

EVALUATION AND TESTING OF DIFFERENT AIR FLOW TECHNIQUES TO DETERMINE AIR FLOW PATTERNS FOR PLACEMENT OF CAM'S/FAS'S

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INTRODUCTION:

HSR-1 EVALUATED 4 DIFFERENT AIR FLOW METHODS IN A LABORATORY SETTING AT CHEMISTRY & METALURGY RESEARCH FACILITY (CMR) TO DETERMINE THE ADVANTAGES AND DISADVANTAGES OF EACH TECHNIQUE.

THE 4 METHODS EVALUATED INCLUDED:

- 1) SAI HELIUM BUBBLE MACHINE
- 2) ROSCO FOGGER
- 3) ROSCO HAZEMAKER
- 4) MSA SMOKE TUBES

DAVE WANNIGMAN AND I PERFORMED THE EVALUATIONS.

THE METHODS WERE EVALUATED TO DETERMINE IF ONE METHOD IS MORE APPROPRIATE THAN ANOTHER METHOD FOR A PARTICULAR AIR FLOW DETERMINATION.

A CRITERIA CHART WAS DEVELOPED WITH MANDATORY AND DESIRABLE CHARACTERISTICS AS A TOOL TO CHARACTERIZE EACH METHOD.

AIR FLOW PATTERNS WERE MAPPED OUT TO SEE
IF PARTICULATES, FUMES, AND BUBBLES RESPOND
DIFFERENTLY.

TEST RESULTS:

ALL 4 METHOD'S RESULTED IN THE SAME AIR FLOW DIRECTIONS.

BUT THERE ARE DIFFERENCES THAT EXIST IN USAGE, COMPLEXITY, FUNCTIONALITY, AND EASE OF USE.

ADVANTAGES AND DISADVANTAGES WILL NOW BE DISCUSSED.

SAI HELIUM BUBBLE MACHINE:

ADVANTAGES:

THE HELIUM BUBBLE MACHINE CREATES DISCRETE BUBBLES WHICH ARE NEUTRALLY BUOYANT AND MORE CLOSELY CHARACTERIZES AIR FLOWS.

THE BUBBLES TRAVEL WITH AIR FLOW AT LEAST 25'.

THE BUBBLES LAST UP TO 5 MINUTES, GIVING EXCELLENT VISIBILITY UNDER TURBULENCE WITHIN A HOOD.

THE OTHER METHOD'S DO NOT LAST LONG ENOUGH TO EVALUATE TURBULENCE.

DISADVANTAGES:

THE MACHINE IS COMPLEX TO SET UP, COMES IN 2 SUITCASES, AND IS CUMBERSOME TO USE.

A COMPRESSOR IS USED WHICH IS NOISY AND GETS HOT DURING USE.

MULTIPLE CORDS AND HOSES CREATE TRIPPING HAZARDS.

ROSCO FOGGER:

ADVANTAGES:

PROVIDES LOTS OF SMOKE THAT IS VERY VISIBLE.

THIS UNIT IS EASY TO USE.

SMOKE IS PROJECTED 10-25'.

DISADVANTAGES:

THERE IS AN APPROXIMATE 5 MINUTE WARM-UP PERIOD.

AN AC CORD IS REQUIRED TO POWER THE UNIT.

THE AC CORD IS A POTENTIAL TRIPPING HAZARD.

INITIAL KINETIC ENERGY IS PROVIDED TO THE SMOKE.

NOTE:

BOTH THE ROSCO FOGGER AND THE BUBBLE GENERATOR SEEMED TO INDICATE MORE UPWARD FLOW THAN ACTUALLY EXIST DUE TO INITIAL KINETIC ENERGY.

THE ROSCO HAZEMAKER (COOL MIST)

ADVANTAGES:

THIS UNIT CAN SHOW LOCALIZED TURBULENCE AND HAS THE BEST INITIAL VELOCITY.

IT IS EASY TO USE ONCE ITS RUNNING.

WARM UP TIME IS LESS THAN 30 SECONDS.

DISADVANTAGES:

THIS UNIT DOES NOT PRODUCE LARGE QUANTITIES OF SMOKE WHICH MAKES IT HARDER TO SEE.

THE SMOKE IS PARTICULARLY HARD TO SEE AGAINST A BACK DROP OF A LIGHT COLORED ROOM.

THE SMOKE DISSIPATES FAST WHICH IS A DEFINITE DISADVANTAGE.

THE UNIT IS BULKY AND A TRIPPING HAZARD EXISTS DUE TO THE AC CORD AND TRUNK.

MSA SMOKE TUBES

ADVANTAGES:

ARE EASY TO USE.

PROVIDE A LIGHT BLUE SMOKE WHICH IS EASY TO SEE.

THE SMOKE COMES OUT AT A LOW VELOCITY.

NO AC POWER IS NEEDED.

YOU HAVE HIGHER CONTROL USING TUBES AS COMPARED TO OTHER METHODS, WHICH IS GOOD FOR REPETITIVE EXPERIMENTS.

THERE IS NO WARM UP TIME NEEDED TO USE THIS METHOD.

DISADVANTAGES:

THESE TUBES ONLY PROVIDE A SMALL RELEASE PER PUFF.

THERE IS A WASTE ISSUE WITH DISPOSING OF EXPENDED TUBES.

SUMMARY

THESE TESTS WERE VALUABLE IN DEMONSTRATING THAT ALL FOUR METHODS DEMONSTRATED THE SAME AIR FLOW DIRECTIONS FOR MAPPING OUT ROOMS. YET EACH METHOD HAD ADVANTAGES AND DISADVANTAGES IN ITS USE.

THE HELIUM BUBBLE MACHINE IS AN EXCELLENT LABORATORY INSTRUMENT WHICH SHOULD BE USED TO EVALUATE TURBULENCE, PERFORM SPECIAL STUDIES EVALUATING A ROOM OR LAB IN MORE DETAIL, OR INVESTIGATING CONTAMINATION INCIDENTS.

THE ROSCO FOGGER AND MSA SMOKE TUBES PROVIDE AN EASY AND RELIABLE METHOD FOR ROUTINE SMOKE TESTING OF AIR FLOWS IN A ROOM.

THE ROSCO HAZEMAKER HAS APPLICATIONS WHERE LOCALIZED MEASUREMENTS CAN BE TAKEN, MINIMIZING ROOM PROGRAM IMPACT'S.