U. S. Army Corps of Engineers Vapor/Off-Gas Blower And Piping System Checklist

Installation Name	_____
Site Name / I.D.	_____
Evaluation Team	_____
Site Visit Date	_____

This checklist is designed to facilitate the performance evaluation of blowers and piping systems for air, off-gas or vapor. It is divided into the following sections:

1. Evaluation team composition
2. Typical treatment objectives
3. References
4. Data collection requirements
5. Performance analysis calculations
6. Adequacy of operations and maintenance
7. Typical performance problems
8. Alternatives for possible cost savings
9. Supplemental notes and data.

The checklist provides suggestions for information gathering, and space has been provided to record data and notes from the site visit. Supplementary notes, if required, should be numbered to correspond to the appropriate checklist sections.

1) Evaluation Team Composition

The following disciplines should be included in the evaluation team for the vapor and off-gas blower and piping systems.

- Process Engineer (site visit, blower system performance evaluation)
- Mechanical Engineer (blower system performance evaluation)
- Cost Engineer (cost of alternatives)

2) Typical Treatment Objectives

Verify that the treatment objectives established when the systems were designed and installed are clear and still valid.

Blower and piping systems contain and move air, off-gas and vapor streams. Filters may be included to remove particulates from the off-gas stream or to catch vapor particles for recirculation. A poor match of blower capacity and required flow rate will effect process efficiency and performance. The operational and maintenance costs of a blower (and the associated off-gas treatment) may require a significant financial commitment over a long term.

3) References

Coordinate this checklist with the Liquid Piping and Pumping Systems, Process Instrumentation and Control, and with the appropriate treatment technology checklists (e.g., Air Stripper Performance checklist). Also review the operations and maintenance manuals of the specific pumps, blowers, and valves associated with this system. The following references may also be helpful:

CEGS 11215 [1]: Fans/Blowers/Pumps; Off-Gas
CEGS 02150 [1]: Piping, Off-gas

4) Data Collection Requirements

Review the performance of each individual piping system, including blowers, filter, flame arrestors, condensate removal devices, valves, and instruments. Record information needed to run performance calculations and to check the operation of the piping and pumping system. Include appropriate units with each value.

a) Record the nameplate information from the blowers, and other mechanical equipment for future reference.

_____

_____

b) Sketch process flow diagram (PFD), including blowers, filters, valves, and instrument locations, on the back of this sheet or a separate sheet.

c) Piping Data

Piping identification						
Pipe size						
Material of construction						
Vapor/Off-gas Characterization						
	Max.	**Avg.**	**Min.**	**Max.**	**Avg.**	**Min.**
Flow rate						
Pressure						
Temperature						

d) Verify the accuracy of <u>as-built</u> process flow and piping & instrumentation diagrams (P&IDs).

_____

e) Are all blowers, fans, filters, flame arrestors, condensate removal devices, valves, and seals operable? Are any blowers, fans, piping components valves, or seals leaking?

_____

_____

f) Do the blowers have the appropriate characteristics for the system and fluid? Are the blower drives fixed or variable speed?

_____

_____

g) Do the blowers operate continuously or intermittently? If intermittent, what controls the blower cycle and how long are the blowers on and then off?

_____

_____

h) Do the blowers make excessive noise or vibrate excessively? Date ____/____/____ of last alignment, balancing, repair, overhaul or replacement

i) Are the valves and valve operators accessible? Are any valves difficult for the operator to reach or manipulate? Are there any safety restrictions resulting from the locations where valves were installed? Are the valves of the appropriate typed for the system and fluid (e.g., are they corrosion resistant if they need to be?)

_____
_____

j) Are the filters effective for the system and particulates? Do the filters plug or require replacement frequently? Are they within the normal range?

_____
_____

5) Performance Analysis Calculations

Are the flow rates appropriate for effective remediation in the current circumstances? Check the submittals to verify that the blowers or fans are appropriate for the conditions.

_____
_____
_____

6) Adequacy of Operations and Maintenance

a) Verify that all ancillary equipment are maintained per manufacturers recommendations.

_____
_____

b) Is the piping and ductwork clearly labeled and are all valves tagged?

_____
_____

c) Is the piping and ductwork adequately supported? Are the hangers and supports in good condition?

_____
_____

d) Are the pipe/duct alignments, locations, and spacing appropriate?

_____
_____

e) Is the piping/ducting insulation in good condition, and is the heat tracing (if used) functioning properly?

_____
_____

f) Is the corrosion prevention system (e.g., protective coating) in good condition? (if applicable)

_____
_____

g) Are valves, valve operators, drivers, and controllers inspected and maintained as recommended in the operation and maintenance manual?

_____
_____

h) Are the sample ports, valves, and drains in good condition?

_____

i) Are metering systems inspected and maintained as recommended in the operation and maintenance manual?

_____
_____

j) Are there physical signs of leakage at shaft seals or piping/ducting connections?

_____
_____

k) Do any blowers show signs of excessive vibration? Are all blowers firmly supported?

_____
_____

l) Are any blowers throttled down to nearly shut-off to achieve the required flow rate? *(Severely throttled blowers operate less efficiently and may require more maintenance.)*

_____
_____

m) Is there a preventative maintenance program for blowers and are the blower maintenance records complete and up to date?

_____
_____

n) Verify that controls and alarms are working. Are there provisions to notify an operator of a malfunction when the unit is unattended?

_____
_____

o) Review the schedule for filter replacement. Is it adequate?

_____
_____

7) Typical Performance Problems

a) Determine whether or not the air stream operation vibrates excessively or produces excessive noise? Precision alignment and vibration isolation may be needed.

_____
_____

a) Is there evidence of a trend in the change of flow rate, temperature, or pressure over time? *(These symptoms may indicate scaling or deposition of sediment in the lines.)*

_____
_____

b) Are moisture and constituent concentrations high enough to be of concern in selecting pipe/duct or valve materials?)

_____
_____

c) Have there been any problems with cold weather operations, such as excessive condensate, condensate freezing, or damage to seals?

_____
_____

d) Is the blower/compressor cycle duration excessively short? *(These conditions may be detrimental to process operation and motor longevity.)*

_____
_____

e) Are any blowers reported to have excessive bearing wear and replacement frequency?

_____

_____

8) Alternatives for Possible Cost Savings.

The contaminant compounds in the vapor stream and/or the contaminant concentrations may have changed sufficiently that other alternatives are more cost effective. Consider the following:

a) Determine whether operation is still necessary or have the flows and concentrations decreased so that forced air movement can be terminated? Can the unit be easily bypassed if no longer needed?

_____

_____

b) Identify any high cost maintenance items. Are there alternatives that might reduce these high maintenance costs?

_____

_____

c) Is the piping/ductwork material of construction performance satisfactory? If not, consider insulation or replacement with a different material of construction. *(Thermal expansion and contraction of plastic pipe exposed to ambient conditions tends to destroy the joints.)*

_____

_____

d) Has the blower performed satisfactorily? Consider modification or replacement of motor and/or blower.

_____

_____

e) Consider the replacement of dilution valves with recirculation to reduce air handling requirements and to enhance concentration to the treatment system.

_____

_____

9) Supplemental Notes and Data

There are _____ pages of supplemental notes and data attached to this checklist.

_____

1 CEGS: USACE Guide Specifications for Construction, available at www.usace.army.mil/inet/usace-docs/.