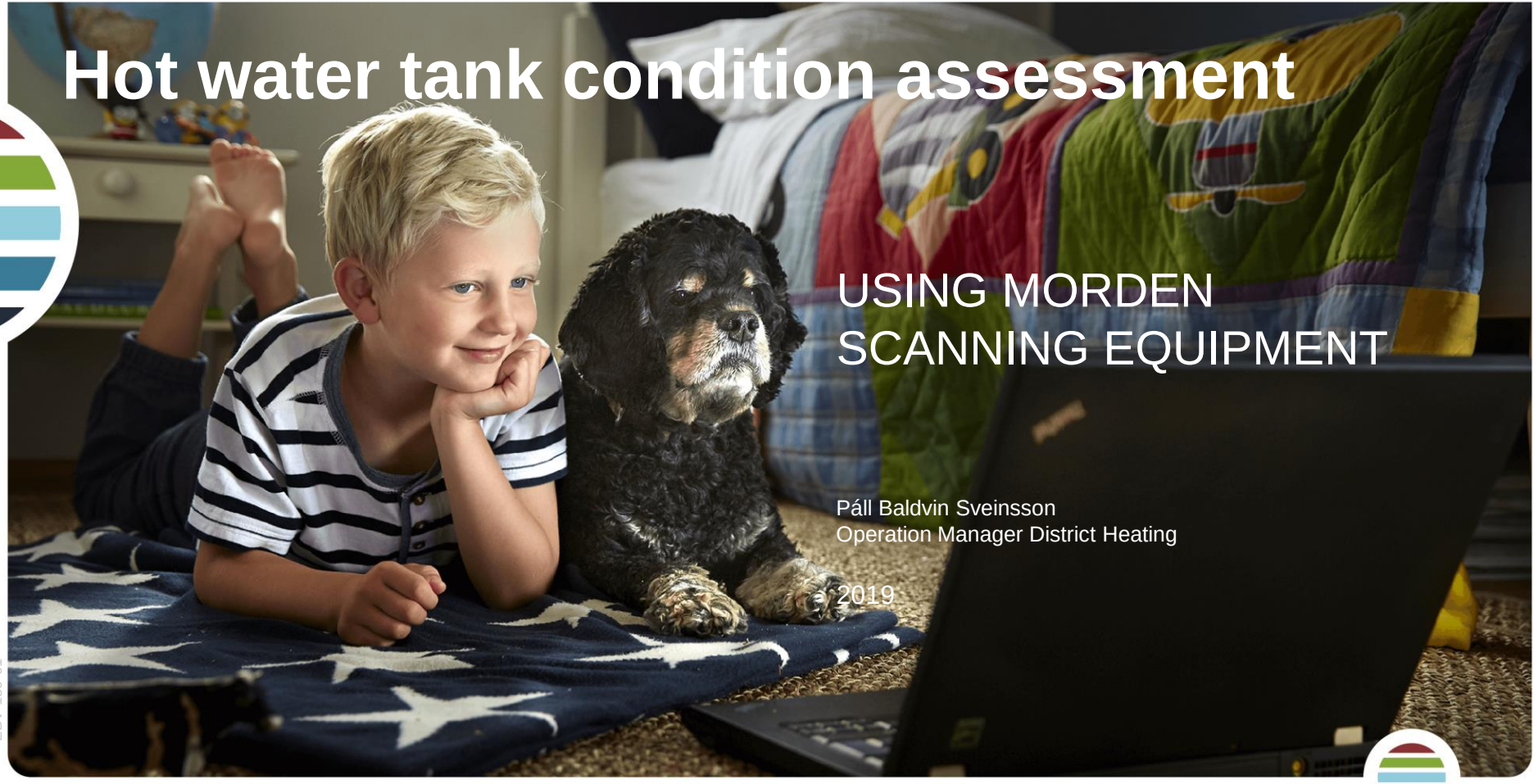
Hot water tank condition assessment



USING MORDEN SCANNING EQUIPMENT

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Operation Manager District Heating

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EBV-159-01

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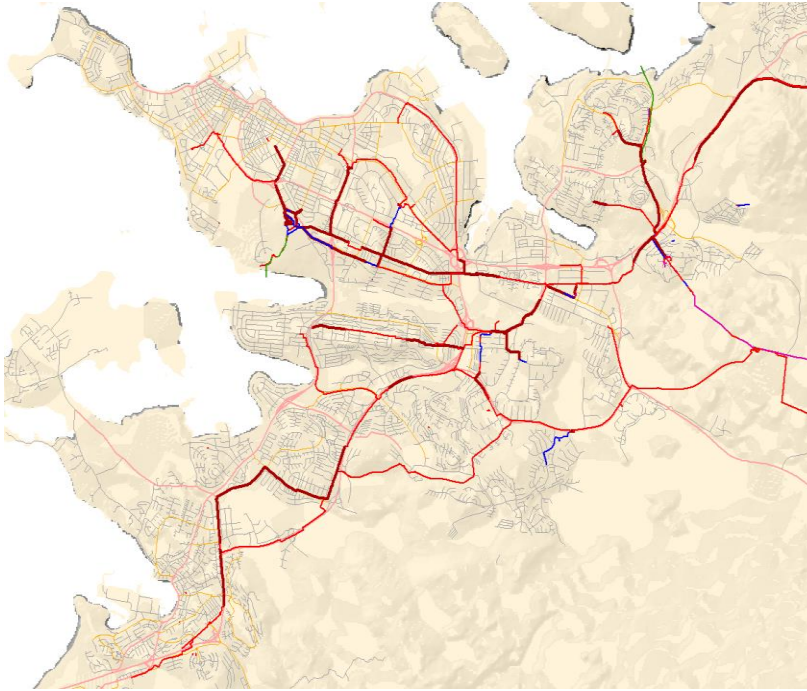
Overview of the Distribution System

- Power: About 900 MW heat power
- Pipe length: 5.600 km
- Pipe max diameter: 1,0m
- Number of tanks: 30
- Total tank size: 110.000 m3
- Age of tanks ranging from 5 to 40 years
- Tank size ranges from 10m3 to 10.000 m3



Main pipes 350 mm and larger

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Grafarholt´s tanks Reykjavík

51.000 m3, water temp. 80°- 90°C

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Challenges - Operation of Tanks

1. Corrosion in steel
   - Corrosion from inside
     - Often above water level
   - Corrosion from outside
     - Water gets throuh the tank´s weathercoat
2. Corrrosion protection inside the tanks
   - New methods of corrosion protection that last longer are being explored
3. Good methods to assess the condition of the tank

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Current State Assessment

The condition of the tanks has been assessed

- Inspection every 7 years
- Visual inspection
- Spot metering
- Repair history
- Security perspective

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Condition Assessment – New Methods

In additon to traditional methods

- Scanning
  - Evaluate the steel thickness in the tankwalls and -floor

- Thermal camera using drones
  - Evalute the surface of the tank
  - Evalute the insulation of the tank
  - Evaluate the weathercoat

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Tank Scanning

Full scale survey of one district heating tank performed in 2017

- Experts in tank scanning were contracted
- Bottom and walls scanned
- Roof is visually inspected

Construction year: 1987
Capacity: 8.500 m3

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Tank Scanning

- Preparation
  - Empty tank, sandblasting and cleaning
- Scanning
  - The condition assessment took three days + reporting work
- Report
  - Turns out that the tank is in pretty good shape
- Several places mapped where corrosion has started
  - Spot repairs performed

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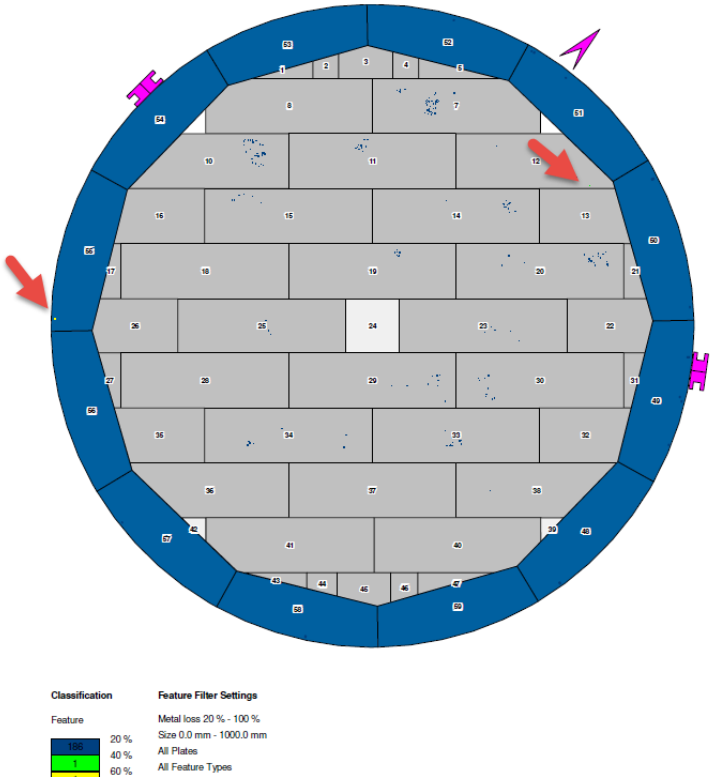
Tank Scanning - Results

Condition of the tank´s bottom

- Damaged in two places where the metal loss is 40% or more

Floor Map



Classification

Feature

125	20 %
1	40 %
	60 %

Feature Filter Settings

Metal loss 20 % - 100 %
Size 0.0 mm - 1000.0 mm
All Plates
All Feature Types

List of Features

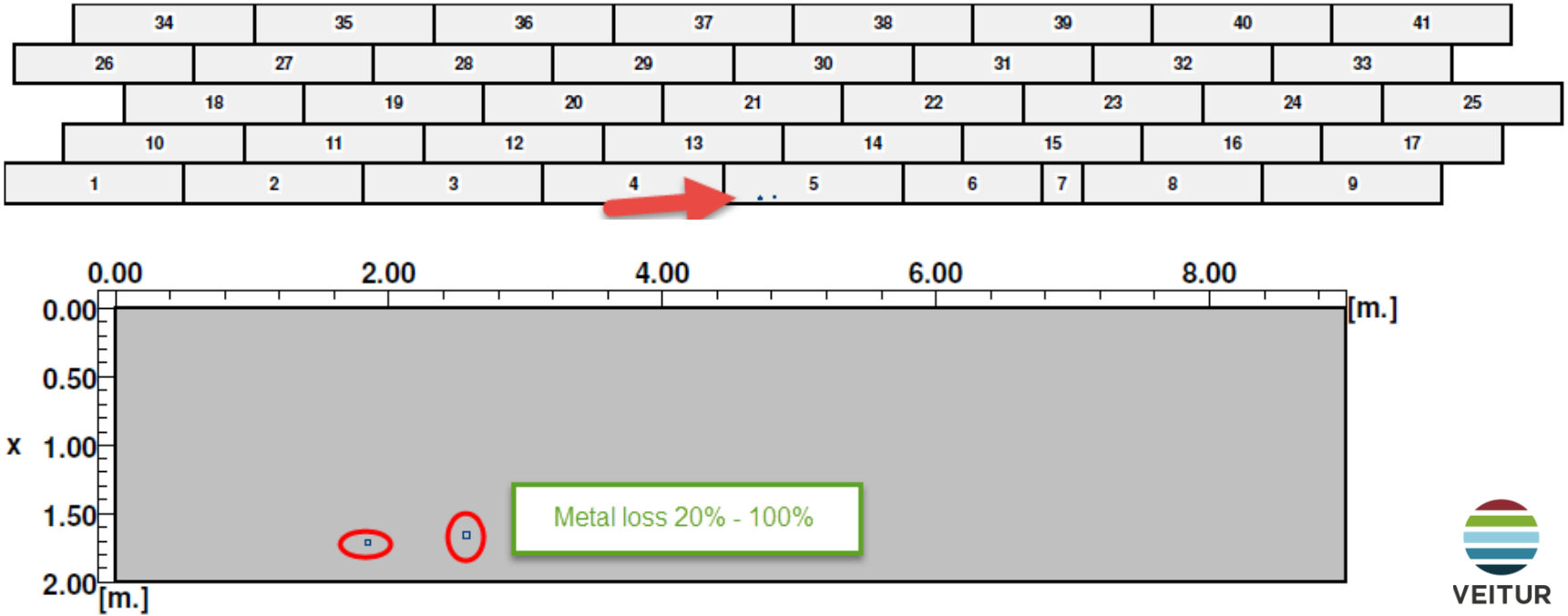
Metal loss 40 % - 100 % ; Size 0.0 mm - 1000.0 mm
All Plates ; All Types ; All Methods (the accuracy of feature pos. is +/- 50 mm)

No.	Plate No.	X Pos. [mm]	Y Pos. [mm]	X Size [mm]	Y Size [mm]	Depth [%]	Type	Method	Location	Classification
1	12	1850	4777	8	11	40	Metal Loss	TBit	SK	Inspection Side
2	55	1387	5083	16	20	65	Metal Loss	TBit	AN / CA	Inspection Side

Tank Scanning - Results

Condition of the tank´s walls

- Corrosion found in two places, metal loss more than 20%



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Tank Scanning – In Action

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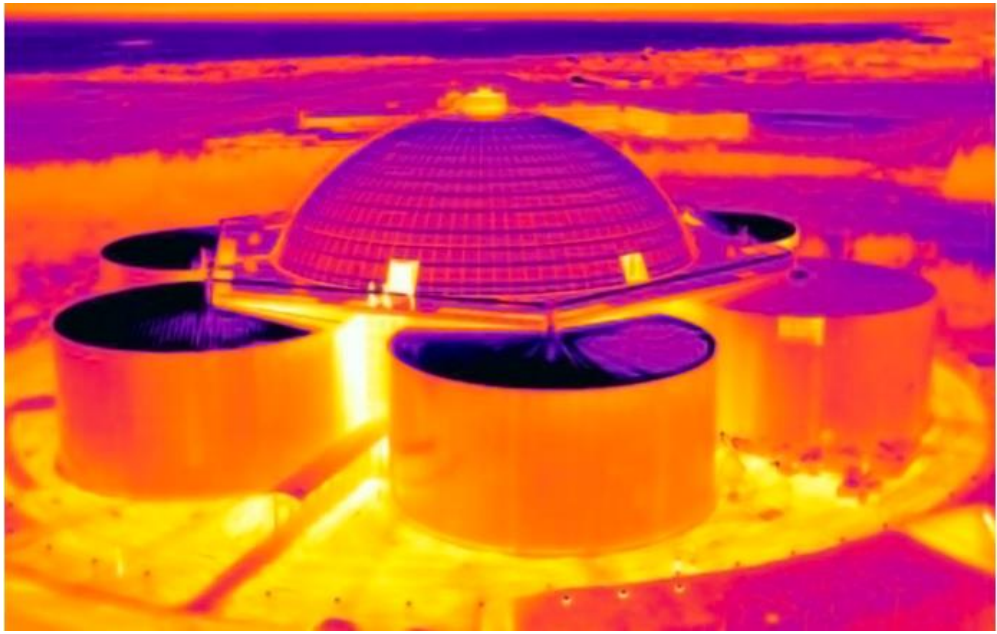
Tank Condition Assessment by Thermal Camera

- Can be viewed from outside with tank in operation
- Good analysis of poor insulation
- Benefits
  - Quick analysis
  - No need for tank entry
  - No need to open the weathercoat



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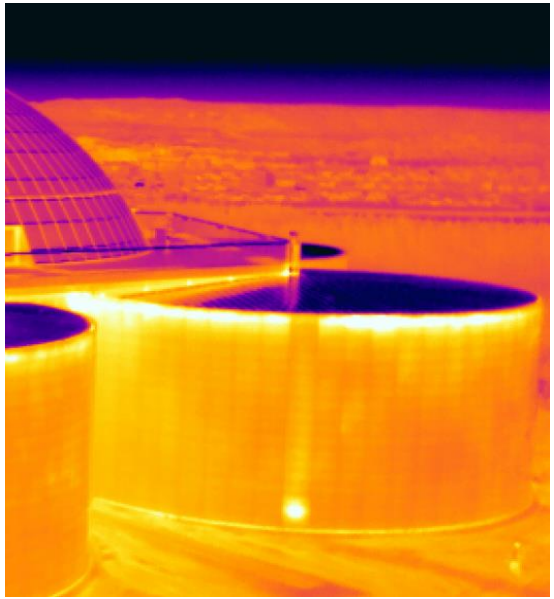
Tank Condition Assessment by Thermal Camera

Use of drones for thermal imaging

- Tanks found in good condition



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Thank you

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