# MELT Recommendation for Inclusion on the Danish Environmental Protection Agency's Technology List

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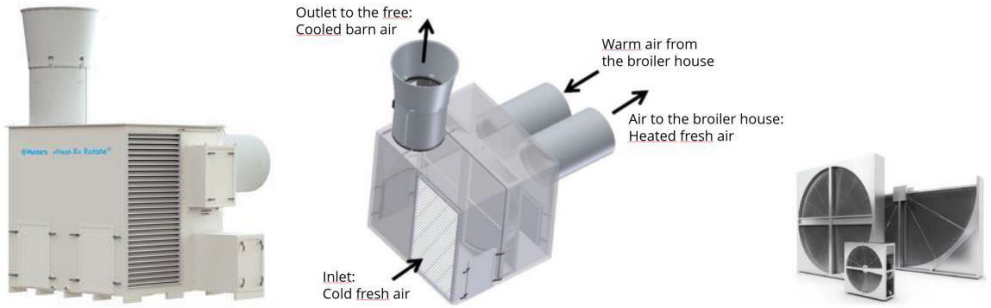
| Applicant | Munters A/S<br>Lyngvej 1, 9000 Aalborg<br>Telephone: 98 62 33 11<br>Att: Hans-Henrik Pedersen. E-mail: hans-henrik.pedersen@munters.com |
| Date of application | 7 December 2020 |
| Name of Technology | Munters Heat-X Rotate rotary heat exchanger for poultry houses |
| Description of the Technology | Munters Heat-X-Rotate is a heat exchanger with a rotating wheel.<br>  <br><br>Heat-X-Rotate Air inlet and outlet Rotating wheels<br><br>The heat exchanger draws air from the barn and releases the exhaust air to the environment through a traditional chimney outlet. There is also a fan that blows air into the barn. Exhaust and intake air passes through the Heat-X Rotate unit. In the Heat-X Rotate unit, there is an electrically driven wheel, consisting of a series of metal channels in the direction of the airflow, which transfers energy from the hot exhaust air to the cold supply air.<br><br>The Munters rotary heat exchanger for poultry houses comes in two sizes, respectively<br>10 000 $m^3$/hour and 20 000 $m^3$/hour.<br><br>In addition to the heat exchanger, internal air circulation fans must be installed in the under-roof housing space, which receive preheated outdoor air from the heat exchanger and distribute the air throughout the housing space. The fans have a typical output of 5 000 – 7 000 $m^3$ $hour^{-1}$ and are installed so that the air is blown horizontally along the length of the barn. |
| MELT Setting | The Munters Heat-X Rotate rotary heat exchanger for conventional broiler houses is recommended for inclusion in the Technology List with a 28% reduction in ammonia emissions in conventional broiler houses. This reduction assumes:<br>• the capacity of the heat exchanger is at least 12 $m^3$ $hour^{-1}$ $m^{-2}$ of production area in the barn.<br>• the capacity of the recirculating fans is at least 26 $m^3$ $hour^{-1}$ $m^{-2}$ of production area in the barn.<br>• that the heat exchanger's capacity is utilised throughout the production period before another air intake is used. However, the heat exchanger may be switched off during periods when the ventilation demand exceeds 80 $m^3$ $hour^{-1}$ $m^{-2}$ of production area in the barn.<br>• that the capacity of the recirculating fans is utilised throughout the production period. |

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| Reason for Recommendation | Munters rotary heat exchanger Heat-X Rotate for broiler houses has been tested according to VERA TEST PROTOCOL for livestock Housing and Management Systems, Version 3:2018-09 and the Danish Environmental Protection Agency's so-called more flexible testing within technology list level.<br><br>The tested model has a capacity of 20 000 $m^3$ $hour^{-1}$ and has been tested in two houses with approx. 23 000 and approx. 31 000 chickens. The production area in the two barns was 1 236 and 1 624 $m^2$ respectively. Recirculation fans with a total capacity of 30 000 and 42 000 $m^3$ hour-1 respectively in the two barns were mounted under the roof and provided internal distribution of barn air and heat exchanger air. The barns used were equipped with a traditional negative pressure ventilation system with wall vents to handle the part of the ventilation demand that was beyond the capacity of the heat exchanger.<br><br>The technology utilises the energy in the exhaust air from the barn to heat the intake air using a heat exchange system. In addition, the system consists of an air circulation system in the barn in order to<br>distribute the heat exchanger system's air intake and increase the air velocity over the floor surface.<br><br>The principle of ammonia reduction is drying out the bedding using air/air-heat exchange in combination with the internal air circulation system. The ammonia-reducing effect found is believed to be largely due to the fact that the internal air circulation system increases the air velocity over the floor surface, which, together with the supply of warm dry air via the heat exchanger system, increases the drying of the litter, thereby delaying the decomposition of uric acid into ammonia.<br>The ventilation performance in barns with the heat exchanger system is higher than barns without a heat exchanger system, which helps to remove evaporated water from the barn space and reduce humidity.<br><br>The test demonstrated a significant ammonia-reducing effect of the technology in both of the barns studied.<br><br>The test was based on a production period of 31 days per batch of chickens, and daily ammonia emission values showed that the effect of the technology decreased from day 24 and that from day 29 the technology no longer had a detectable effect.<br><br>The production areas in the two barns are provided by the test institute after MELT has approved the test report.<br><br>The technology is not considered to have an impact on odour and dust emissions, so these emissions have not been verified.<br><br>The Munters rotary heat exchanger Heat-X Rotate has demonstrated satisfactory operational stability in the test. |

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| | It should be noted that the manufacturer has requested an entry where the environmental effect does not decrease with the length of the production period, referring to a heat exchanger model ACU+ from Rokkedahl Energi, which is included in the technology list with an ammonia-reducing effect of 28% regardless of the length of the production period. |
| Recommended text for The technology list | Same wording as for the field: MELT setting. |
| MELT experts | Bjarne Schmidt Bjerg and Peter Kai.<br>ETA-Danmark A/S case handler: Thomas Bruun. |
| Recommendation sent to Danish Environmental Protection Agency (date) | 15 November 2023 |
| Decision of the Danish Environmental Protection Agency (to be completed by The Danish Environmental Protection Agency) | |