

# ROADCRACK™ – MEASURING MORE THAN CRACKS

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# Overview

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- **A brief introduction to RoadCrack**
- **The upgrade**
- **The concept of co-creation**
- **The offspring (co-creation at work)**
- **Some benefits**

# RoadCrack

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- **Developed by RMS NSW in conjunction with CSIRO in mid 1990s**
- **Real time crack measurement system**
- **Designed and proven to measure 1mm+ cracks on all surfaces**
- **> 20,000 km surveyed annually**



# CSIRO Volvo truck installation

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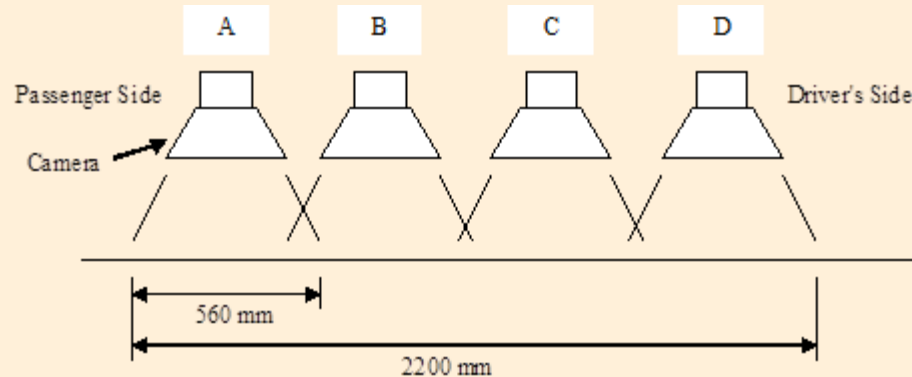
# Cameras and lighting

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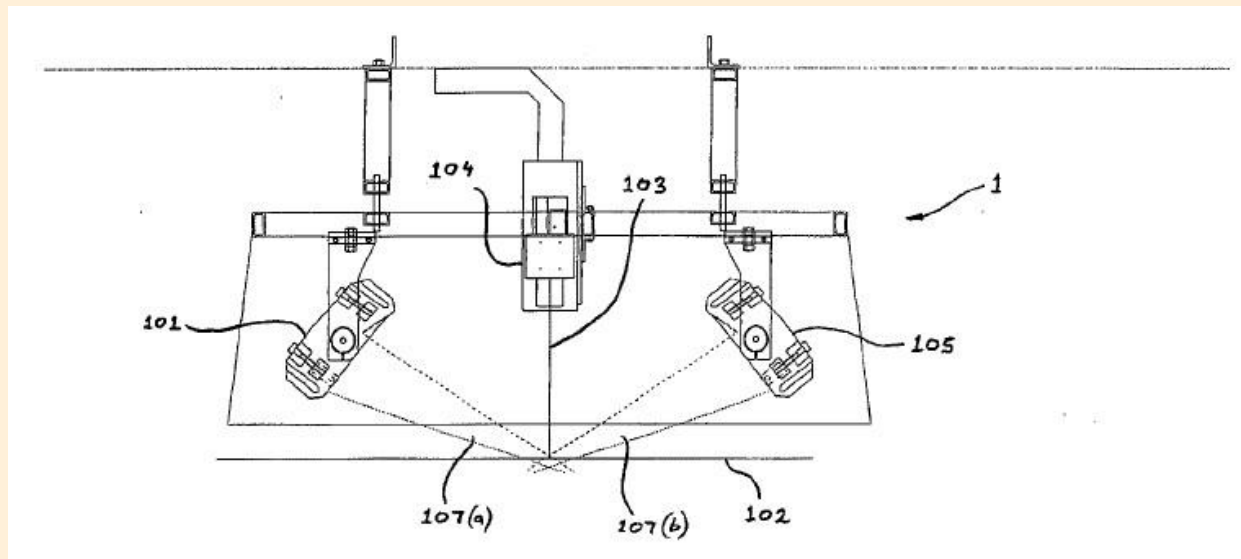
# Camera configuration

- 4 x line-scan cameras, single transverse scan every 1mm
- 1mm per pixel, longitudinally and transverse
- exposure adjusted for surface reflectivity, 4 – 20  $\mu$ S
- packaged into 500mm long frames



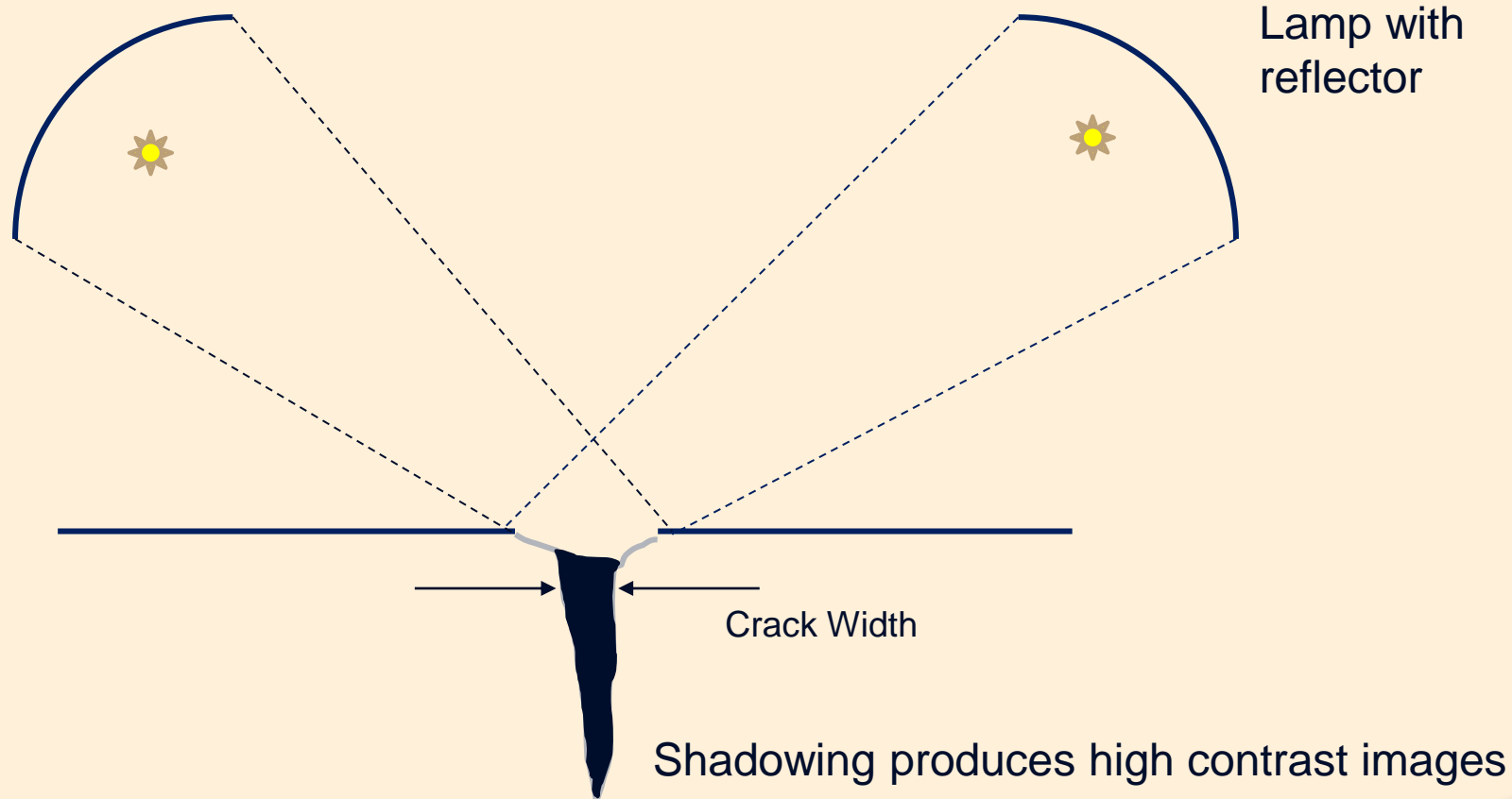
# Lighting

- 8 x 1500W quartz iodide lamps with reflectors





# Importance of angled lighting





# High intensity line illumination

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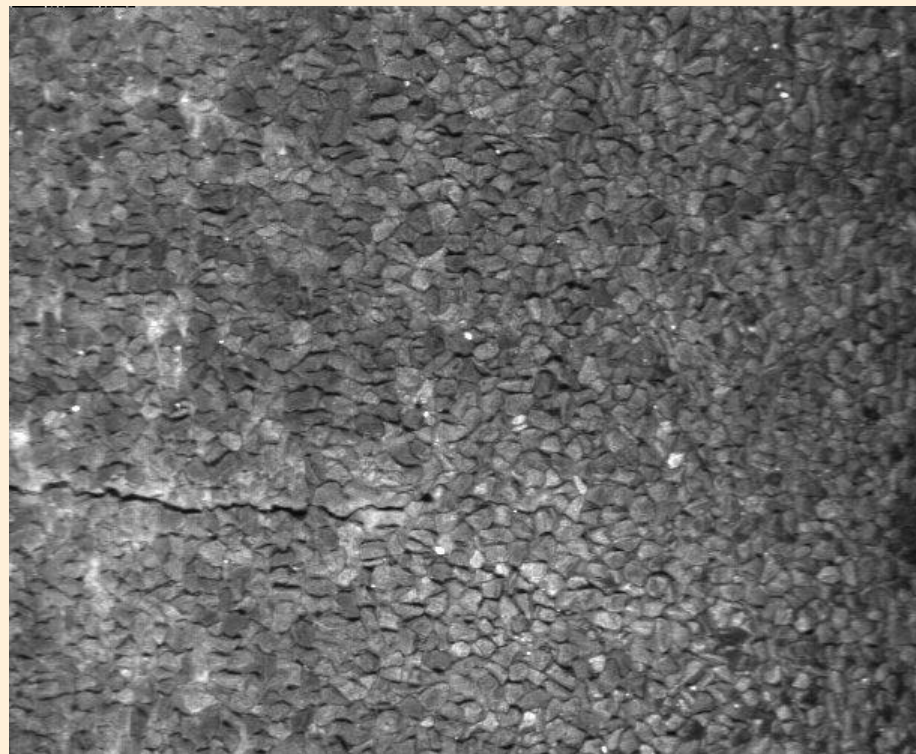
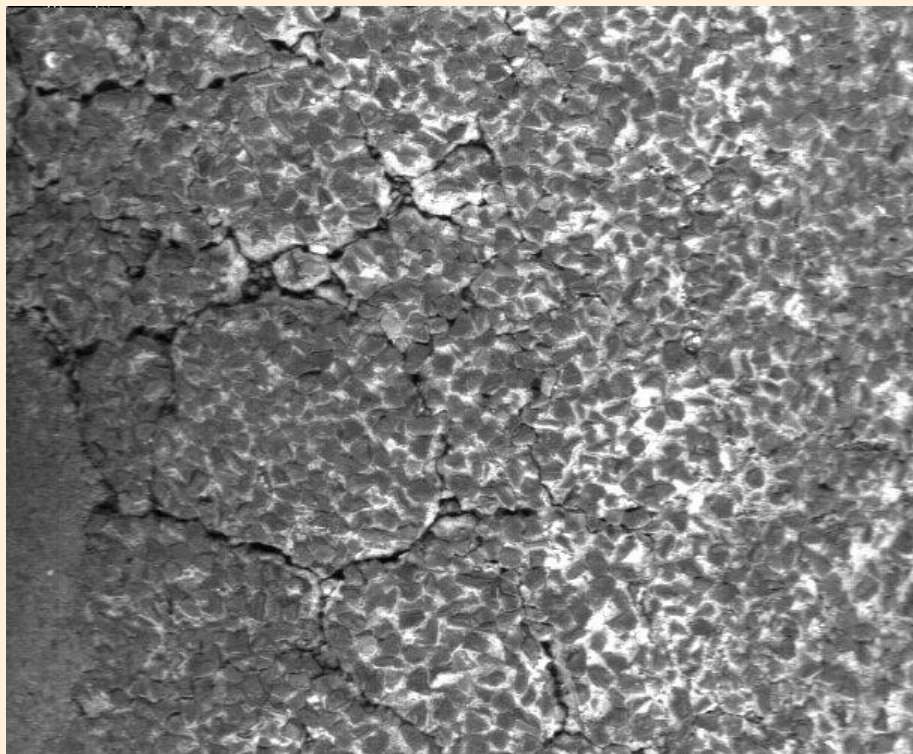
# Only as much power as a.....

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# Pavement images

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# The upgrade – why?

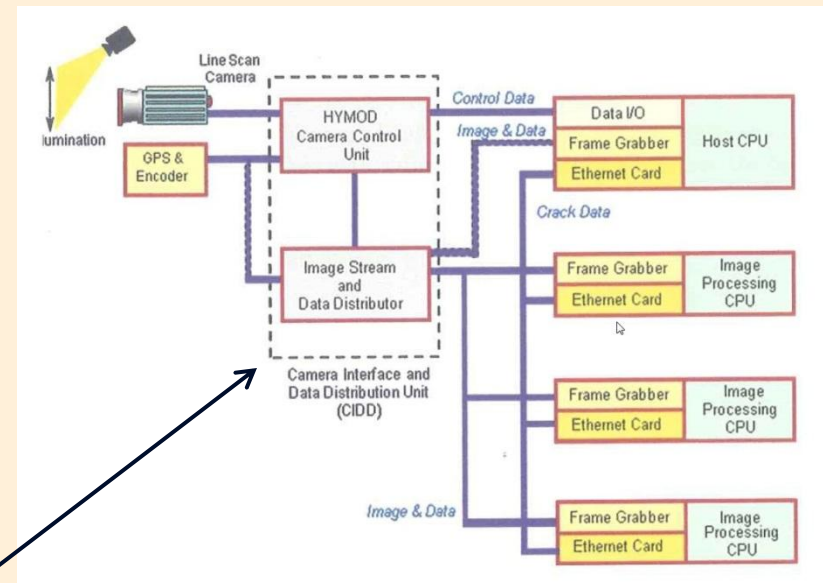
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- **Successfully used for 15 + years**
- **Several components no longer available**
- **Desire to collect data for a minimum of 5 years more**



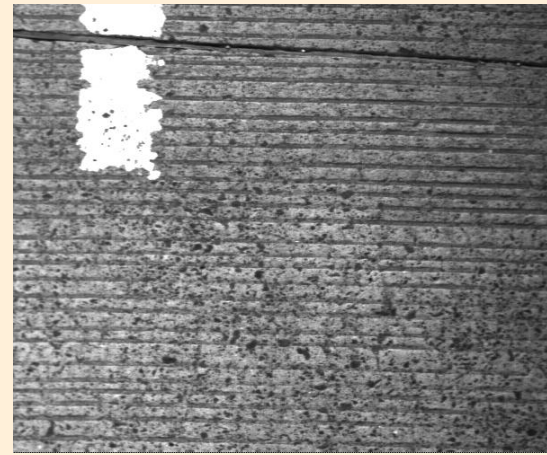
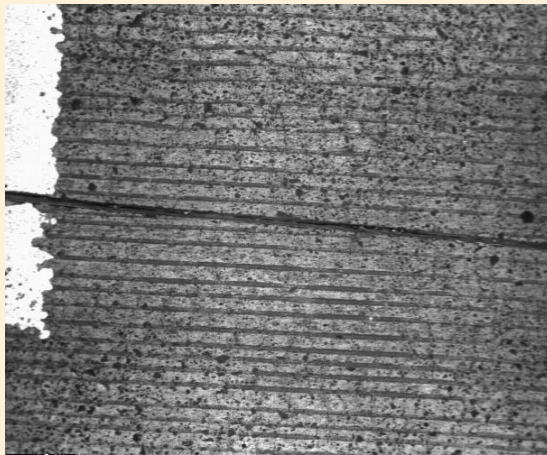
# The upgrade - specifics

- Replace 13 DEC Alpha computers with one PC
- Migrate crack detection software from UNIX operating system to Windows OS
- Replace and upgrade CSIRO camera interface modules

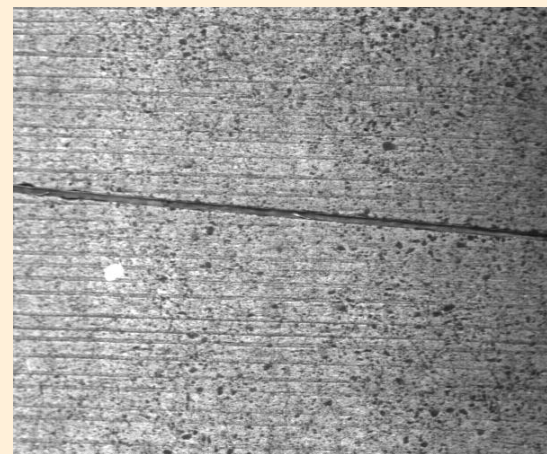


# Sample images - concrete

New



Old

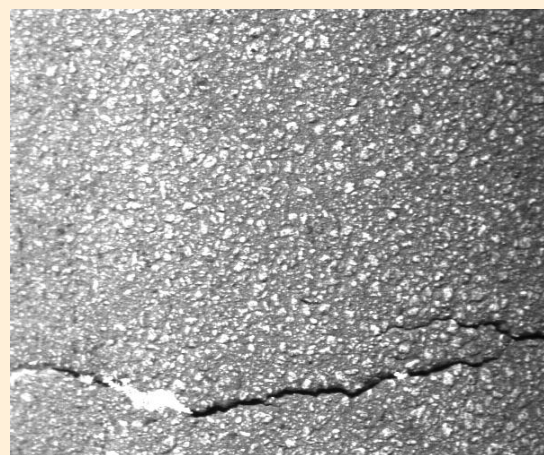
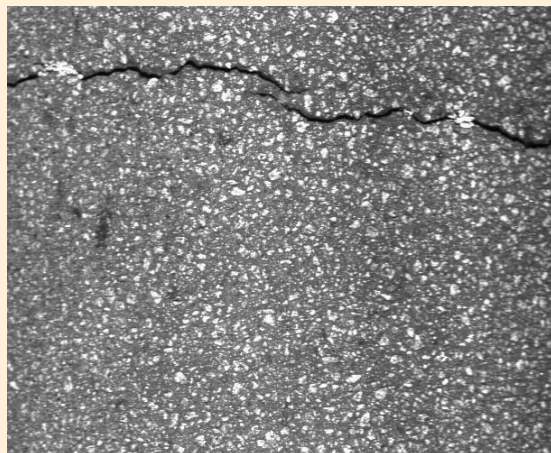
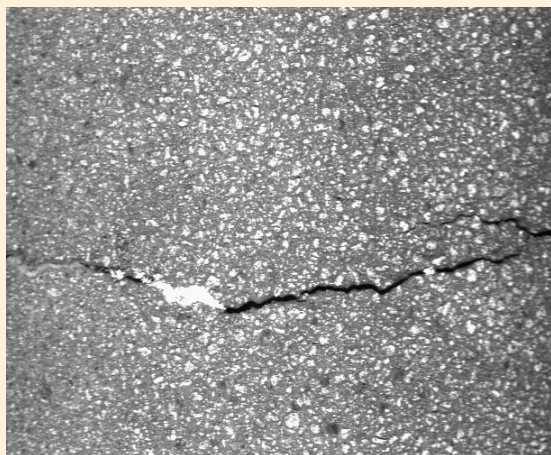




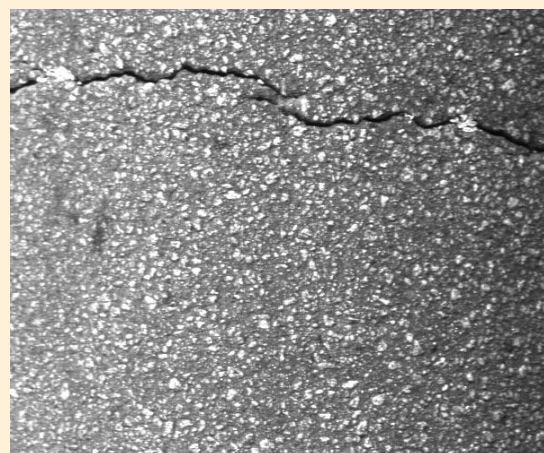
# Sample images – asphalt

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New



Old





# Staged upgrade

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- **Single channel upgrade & evaluation**
- **Successful comparison with historical results**
- **Multi channel upgrade evaluation**

# Co-creation definition:

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A business structure for customer co-creation that encourages a positive customer relationship and encourages value creation from the customer experience

(<http://www.busine>



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# The offspring

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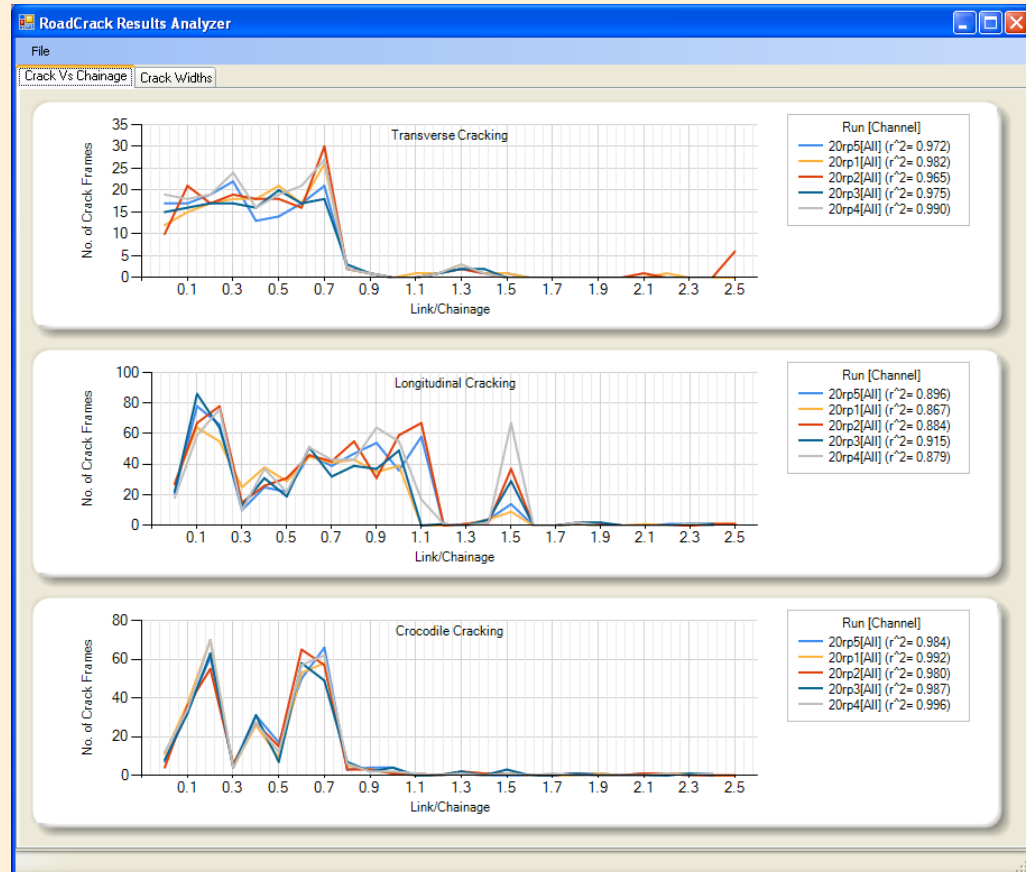
- **4 channel RoadCrack™ system in 5<sup>th</sup> wheel trailer**
- **Integrated with Hawkeye data acquisition platform**
- **Data analysis and reporting included in single software package**

# 5<sup>th</sup> wheel trailer variation

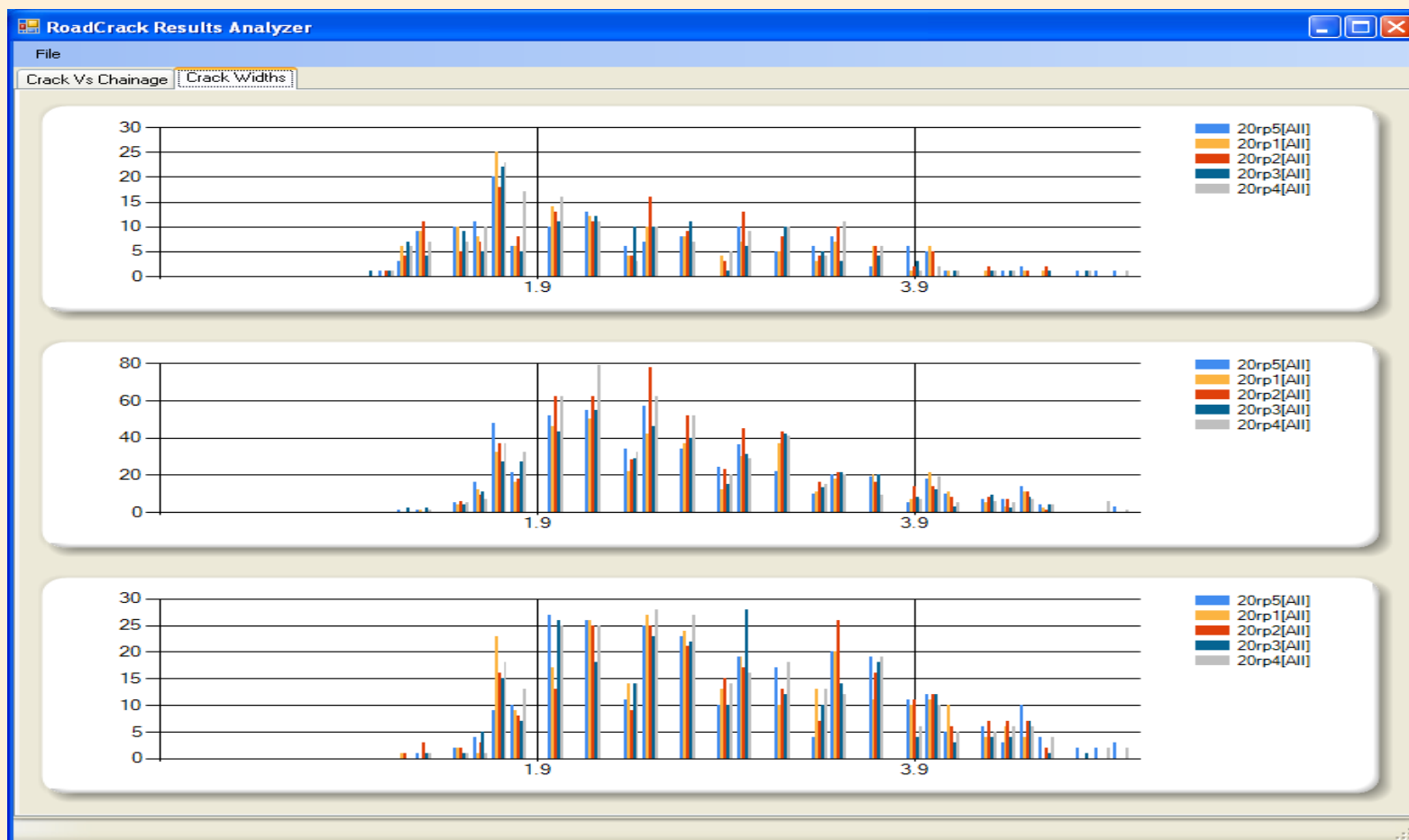


# Repeatability

Transverse,  
longitudinal  
and crocodile  
cracking



# Crack width histogram



# Images

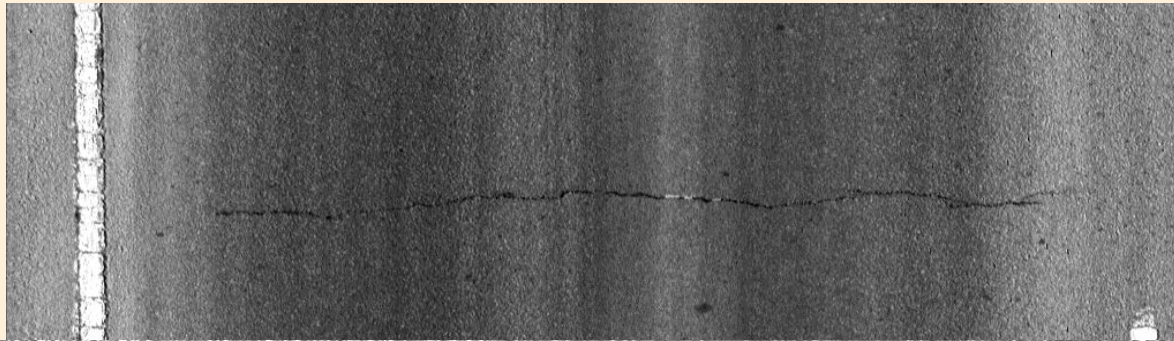
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- **Images saved as JPEGs or uncompressed**
- **Save all images or only those with cracks**
- **JPEG compression ~80 kB per image (per 500mm)**
- **Say 10% total cracked, 64 MB per km. (4 cameras)**
- **Uncompressed 243 MB per km**



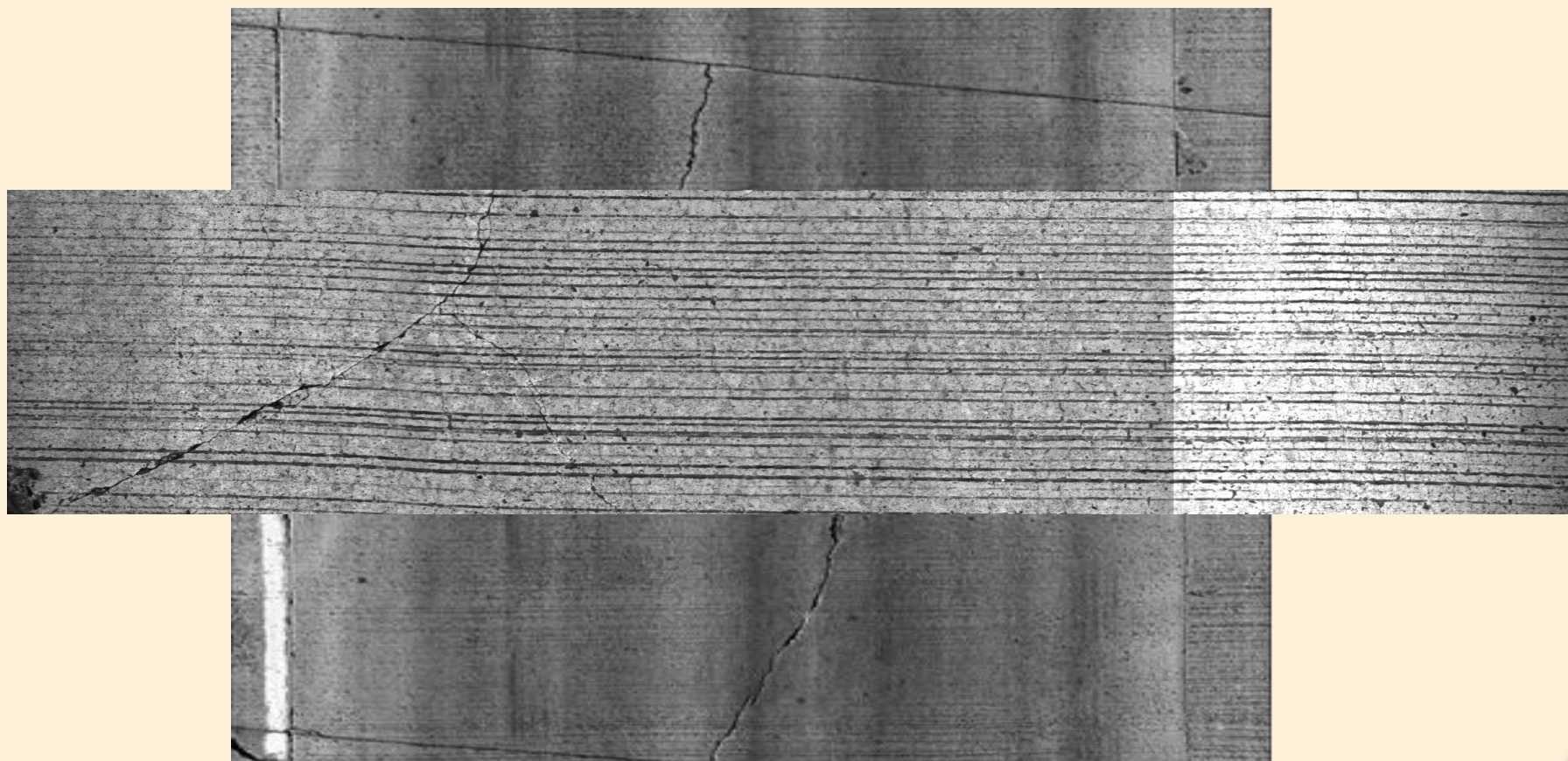
# Comparison with 3D system

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# Comparison with 3D

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# Major benefits

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- **Immediate results. No post processing and data handling**
- **Accurate and repeatable**
- **High precision provides confidence in network performance analysis**
- **Independent of analysis subjectivity**

# Additional benefits

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- **All data synchronised through Heartbeat and analysed in Hawkeye Processing Toolkit**
- **Capacity to integrate additional systems: roughness, rutting, texture, geometry, asset cameras, line marking retro-reflectivity etc.**



# Trailer with integrated profiler

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# Verification of results

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# Verification of outputs

- Internal repeatability,  $r^2$

Run No.	Roughness	Rutting	Texture (passenger)	Texture (centre)
1	0.99	0.98	0.99	0.99
2	0.99	0.99	0.99	0.99
3	0.99	0.99	0.99	0.99
4	0.99	0.99	0.99	1.00
5	0.99	0.99	0.99	0.99



# Verification of outputs

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- **Reproducibility,  $r^2$**

Run No.	Roughness	Rutting	Texture (passenger)	Texture (centre)
Trailer versus profiler	0.985	0.933	0.926	0.968

# Direct benefits to RMS NSW

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- **Single pavement condition survey (cracking plus other parameters)**
- **Significant cost savings**
- **Fully integrated data sets**



# Summary

- **RoadCrack time proven technology**
- **Successfully upgraded**
- **Trailer platform a product of co-creation**
- **Now measuring more than cracking**



# Thank you

## Acknowledgements:

Roland Leschinski, ARRB Group

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Richard Wix, ARRB Group

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Together  
we can save  
millions  
of lives.

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