

Abstract

# Mid-infrared monitoring and image processing in rotary combustor

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Impact of the declining domestic workforce in Japan is becoming increasingly serious, making it difficult to secure workers for operation and maintenance of waste treatment facilities. To cope with this situation, there is an urgent need to develop technologies that can support and automate operation of the waste incineration facilities by utilizing such as IoT and AI techniques.

We KOBELCO Group have been developing combustion control techniques for rotary combustor (rotary stoker-type) to make the operation automatic instead of manual by the workers. As an effort to contribute to the automatic operation of the combustor, we have attempted to observe inside of the rotary combustor by using mid-infrared camera with passing-through-flame bandpass filter as shown in Figure 1, which is difficult to see inside the combustor by using visible light due to the influence of flame and gasses.

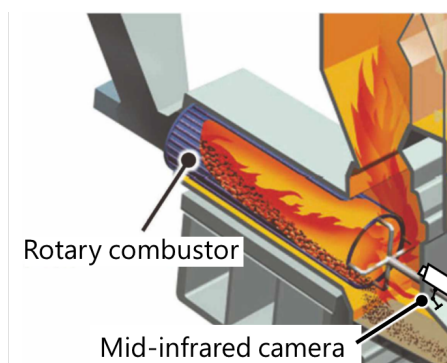


Figure 1. Rotary combustor  
(rotary stoker furnace)

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As a result of mid-infrared monitoring, it is confirmed that the refuse layer, which are fed from the hopper and in the process of combustion, can be clearly observed. For evaluating the condition of rotary combustor, image segmentation is applied to the mid-infrared images using deep learning model (Mask2Former1) by fine-tuning to our data set. As shown in Figure 2, we confirmed that the model can be identified the refuse layer and rotary tube (combustor structure) accurately in the mid-infrared image. In this presentation, a monitoring technique of the combustor condition by using image segmentation results of mid-infrared images is reported.

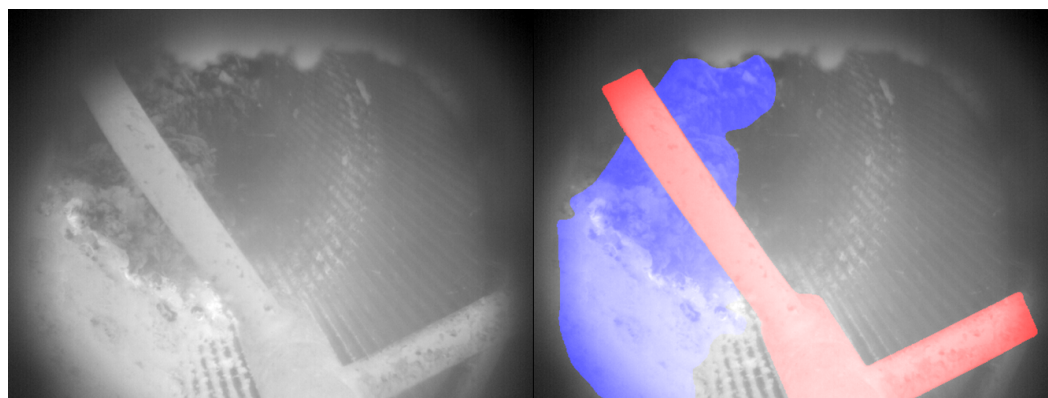


Figure 2. Left: Mid infrared image of the rotary combustor. Right: Result of image segmentation by the fine-tuned Mask2Former model (blue: refuse layer, red: rotary tube)

## References

1. B. Cheng et al., Masked-attention Mask Transformer for Universal Image Segmentation, In CVPR, 2022.