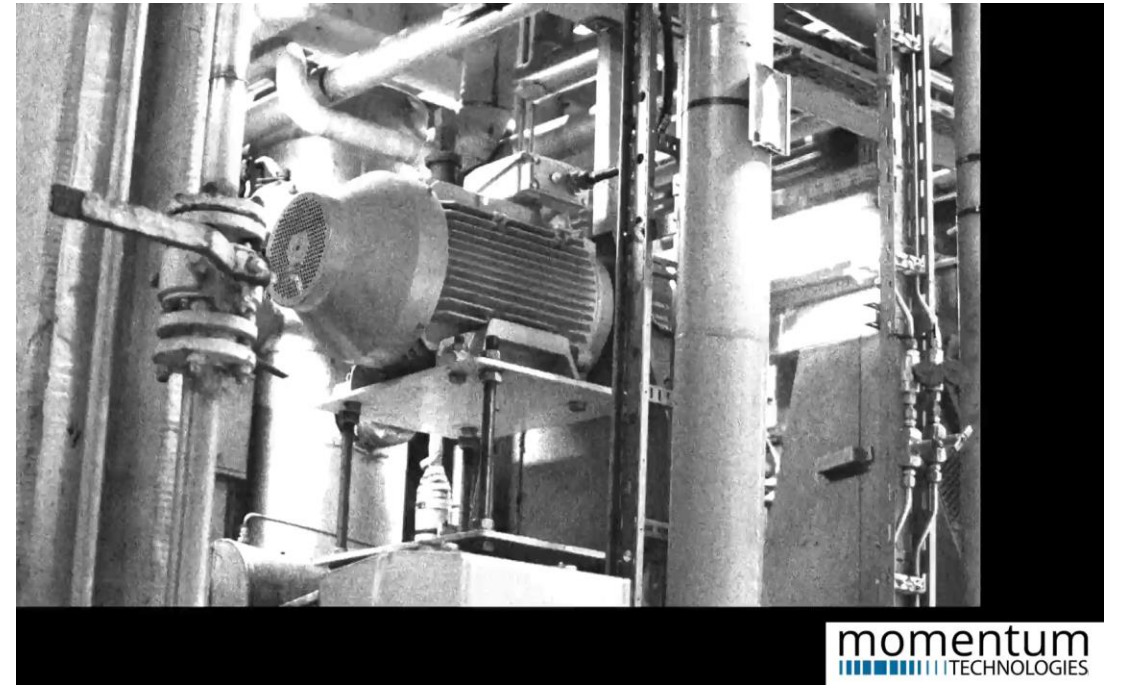


Example of current use for topside machinery vibration inspection

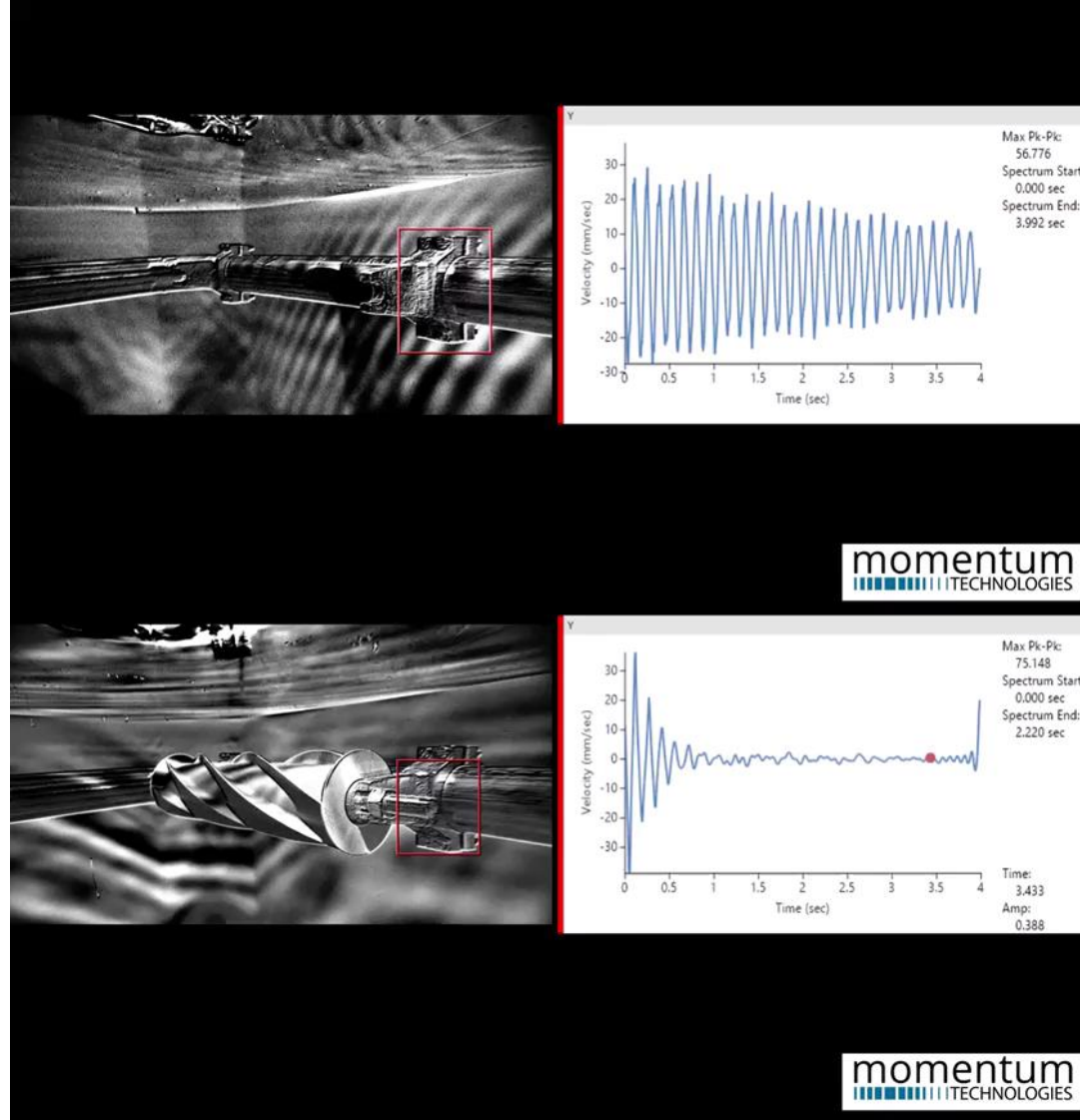
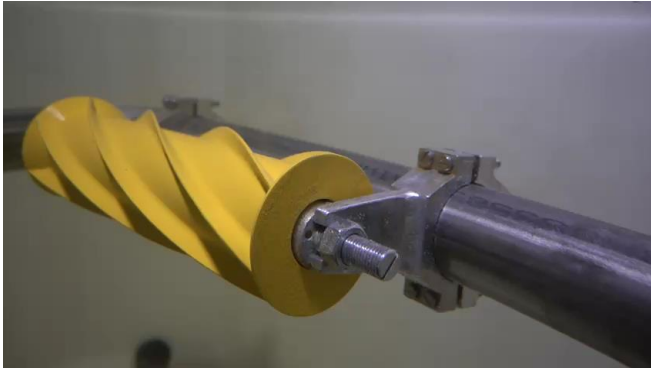
Large compressor foundation



Small pumps



Video based vibration measurement in tank



momentum

Expert services and solutions within vibration and sound.

simple solutions to complex problems

