ILEVE Technical day

Recirculating LEV systems

27th June 2018

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Overview of presentation

• Introduction
  – Why focus on recirculating LEV systems?
  – Background to workshop and forum

• Feedback from:
  – ILEVE/BOHS workshop (06/02/18)
  – Industry and Regulatory Forum (25/05/18)
Typical recirculatory LEV systems
Recirculation – Perceived benefits
Judging performance

- Test media / filter element / whole machine?
- Particle challenge – Separation efficiency (%)?
  - Standard aerosol challenge or ‘real’ aerosol challenge?
  - If standard, monodispersed or polydispersed aerosol?
- What do you measure
  - Mass?
  - Number?
Number vs Mass

**Number Distribution**
- **Mean** = 0.38 µm
- **Median** = 0.30 µm
- **SA** = 13467 cm²/cm³
- **Standard Dev** = 0.40

**Volume Distribution**
- **Mean** = 12.65 µm
- **Median** = 11.58 µm
- **SA** = 13467 cm²/cm³
- **Standard Dev** = 8.29
New filter media?

- ~100% separation efficiency (never seen one fail)
High efficiency particulate air (HEPA) filters

- Positioned close to the fume cupboard (above?)
- H14 (≥ 99.97% filter efficiency)

Most Penetrating Particle Size (MPPS)
Reminder what HSG 258 says

• Recirculation is acceptable as long as the air is thoroughly cleaned.

• Air cleaner must match the contaminant and its concentration

• Failure that can result in dangerous conditions, any recirculation system should incorporate monitoring and alerts
  – alarm for a blocked or failed filter
  – system to divert recirculated air out of the workplace connect to alarm
ILEVE/BOHS workshop on recirculatory LEV systems

• BOHS / ILEVE Conference 2018 (6th February)

• 3 (+1) questions posed
  – Q1. When should we be using recirculating units?
  – Q2. When shouldn’t we be using recirculating units?
  – Q3. How do you ensure they are working effectively and not contributing to risk?
  – Q4. What should come from this (output from the workshop)?
Q1. When should we be using recirculating units? (1 of 2)

• Never!

• Restrictions
  – Planning
  – Environmental
  – Practicalities

• Portability

• Process/contaminant
  – Contaminant toxicity
  – Frequency of use / RA
Q1. When should we be using recirculating units? (2 of 2)

• Filter performance
  – Make sure they are filtering
  – Matched to contaminant
  – Known filter performance
  – Consequences of filter failure are low

• Suitable monitoring
  – Accurate, reliable and sensitive
  – Saturations alarms
  – Fail safe filter (e.g. double carbon)

• Housing / shielding of filters (DSEAR?)

• Energy saving
Q2. When shouldn’t we be using recirculating units?

(1 of 2)

• For toxic, flammable, explosive substances, gases, carcinogens, sensitisers, biological

• Where there is potential for an externally sited unit

• Process/contaminants:
  – Multiple contaminants
  – High volume of contaminant
  – High temperature working
  – Frequent process changes
  – For solvents
  – Nano particles
  – Clean rooms
Q2. When shouldn’t we be using recirculating units?
(2 of 2)

• **Filter performance**
  – No filter fitted
  – High filter loading
  – Where filter breakthrough or release cannot be predicted or monitored (insufficient monitoring)
  – Vapours with no monitoring
  – Filters not guaranteed for specification of the material

• **Cost**
  – Through life costs don’t justify
  – When offered a cheap deal on recirculating filters
  – No tangible benefit to using – cost /benefit

• **Management** – complex / risk of failure / number of people
Q3. How do you ensure they are working effectively and not contributing to risk? (1 of 2)

• Filters
  – Date of filter change
  – Appropriate filtration for process
  – Examination and test of filters – challenge test
  – Safe change of filters

• Monitoring
  – Continuous monitoring of return air
  – Regular calibration of monitors
  – Airflow monitoring
  – Direct reading / Alarm system
  – Air sampling – Personal monitoring
  – Health surveillance
  – Smells / visual checks
Q3. How do you ensure they are working effectively and not contributing to risk? (2 of 2)

- **Maintenance**
  - Regular/ more frequent maintenance / inspections (risk based)
  - Trending of system (daily checks etc.)
  - TExT after replacement of filters and measure contaminant concentration in the return air as per L5

- **Logbook / commissioning data / user training**

- **Regulator competence similar to gas safe, NICEIC, SELECT**

- **Filter shields for open filters**

- **Design guidance**
Q4. What should come from this (output from the workshop)?
(1 of 2)

• Guidance and standards
  – HSE guidance and enforcement – “big stick”
  – Guidance on monitoring discharge air (e.g. isokinetic sampling)
  – Industry standards from ILEVE
  – Education on ALARP

• TEXT
  – Min. 6-monthly LEV testing for recirculating systems
  – TEXT reports should be reportable if a significant defect
  – Self-certification scheme e.g. similar to RIDDOR where all companies have to legally register and update LEV records online

• More specialised training
Q4. What should come from this (output from the workshop)? (2 of 2)

- Diagnostics or monitoring to be installed as a statutory requirement (part of CE marking)
- Close collaboration with other bodies
- Filters
  - Breakthrough data/filter life supplied by all manufacturers
  - Labelling of filters – similar to respirator cartridges
Industry and Regulatory Forum on LEV

- First meeting held 25th May 2018, CIBSE offices

- Members:
  - ILEVE (Chair am session)
  - HSE (Chair pm session)
  - BESA
  - EMADA
  - SAFed
  - INITA
  - UNITE
  - BOHS
  - UKAS
  - CIBSE
  - IOSH
  - SHAPA
  - FETA

- HSE presented a document ‘for discussion’
Proposal to develop criteria

- Commissioning data
- In use performance testing
- Criteria for exemption from information requirements
Commissioning data

• Commissioning data demonstrating the LEV can provide adequate control. For example
  – Air cleaner performance testing
  – Data showing the air cleaner is matched to the contaminant with specified in-use penetration characteristics
  – Volume flow rate parameters
In use performance testing

- Air sampling to confirm control effectiveness.
- Direct or indirect monitoring of the return air. An example of an indirect monitor could be the pressure drop or rise across a particle filter.
Criteria for exemption from data requirements

The systems are for intermittent processes that generate or emit small amounts (millilitre or gram quantities) of airborne low or non-hazardous contaminants.
Comments from forum on recirculation

- Require measurement of the air concentration and have an alarm system
- Static air monitoring is the only way of confirming control
- Calibration of monitors and alarms
- Require research on how they are used and user understanding
- Air flow is not a good indicator of control
Comments from forum on recirculation

- Recirculation of vapours should not be allowed
- Clarity will be required on terminology such as intermittent, gram quantities, low or non-hazardous contaminants etc.
- Guidance for different audiences e.g. employers, designers, installers etc.
- Mandatory
  - Log book
  - Filter change regime
  - Measurement gauges across filters
  - Filter flow rate
Comments from forum on recirculation

• Potential issues:
  – Increase in costs
  – Planning permission and space requirements
  – Increase fire & explosion hazards (bag filter)

• Going forward development of guidance Information requirements:
  – Data on the number of units being sold
  – Technical data on filters
Conclusion

- HSE policy framework
- Guidance on recirculation systems?
  - Industry / HSE?
- Probably best to address different areas separately rather than attempting to draft all encompassing guidance
Thank you

Any questions?