

Responses to pre-workshop questions – ventilation air methane suppliers

	Written feedback to share with workshop participants
Can ventilation air methane abatement be implemented at mine sites that have ventilation air methane concentrations down to 0.2%?	Anguil Environmental Will guarantee this performance. Yurcent Environment Yes, the most effective measure for ventilation air methane emission reduction is adopting regenerative thermal oxidiser treatment. When the methane concentration reaches 0.18% – 0.2%, the regenerative thermal oxidiser can achieve self-sustained operation, meaning no supplemental fuel is required, and the energy consumption is limited to electricity usage. When selecting a regenerative thermal oxidiser, it is essential to choose one with higher purification efficiency and thermal efficiency, namely it must be equipped with a purging chamber. Peak Carbon Australia Yes, there are other regenerative thermal oxidiser original equipment manufacturers in the room, such as Anguil, who can validate this. As an aside, anyone in the room is welcome to come visit Peak Carbon's full scale regenerative thermal oxidiser in Wales (UK) operating at 0.2% on working mine. Biothermica Technologies Yes. Biothermica's VAMOX® regenerative thermal oxidiser systems are designed for and guaranteed to maintain stable operation at methane concentrations down to 0.20%. The technology has been successfully demonstrated at both pilot and commercial scales across a broad range of methane concentrations. BAOLAN EP INC. We agree with the rationality of using regenerative thermal oxidiser for processing; Through our calculations, when the methane concentration reaches 0.15%, the regenerative thermal oxidiser system can be completely self-heated, after self-heating it does not need extra energy consumption. The treatment cost is very low, but can bring about good environmental benefits. At the same time, under this concentration condition, the treatment safety is also very high. In summary, we believe it is feasible to use regenerative thermal oxidiser technology to treat 0.2% concentration of ventilation air methane. CSIRO The CSIRO catalytic ventilation air methane mitigator (CataVAM™) is a catalytic oxidation process operating at lower temperatures (450-650°C). It enables self-sustaining destruction of low levels of ventilation air methane below 0.2% methane without external fuel or energy input. At its core is a proprietary honeycomb-shaped catalytic regenerative bed, engineered for high performance and robust deployment in real-world mining conditions. Successful pilot trials at the Appin mine in NSW showed approximately 98% methane destruction efficiency across ventilation air flow rates up to 1.3 Nm³/s and methane concentrations between 0.15-0.5%. Key features include: - Self-sustaining operation with <0.2% methane, tested down to 0.15%. - Higher ventilation air throughput, indicating a smaller unit footprint and reduced capital expenditure. - Lower operating temperatures, enabling heat recovery from low concentration ventilation air methane (0.3-0.5%). - Low pressure drops across the bed, reducing energy requirements and operating costs. - Improved techno-economics and net carbon avoided. The outstanding results from CataVAM site trials with actual ventilation air methane at Appin indicate that regenerative catalytic oxidation has a much higher technological readiness level and commercial readiness level than enrichment, achieving TRL 7 for CataVAM.

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What factors influence the physical space required?	Anguil Environmental Site constraints Yurcent Environment The influencing factors include: 1. The volume of ventilation air methane to be treated. 2. The structural design of the regenerative thermal oxidiser. (Adjustments can be made according to the venue) Peak Carbon Australia The number of regenerative thermal oxidiser is proportional to flow rate, the footprint of the regenerative thermal oxidiser (different original equipment manufacturers have different footprint) and the length of duct required to meet process safety requirements. Biothermica Technologies The system footprint is primarily driven by the required airflow capacity and the minimum methane concentration at which the unit must reliably operate. Project Portfolio Management • Ventilation shaft capacity is the primary driver of space required - larger ventilation fans will require a larger footprint for ventilation air methane abatement • High voltage requirements - augmentation of high voltage infrastructure may be required. • Local topography • Fan ducting configuration on the Evase • Proximity to local communities • Land ownership may be an issue given the size of the footprint required. BAOLAN EP INC. The volume flow rate of the ventilation air methane to be treated is directly proportional to the area occupied by the treatment equipment. Therefore, reasonable control of ventilation air methane emissions is to discuss the source control of emission reduction. We also believe that through the promotion of ventilation air methane emission reduction, the rationality of emissions will be considered at the first time, which will indirectly promote source emission reduction.

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<i>Are there other factors related to technical feasibility that we should discuss?</i>	Anguil Environmental Volume of ventilation air methane to be mitigated Yurcent Environment Ventilation air methane is often accompanied by a small amount of coal dust. It is recommended to test the dust content and moisture content in the ventilation air methane. Considering that long-term operation may clog the heat storage ceramics, the structural design and material selection of these ceramics are particularly important. Biothermica Technologies No. Ventilation air methane concentration range, flow capacity, available space on site, and safety are the main factors that determine the technical feasibility of an abatement project. Project Portfolio Management • Connection to an operating mine and the risk of explosive methane concentrations in the return shaft connected to a ventilation air methane facility. • Impact of system back pressure on the performance of the mine ventilation system. • Electrical incoming load requirements – ventilation air methane facilities require considerable power which may not be available from the high voltage network • Performance of abatement facilities with the impurities in the ventilation air methane - coal dust and stone dust. • Integration of control system to meet requirements of site management plans. • Life of mine and economic viability for ventilation air methane abatement facilities for mines with limit time on current approvals. BAOLAN EP INC. Regenerative catalytic oxidation (thermal storage catalytic oxidation) technology may also be a technical direction for ventilation air methane treatment in the future. Regenerative Catalytic Oxidation is more suitable for processing low concentration conditions, such as methane concentration less than 0.1%, under this working condition concentration condition, the energy consumption cost of regenerative thermal oxidation technology will be relatively high, which is RCO will be a more suitable choice. With the introduction of the catalyst, the oxidation temperature will be reduced to 400-500°C, which will greatly save energy.

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What are the steps and timelines for implementing a ventilation air methane abatement trial?	Anguil environmental Does not believe a trial is necessary as regenerative thermal oxidation is proven technology Biothermica Technologies Once an agreement with the mine is reached, the typical lead time for engineering, procurement, construction, and commissioning is estimated at eight to 12 months, subject to the availability of long-lead critical equipment. Yurcent Environment 1. Provide the ventilation air methane temperature, volume, and methane concentration for the trial, as well as the regenerative thermal oxidation installation site dimensions. 2. The manufacturer provides the technical proposal, both parties confirm and sign the agreement. (15 days) 3. The manufacturer conducts production (80 days), pre-assembly (25 days), shipping (40 days), and on-site installation and commissioning (30 days). 4. On-site trial operation and collection of relevant data. (10 days) BAOLAN EP INC. 1. Regenerative thermal oxidation in ventilation air methane is already a proven technology, we don't think it's necessary. 2. If we really require the trial we suggest the government take the lead in selecting several typical mining companies for the trial. 3. We can provide a regenerative thermal oxidation from 2000-5000CMH for trail. That will usually take about two or three months for manufacturing, 30 days for shipment, 40 working days for installation, 40 working days for commissioning and data collection (The end user needs to bear the remaining costs, such as logistics and import-related expenses, pipeline ventilation system-related expenses, installation and commissioning costs, etc.)

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What are the steps and timelines to take the trial to full scale?	Anguil Environmental Can produce and deliver 200,000 Nm³/hr ventilation air methane regenerative thermal oxidation six months after drawing approval and then the same again every month after with our current supply chain infrastructure. We can increase that as required for increased delivery capacity. Biothermica Technologies Same answer: once an agreement with the mine is reached, the typical lead time for engineering, procurement, construction, and commissioning is estimated at eight to 12 months, subject to the availability of long-lead critical equipment. Yurcent Environment Detailed planning and scheduling should be carried out based on the volume of ventilation air methane to be processed. Project Portfolio Management Step 1: Design and test the ventilation air methane plant connection infrastructure and control system (without ventilation air methane abatement facilities connected) with the mine at full scale - 12 months. Step 2: Prefeasibility for a full-scale facility (including environmental impact statement and requirements for lodgement of a development consent) - 12 months. Assume that the development application would be lodged within the first six months of the prefeasibility study. Step 3: Secure development consent from the NSW Government - 12 months from lodgement. Step 4: Complete a feasibility study - 12 months following the completion of the prefeasibility. Step 5: Construction and commissioning - 18 months from investment decision. Total estimated timeline is approximately four years with some activities above overlapping BAOLAN EP INC. 1. After the trial, we can determine the schedule based on the actual flow rate. The usual situation is as follows (based on an air volume of 200000Nm³/h) 2. All design and documentation take about three or four months (some documents need to be submitted according to project progress). Production and pre-assembly according to drawings take about five or six months, logistics time is about one month, on-site installation and commissioning take about five months.