**Title:** Energy Savings with a Scalable Source Capture Ventilation

**Performing Organization:** PlymoVent Corp

**Abstract:**

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Energy Savings with a Scalable Source Capture Ventilation

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Why source extraction?

- Significant Energy Savings are realized when capturing the process pollutant at the source vs. using general ventilation methods.
- When using general ventilation a high increase in air changes is required at a very high cost.
- Protect the operators breathing zone and prevent the contaminant from being spread throughout the building and effecting other people.
- 60% savings on Heating and Electric Bills can be achieved when using the source capture method.
- 90% savings can be achieved when using source capture combined with “Demand Controlled Ventilation”.

*Run the process only at the capacity required at any given moment*
SOURCE CAPTURE IS COMMONLY USED FOR THE FOLLOWING PROCESSES

- Welding Applications
- Grinding Applications
- Machining Applications
- Vehicle Exhaust Applications
Methods of process ventilation
Natural ventilation
General ventilation with ceiling or wall mounted fans
General ventilation with re-circulation
Source Capture Fume extractors
Source Capture with energy saving controls and a variable speed drive
Source Capture of welding smoke
Source Capture of Grinding Dust
Source Capture of oil mist generated from CNC Lathes
Source Capturing of oil mist with 4” arms---Open machine tools
Click Here to View Video
Source Capture of Vehicle Exhaust fumes in a maintenance repair facility
Source Capture of Vehicle Exhaust fumes in an Army tank repair facility
Source Capture of vehicle fumes at Dyno Testing Station
Click Here to View Video
PROCESS VENTILATION WITH HEAT RECOVERY

- General ventilation with heat exchanger
- Air Supply
- Exhaust Air
- Pressure Transmitter
- Pressure Hose
- Frequency Inverter
- Silencer
- Automatic Damper
- Hood
- Welding Fume
- Supply Air
- Exhaust Air
- Robot Welding
- Extraction Arm
- Multi Dust Bank
- Fan
Click Here to View Video
TYPICAL CONTROL SENSOR TYPES

• Pressure differential sensor
• Infra-red light sensor
• Inductive electrical sensor
• Particulate sensor
• Relative humidity sensor
• CO sensor
• Hydrogen sensor
• Temp. sensor
• And many others
## Energy Saving Analysis

Average temperature on location C: 6 degrees C  
Ambient air temperature: -15 C  
Two shift operation hours: 3520h  
Year hours: 8760h  
Energy required to heat 1 m³ air 1 degree C: 0.348W  
Min. required efficiency on heat exchanger: 50%

<table>
<thead>
<tr>
<th>Without controls and heat exchanger</th>
<th>With controls and w/o heat exchanger</th>
<th>With controls and heat exchanger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pcs \ point m³/h /year \ Usage \ % airflow/h</td>
<td>Pcs \ point m³/h /year \ Usage \ % airflow/h</td>
<td>Pcs \ point m³/h /year \ Usage \ % airflow/h</td>
</tr>
<tr>
<td>Extraction arms manual welding</td>
<td>5 \ 1 000 \ 3520 \ 100 \ 5 000 \ 30 \ 1 500</td>
<td>5 \ 1 000 \ 3520 \ 100 \ 5 000 \ 30 \ 1 500</td>
</tr>
<tr>
<td>Suction tables manual welding</td>
<td>24 \ 1 800 \ 3520 \ 100 \ 43 200 \ 30 \ 12 960</td>
<td>24 \ 1 800 \ 3520 \ 100 \ 43 200 \ 30 \ 12 960</td>
</tr>
<tr>
<td>Suction hoods robot welding</td>
<td>8 \ 1 800 \ 3520 \ 100 \ 14 400 \ 80 \ 11 520</td>
<td>8 \ 1 800 \ 3520 \ 100 \ 14 400 \ 80 \ 11 520</td>
</tr>
<tr>
<td>General ventilation</td>
<td>1 \ 28 000 \ 8760 \ 100 \ 28 000</td>
<td>1 \ 28 000 \ 8760 \ 100 \ 28 000</td>
</tr>
<tr>
<td>Total airflow</td>
<td>90 600</td>
<td>53 980</td>
</tr>
</tbody>
</table>

Energy consumption per year process ventilation: kWh 1 063 000 445 885 156 153  
Energy consumption per year general ventilation: kWh 1 195 000 1 195 000 421 431  
Power consumption on fan motor: kWh 497 340 419 724 419 724  
Total: kWh 2 755 340 2 060 609 997 308  
Savings with control equipment: kWh 694 731  
Savings with control equipment and heat exchanger: kWh 1 758 032
HOW ARE SAVINGS ACHIEVED?

- **Lower energy consumption** – energy consumption is reduced since the ventilation system only operates when required by the demand of the process.

- **Lower maintenance costs** - maintenance cost will be reduced since the system will not be required to operate at 100% capacity at all times.

- **Lower operating costs** – operating costs will be reduced by more efficient energy saving blower motors which in turn are energy managed by demand controllers.

- **Lower installation costs** – installation costs are reduced by reducing the overall size of the system and its related components such as electrical wiring, motor starters, size of ductwork, and the need for fire suppression.

- **Lower initial purchase costs** – since few manufacturing processes operate at 100% demand, a savings will be achieved by reducing the overall air volume of the system and its filtering systems.
QUESTIONS FROM THE AUDIENCE
THANK YOU FOR YOUR PARTICIPATION.

• If you have any questions or comments, please email them to sbarnkow@plymoventusa.com
• Or Call 732-371-7583