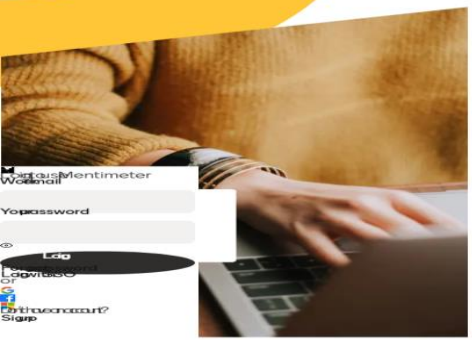
WEDNESDAY 14 JANUARY 2026

Air balance study

Jay Mullin
Energy management coach



By the end of this workshop, you will be able to:

- Understand the fundamentals of air balancing
- Interpret airflow data and diagnose imbalance issues
- Identify the next steps to support your air balance study

Follow along in the participant workbook!

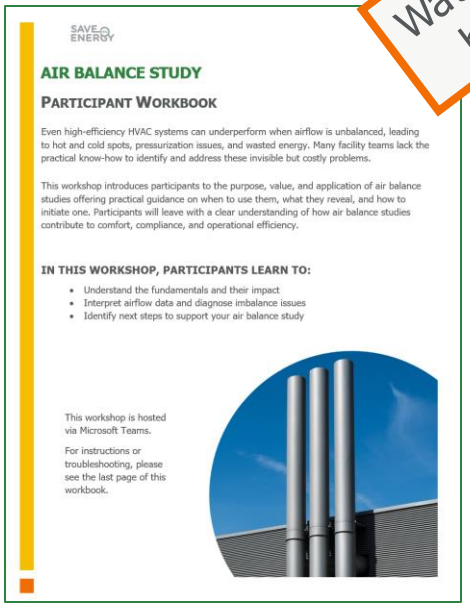
1

Watch for this icon to help follow along

Have the workbook open or printed out

Where to find the workbook:

- Click the link in the chat
- Download a copy to your computer
- Open and follow along



SAVE ON ENERGY

AIR BALANCE STUDY

PARTICIPANT WORKBOOK

Even high-efficiency HVAC systems can underperform when airflow is unbalanced, leading to hot and cold spots, pressurization issues, and wasted energy. Many facility teams lack the practical know-how to identify and address these invisible but costly problems.

This workshop introduces participants to the purpose, value, and application of air balance studies offering practical guidance on when to use them, what they reveal, and how to initiate one. Participants will leave with a clear understanding of how air balance studies contribute to comfort, compliance, and operational efficiency.

IN THIS WORKSHOP, PARTICIPANTS LEARN TO:

- Understand the fundamentals and their impact
- Interpret airflow data and diagnose imbalance issues
- Identify next steps to support your air balance study

This workshop is hosted via Microsoft Teams.

For instructions or troubleshooting, please see the last page of this workbook.

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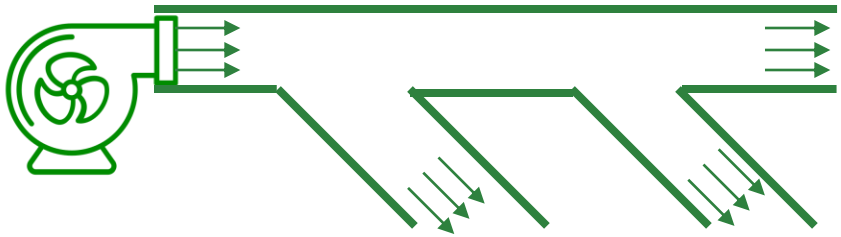
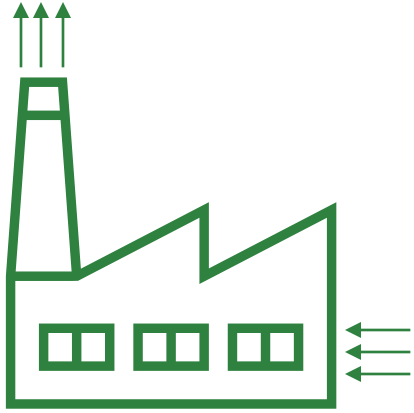
SAVE ON ENERGY POWER WHAT'S NEXT

Why air balancing matters

What we mean by air balancing

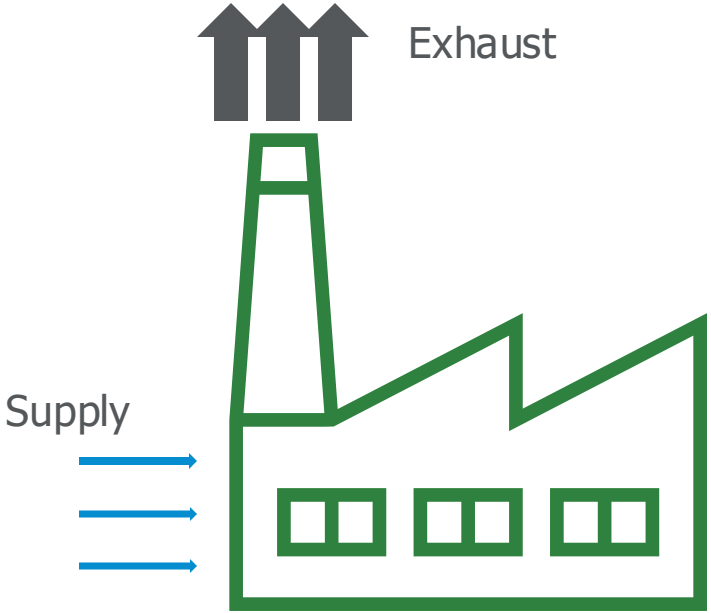


Balancing flow within a heating, ventilation and air-conditioning (HVAC) system

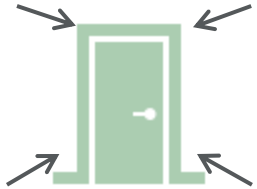


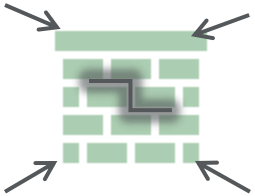
Balancing exhaust and make-up air

Negative building pressure

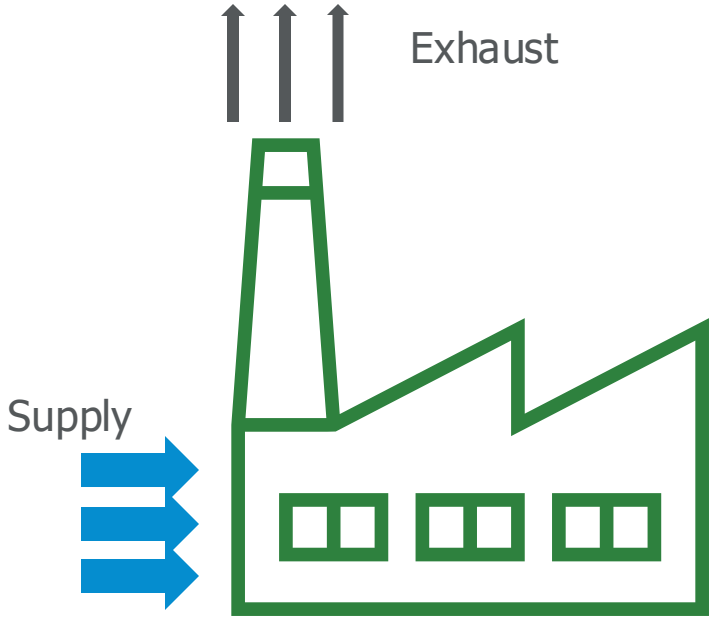


Pulls in

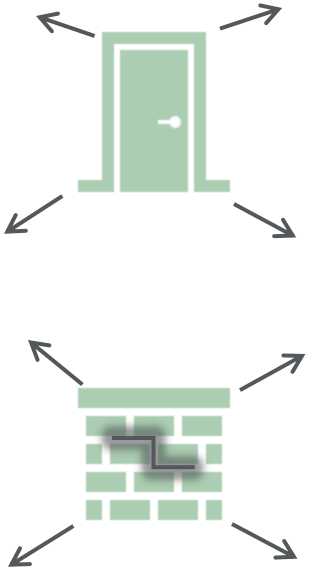




Positive building pressure



Pushes out



When pressure is intentionally negative or positive

1

Maintain positive pressure

Electronics

Food and beverage

Pharmaceuticals

Maintain negative pressure

Chemical plants

Washrooms

Paint or weld cells

Why “slightly positive” is the default

2

Comfort

- Stable temperatures
- Fewer drafts at doors

Indoor air quality (IAQ)

- Limits odour and contaminant entry
- Supports controlled ventilation

Infiltration control

- Reduces uncontrolled outdoor air
- Improves humidity control

Benefits of air balancing

Occupant comfort

- Consistent temperature and flow
- Stable IAQ
- Employee productivity and satisfaction

Energy efficiency

- Optimized static pressure and flow
- Proper ventilation
- Data-driven control strategies

Compliance, safety and performance

2

Compliance and safety

- Correct pressurization
- Building codes and standards
- Reduced fume migration

Equipment performance

- Minimized unnecessary strain
- Avoided premature wear and tear
- Stable and efficient operation

Common triggers for an air balance study

- New construction
- Major system retrofits
- Recommissioning
- Accreditation

Facility specifics leading to a study

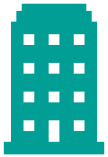
- High energy consumption
- Safety concerns
- Regulatory, insurance or audit drivers
- Major changes
- Noticeable issues

Common signs of air imbalance

Hot/cold complaints

Draft/noise

IAQ issues



Pressure complaints

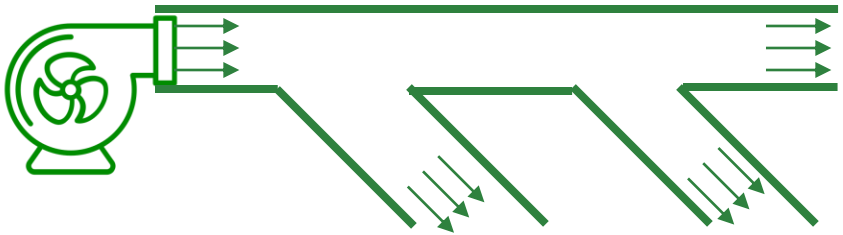
High energy use

HVAC service calls

What is an air balance study?

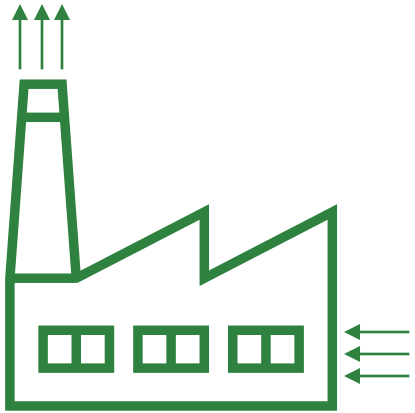
Types of air balance study-1

Type 1- balancing flow within a duct system

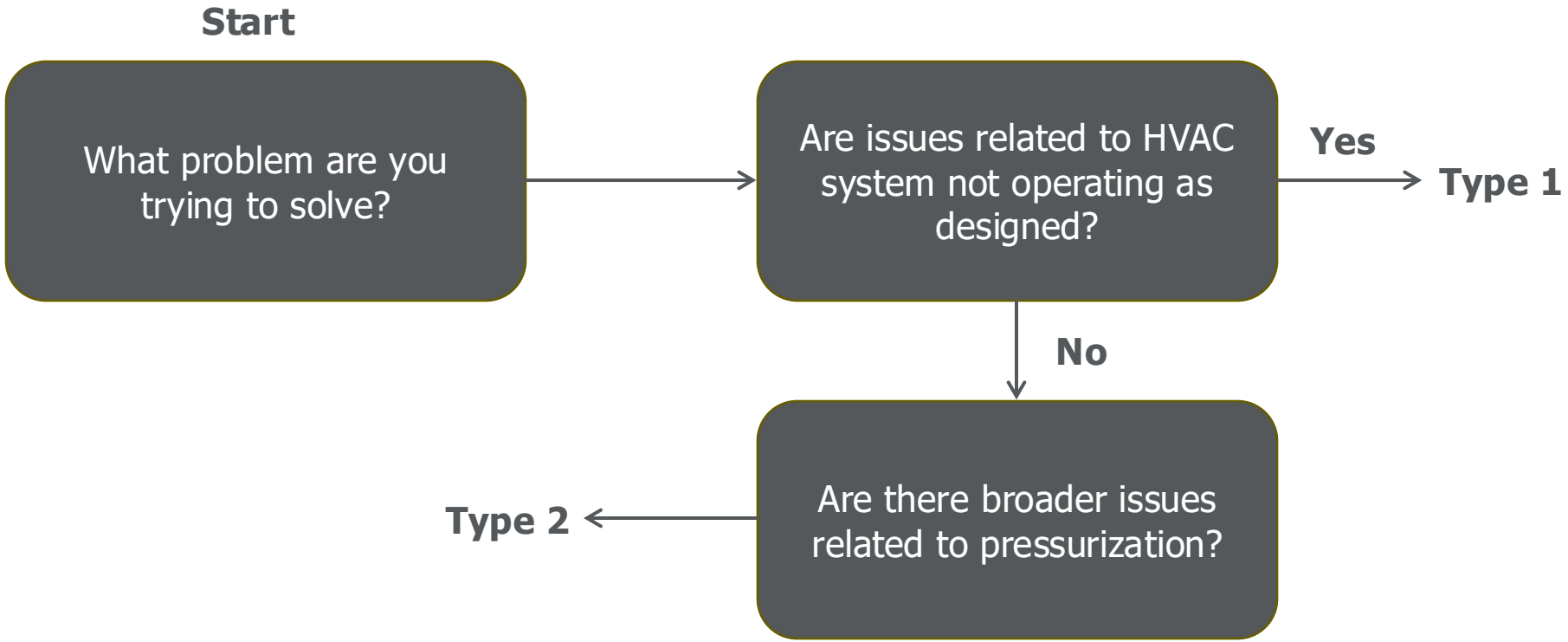


Types of air balance study-2

Type 2- balancing exhaust and make-up air



Which type of balancing do you need?



What is involved?

Desk evaluation

Information to be collected

- Mechanical drawings
- Airflow schedules
- Equipment specifications
- Total exhaust and supply

Goals

- Identify all exhaust systems
- Identify all make-up air (MUA) sources
- Calculate net airflow
- Determine if the make-up air unit (MUA) is sized correctly for exhaust

Visual inspection

What to look for

- Identify symptoms (what and where)
- Air handling unit (AHU) and MUA sources
- Maintenance issues
- Variances from mechanical drawings
- Building envelope integrity
- Control system check

Goals

- Zero in on where issues are occurring
- Determine if envelope and systems are operating as intended
- Identify easy-to-fix maintenance issues

Measurement

What to collect

- Pressure difference
  - Indoor versus outdoor
  - Between zones
- Airflow
  - Exhaust systems
  - Make-up sources
- Runtime/operating hours

Goals

- Quantify pressure imbalance relative to target
- Compare design to measured performance

How measurements are taken:

Balometer

Manometer

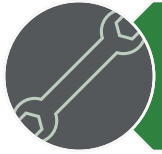
Anemometer

Audit results

Inventory

Mass balance

Root causes



Corrective actions

Evaluating performance

- Build an exhaust and supply inventory
- Conduct a mass balance
- Confirm drivers of imbalance
- Test worst-case condition
- Prioritize fixes

Build an exhaust and supply inventory

Create an inventory of all air-moving devices, including:

- Nameplates
- Measured flows
- Locations
- Controls

Conduct a mass balance

- Compile all airflow measurements
- Compare total exhaust (m^3/h) to total outdoor air supply (m^3/h)
- Break down by zone
- Note impact of changes:
  - Shift
  - Temperature
  - Large doors open

Confirm drivers of imbalance

Common causes

- Outdoor air dampers not working as intended
- Airflow blockages
- Insufficient make-up air (or exhaust)
- Fans running above design
- Exhaust or MAU running when not needed

Test worst-case condition

- Create a test plan
  - All process exhaust on, doors closed
  - Minimum ventilation mode (winter) with exhaust on
  - Warm weather mode with economizer active
  - Shift changes when doors open and people traffic spikes

Prioritize fixes

1. Address maintenance issues
2. Identify pressure targets by zone
3. Provide additional make-up air or reduce exhaust
4. Implement controls
5. Address leakage and big door impacts

Frequent mistakes

- Conducting study using outdated layouts/equipment drawings
- Applying stopgap fixes instead of addressing root causes
- Ignoring return or exhaust airflow and space pressurization
- Not documenting baseline or final conditions
- Conducting study only at one operating condition

Scenario A

- Your team conducts its own air balance study
- It digs out the old building design drawings.
- It maps out exhaust and make-up air ratings.
- It identifies where imbalances exist.
- It installs new MUA to compensate for the difference.

However, it seems to have made the pressure differential between different zones even greater.

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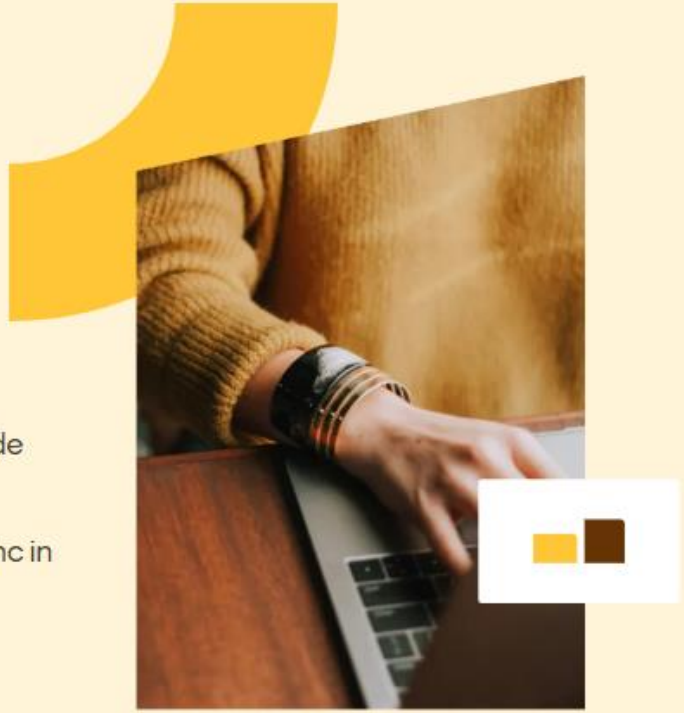

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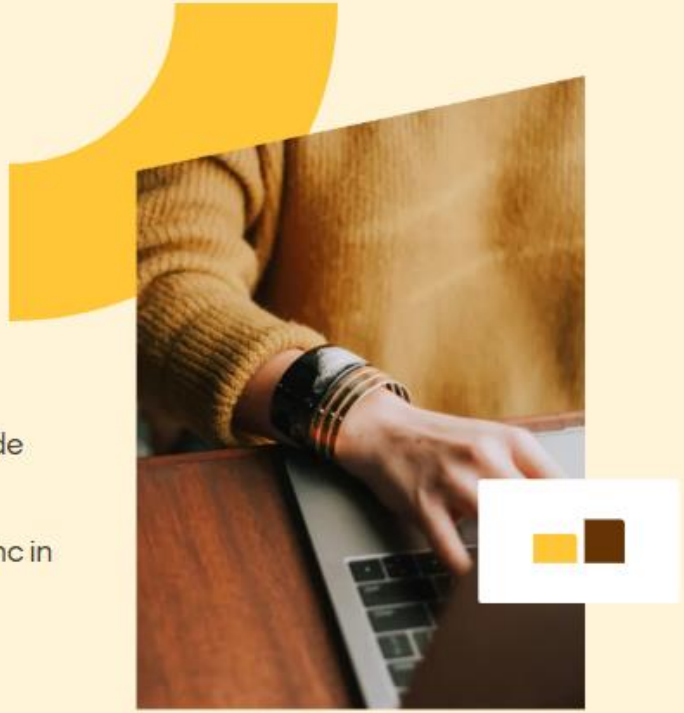

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Scenario B

- Your team receives complaints about drafts and doors slamming shut in January, indicating negative pressure.
- After getting approval and finding a consultant, it conducts a study in April.
- It reviews drawings and equipment specifications and measures flow to map out exhaust and supply.
- A range of issues are identified, from broken dampers to controls issues, which are then addressed throughout June and August.

Six months later, the team starts getting the same complaints about drafts and doors slamming.

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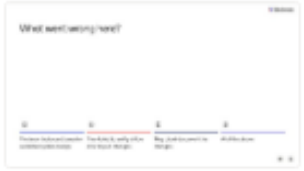
What went wrong here? (Scenario B)

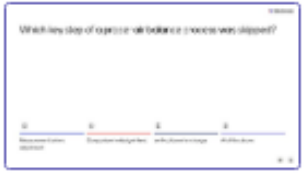
0	0	0	0
They didn't conduct a mass balance	They didn't confirm drivers of imbalance	They used outdated drawings	They didn't test under worst-case conditions

Menti

Air balance study

Choose a slide to present





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What should they have done differently?

All responses to your question will be shown here

Each response can be up to 200 characters long

Turn on voting to let participants vote for their favorites

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Air balance study

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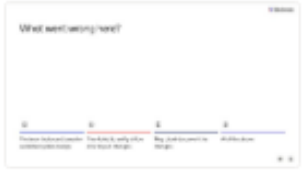

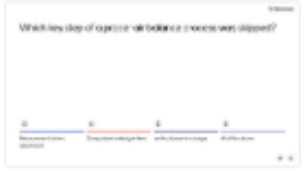

Planning a study

Key steps

Confirm symptoms and risks

Define scope and intent

Define design requirements and constraints

Choose do it yourself (DIY) or consultant

Conduct study

Implement, verify and lock in

Step 1: confirm symptoms and risks

Confirm symptoms and risks

- Verify reported symptoms
  - Doors, drafts, dust, odours
- Assess potential risks and safety concerns
  - Combustion concerns
  - Backdrafts
  - Air quality
  - Regulatory risks

Step 2: define scope and intent

Define scope and intent

- Whole building or one zone?
- Achieve specific target pressure or minimize symptoms?

Step 3: define design requirements and constraints

Define design requirements and constraints

- What are the required exhaust capture and transport needs?
- What is the required air changeover rate?
- Are there different specific pressure requirements (e.g. for cleanrooms)
- What is your target pressure differential?

Step 4: choose DIY or consultant

Choose DIY or consultant

- DIY if:
  - Systems are simple
  - Access to building automation system (BAS)
  - Internal capability to measure flow
- Consultant if:
  - Multiple interacting systems
  - Safety critical exhaust
  - Combustion issues
  - No access to measurement equipment

Step 5: execute study

Conduct study

- Gather information
- Identify root causes
- Develop a prioritized action plan

Step 6: implement, verify and lock in

Implement, verify and lock in

- Mix maintenance issues
- Add make-up air capacity or reduce exhaust if needed
- Add controls
- Repeat tests to verify results
- Document and store results for future reference
- Implement procedures or regular tests to ensure solutions stick

Engaging a consultant

Look for:

- Professional engineer (Mechanical)
- Experience with industrial exhaust and MUA systems
- Certified testing, adjusting, and balance (TAB) professional

Avoid:

- Controls vendors acting alone
- Equipment sales representatives not addressing the root cause
- HVAC contractors without engineering staff or industrial process exhaust experience

Case study: Presstran Industries

Case study: confirm symptoms and risks

- Lots of exhaust (high cubic feet per meter [CFM], high air changes per hour [ACH])
- High HVAC energy costs
- Poor controls and coordination between exhaust and supply
- Lots of unnecessary fans running
- Potential CO risks from direct-fired MUA

Confirm symptoms and risks

Case study: define scope and intent

- Whole building
- Reduce unnecessary exhaust and make-up air
- Support BAS implementation

Define scope and intent

Cast study: define design requirements and constraints

- Requirements for weld booths (ACH, airflow capture)
- Facility design requirements

Define design requirements and constraints

Case study: choose DIY or consultant

- Chose DIY
- Craig had an HVAC background
- Had access to measurement equipment

Choose DIY or consultant

Step 5: conduct study

- Completed over a couple of months
- Gathered equipment ratings, actual exhaust and make-up airflow
- Collected and developing documentation
- Mapped out building exhaust fans and process exhaust fans (changed nomenclature to reflect this)
- Mapped exhaust and make-up supply to specific processes and equipment to create desired end state

Conduct study

Step 6: implement, verify and lock in

- With a BAS, implemented cascading interlocks (process turns on, exhaust turns on, associated MUA turns on)
- BAS monitors overall balance and adds make-up supply or exhaust as needed
- Once controls in place, reduce leaks (e.g. air curtains)
- Escalating alerts (e.g. open loading dock doors)
- Monitor BAS trends

Implement, verify and lock in

Fill out your plan

- Confirm symptoms and risks
- Define scope and intent
- Define design requirements and constraints
- Choose DIY or consultant
- Conduct study
- Implement, verify and lock in

Section 1. Sample Systems / Zones to Include

Instructions: List the systems or zones in your facility that may require air balancing. Consider comfort issues, ventilation concerns, or energy inefficiencies.
Examples provided below—add or modify as needed.

System / Zone	Current Issues Observed	Known Complaints	Priority (H/M/L)
Office areas / Admin spaces	Hot/cold spots, drafts	Temperature complaints	
Production floor / Welding cells	Fume capture not consistent	IAQ concerns	
Paint booth / Finishing area	Pressurization imbalance	Quality issues	
Cafeteria / Breakroom	Stuffy, low ventilation	Occupant discomfort	
Washrooms / Locker rooms	Exhaust flow inadequate	Odours persist	
Mechanical rooms	Overheating	Equipment alarms	
Warehouse zones	Stratification	Product quality impacts	
Other:			

Call for action

What is one specific action you will take in the next 30 days?

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-Allison

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