



DRONESYSTEMS

Leak detection with drones in DH systems

THERMAL INSPECTION SPECIALIST

Smart Heating Croatia 2021
Danish Croatian District Heating Days
22-24.09.2021



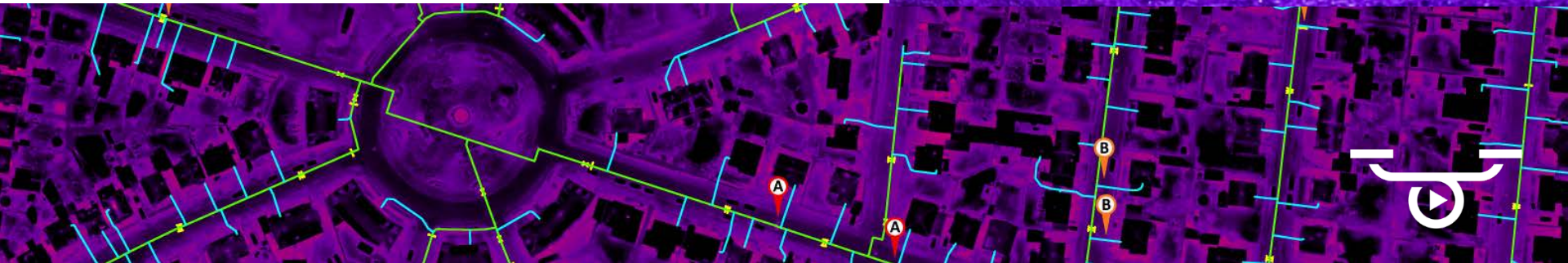
COMPANY

- ▶ Founded in 2015
- ▶ Specialists in thermal mapping and data analysis
- ▶ Primary market: District heating
- ▶ Leading provider in Denmark with 150+ district heating customers
- ▶ Based in Aarhus, Denmark



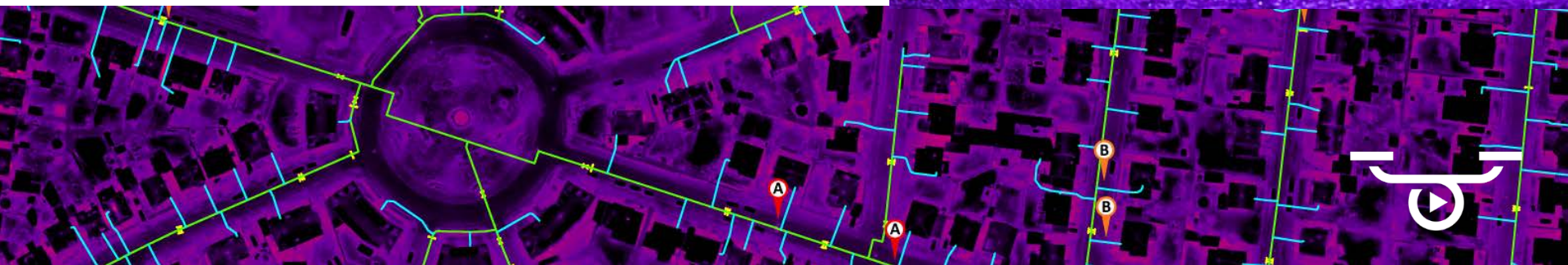
OUR SERVICES

- ▶ Thermal drone inspections of district heating networks, in collaboration with local drone pilots/partners.
- ▶ We deliver thermal ortomaps and analyses in Teraplan, our unique cloud-based web platform, developed and maintained by Drone Systems.
- ▶ Teraplan provides a total overview of the network including general condition assessment.
- ▶ Teraplan can be used for prioritized renovation planning.



WITH OUR SERVICES WE HELP OUR CUSTOMERS TO:

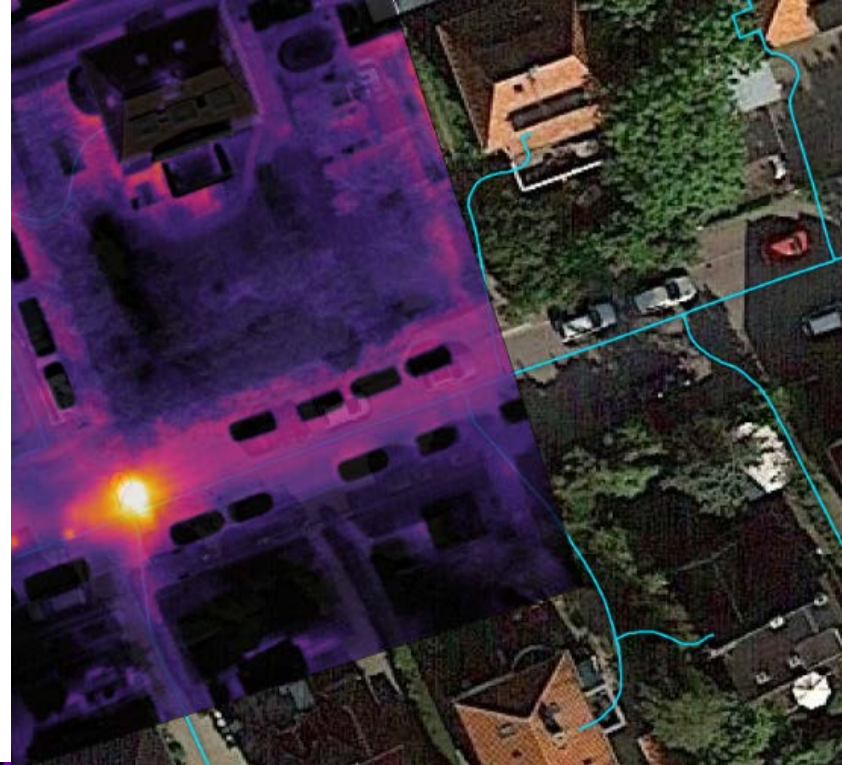
- ▶ Getting full overview of the condition of their district heating network.
- ▶ Reduce heat losses.
- ▶ Finding leaks, they cannot find on their own.
- ▶ Saving money.
- ▶ Benefitting the environment.



TERAPLAN

Generating value from thermal data

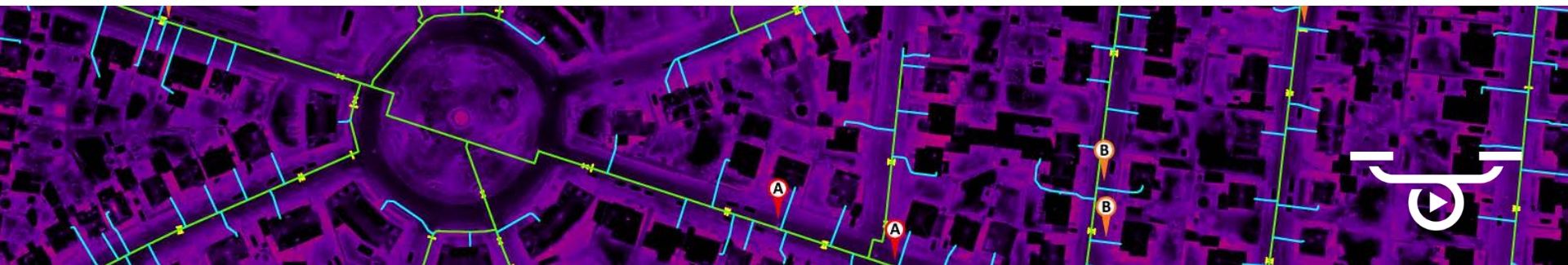
- ▶ Teraplan is a cloud-based web platform tailored for presenting thermal survey results for district heating companies.
- ▶ High quality and accurate radiometric ortomaps, analysed and presented in Teraplan (Interactive dynamic mapping)
- ▶ Dynamic tool, providing full overview
- ▶ Simple and easy-to-use
- ▶ Reporting and workflow capabilities



TERAPLAN

Generating value from thermal data

- ▶ Teraplan only contains functions relevant for the district heating domain
- ▶ Personal logins to own networks
- ▶ GIS integration
- ▶ Developed and maintained by Drone Systems



A B C D E F #

Filter

Roter Delta T

Ledningsregistrering

M1 M2

Vælg Sammenligning

Sej Adresse

Lemvig, Feb-Mar 2020



Map

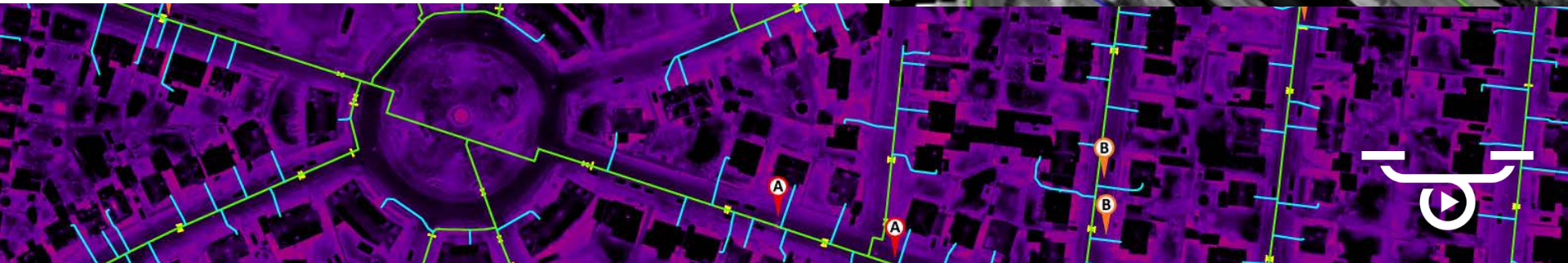
Satellite



REFERENCES ABROAD

- Banja Luka, Bosnia and Herzegovina
- Nottingham & Sheffield, UK
- Torshavn, the Faroe Islands
- Lerwick, Shetland
- Drammen, Mo & Lillestrøm, Norway

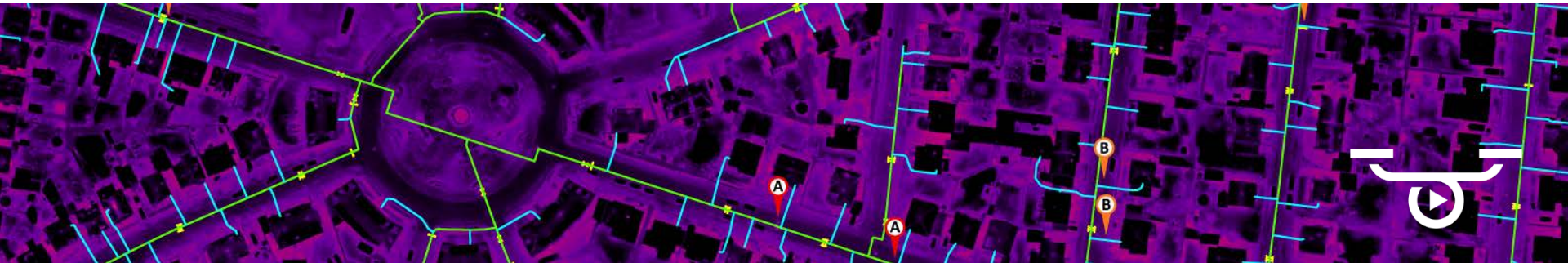
We use fixed-price agreements.



TECHNICAL SPECIFICATIONS

MATRICE 600 PRO

- ▶ Diagonal Wheelbase: 1133 mm
- ▶ Dimensions: 1668 mm x 1518 mm x 727 mm with propellers, frame arms and GPS mount unfolded (included landing gear)
- ▶ Weight including 6 batteries: 10 kg
- ▶ Battery exchange: approx. every 20 min
- ▶ Max ascent speed: 5m/sek



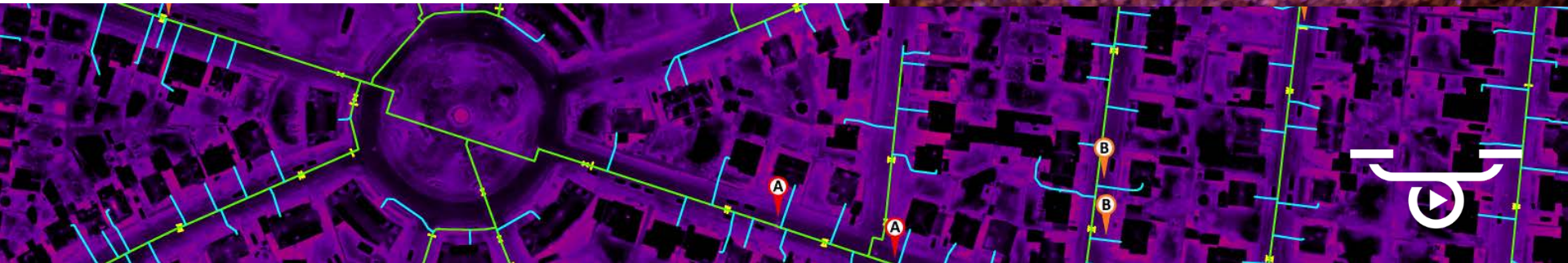
WEATHER REQUIREMENTS

Weather Requirements

- ▶ Temperature -5°C to 8°C
- ▶ Mean wind $< 6\text{m/s}$
- ▶ Relative Humidity $< 90\%$
- ▶ Dry surfaces

Weather Recommendations

- ▶ No precipitation the day before data capture.
- ▶ As small as possible variations in temperature 24h prior to data capture.





Client Statement

HOFOR, Copenhagen

“With the drones’ temperature measurements, we have refined our monitoring of the district heating network. We can now make a better planning and prioritization of our preventive efforts, and at the same time have the most acute problems repaired and closed. We detect poor insulation and leaks so we can quickly repair leaks on jackets and pipes.

Our pipeline network presents a huge value, so it is always interesting to know the condition of the network even better, and we get the opportunity to do so with the drone measurements.”

Bo Jensen Møller

Section leader, operation at HOFOR





Client Statement

LEMVIG District Heating Plant

"We are very pleased with the black/white mosaic from Drone Systems. A merger between Ramme and Lemvig district heating plants in 2019, meant that we took over a network registration drawn on the best belief. The mosaic revealed several places where the network registration differed from the thermography.

With the help of the GIS integration our GIS supplier has subsequently been able to make corrections."

Thomas Byskov

Distribution Manager at Lemvig District Heating Plant





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