



AIR QUALITY AT SAS

-
- At Shanghai American School, we know air quality is of the utmost concern. That's why we take multiple steps in our effort to maximizing the quality of our air, to help address air quality issues as best we can for our students, faculty, staff, and community.
 - We would like to share our approach to air quality so you can better understand the steps we take as a school.



AIR QUALITY AT SAS: A SUMMARY

SAS continually monitors and responds to environmental fluctuations. These efforts reflect our ongoing commitment to proactive and strategic investments we make to maximize the quality of our air.

There are four key steps SAS has taken: Assess, Implement, Improve, and Involve.

- **ASSESS.** To begin, we partnered with engineering consultants and environmental experts to conduct a study that assessed our facilities and air quality, and identified opportunities for improvement.
- **IMPLEMENT.** Next, we used the results of the study to launch a multi-phased implementation plan. This plan involves improvements to facilities, air handling systems, and even enhancements in the landscaping on campus.
- **IMPROVE.** Throughout our implementation, we have continually assessed the quality of our efforts and refined our approach to take advantage of advancements in relevant technologies. For example, a recent inquiry revealed the need for an air quality measurement system that broadens our scope of measurement beyond AQI or harmful particle matter (PM2.5), to include other elements such as carbon dioxide.
- **INVOLVE.** Lastly, we recognize the biggest variable to indoor air quality is a human one. Helping our community stay mindful of behaviors that affect air quality, such as limiting door openings or using doors with newly-installed vestibules, plays a meaningful role in improving the quality of our air.

Our intention is to meet or exceed all recommendations from the Shanghai Education Commission (SEC) related to outside air exposure to students. The air quality measures we've taken have put SAS at the forefront of schools in Shanghai.

Fortunately, we're not alone in our effort to improve air quality for our community. Due in part to local rules and restrictions, Shanghai's air quality has shown steady improvement as China has pledged to radically reduce PM2.5.

While staged improvements continue, SAS remains vigilant in seeking additional ways to improve our indoor air quality. For questions or concerns, please contact Chris Levesque, Director of Facilities, at Christopher.Levesque@saschina.org.

OUR APPROACH IN DETAIL

ASSESS

The school hired the engineering consulting firm CH2MHill to conduct an air quality study at both campuses. The focus of the study was the design and performance of the schools mechanical systems along with an assessment of the buildings on both campuses and associated suggested actions. The links to these reports are attached below.

Pudong – http://www.saschina.org/uploaded/About_SAS/pudong_indoor_air_quality_audit_report.pdf

Puxi – http://www.saschina.org/uploaded/About_SAS/puxi_indoor_air_quality_audit_report.pdf

IMPLEMENT

The action plan derived from the CH2MHill study is as follows:

- Add vestibules to building exterior doors to reduce infiltration due to ingress and egress
- Improve building envelope seal
- Replace existing central Air Handling Systems (AHU's) with new units with increased make-up air (air turnovers) and include multistage filtration
- Enhance campus landscaping with additional trees and plantings
- The current actions that have been completed to date are as follows:
 - ❏ Vestibules added to main exterior doors on both campuses
 - ❏ Implementation of HEPA vacuums at both campuses to replace standard vacuums

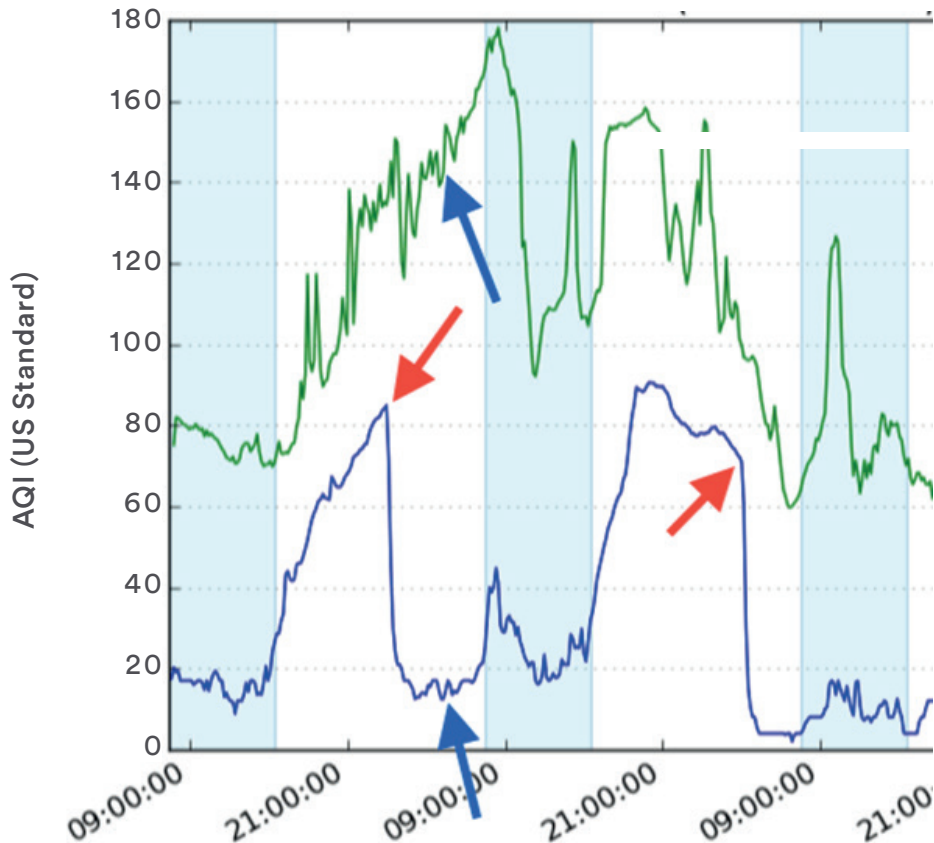
- ❏ Dry carpet cleaning process implemented to replace wet process – greater reduction of dust, allergens and mold spores
- ❏ Replacement of exterior frameless windows with new double glazed framed design
- ❏ Replacement of old AHU's in Elementary School on Puxi and Pudong campuses with multistage filtration units
- ❏ Multistage filtration added to the Pudong PAC air handling system
- ❏ Landscape master planning exercise – Develop staged planting program
- ❏ Replacement of AHU's in Middle School on Puxi and Pudong campuses with multistage filtration units
- ❏ Replacement of Puxi High School AHU's with multistage filtration units (as part of the Puxi High School Science remodel project)
- ❏ Replacement of Pudong and Puxi (remaining balance) HS AHU's with multistage filtration units

Continued improvement plans in progress are as follows:

- Review and develop indoor plant program
- Replacement of common area AHU's with multistage filtration units
- Implementation of landscape master plan (Multiple Phases)

SAS has also partnered with GAMS to measure and collect indoor and outdoor AQI readings using Thermo Fisher laser particle measuring technology. The school has invested in air monitors for each division, as well as an outdoor monitor.

The current data collected shows that the systems in place dramatically reduce indoor air particulate when the filtration system is turned on ahead of school hours. The HVAC systems are deliberately scheduled to turn on approximately three hours before school begins in order to filter the air and bring temperature levels into desired ranges. Additional work is still in progress to adjust circulation, make-up air and building pressurization.



The graph above shows the typical pattern of indoor air quality relative to outdoor air quality, over a three day snapshot – the patterns and trends are similar for all divisions. The blue shaded areas indicate the school hours of 7:30 a.m. – 3:30 p.m. The red arrows show when our HVAC system activates at approx. 4:00 a.m. You will see that when the system turns on the interior AQI drops dramatically. The blue arrows show that even when the outdoor AQI is rising we are able to maintain and keep the interior AQI from rising. The peaks and valleys are related to the opening and closing of doors and the heating/cooling turning on and off to regulate temperature.

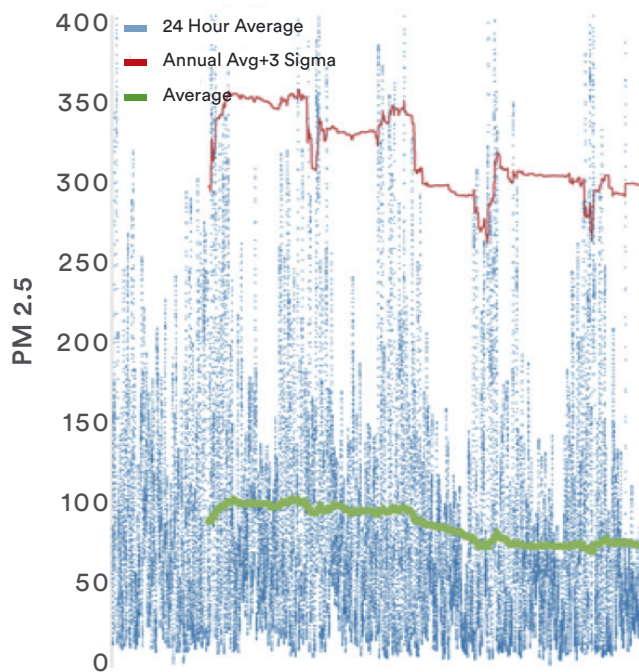
IMPROVE

The measuring monitors purchased by the school are manufactured by a world leader in lab instrument design and contain the leading edge technology in the area of particle measurements. Unlike many inexpensive handheld devices, our units are factory calibrated to specific environments and require that they be sent to certified factory vendors who specialize in these units and meet global certification standards.

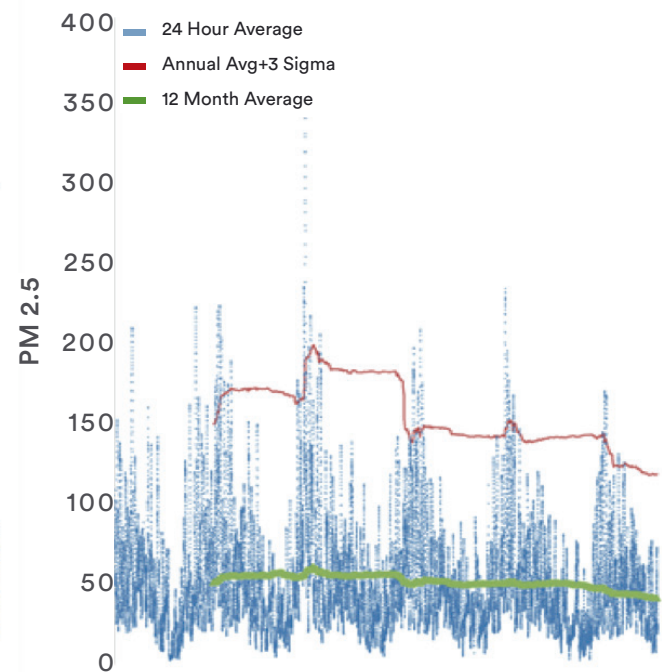
In an effort to continuously improve our data, the school is working with GAMS to explore additional monitoring efforts to offer more accurate, comprehensive data. This would include additional fixed monitors as well as floating monitors to identify air quality issues in “hot spots” or areas perceived to be problematic.

Regarding broader efforts undertaken by China, this graph shows the gradual improvement in air quality across Beijing and Shanghai over the past four years.

Beijing PM 2.5 2012 - June 2017



Shanghai PM 2.5 2012 - June 2017



INVOLVE

In addition to the above there are some simple behaviors that you as individuals can do to help keep IAQ (indoor air quality) at the best levels.

- Keep doors and windows closed during high AQI days
- Limit door open and closing time by staging student traffic flow between buildings
- Take indoor passage ways and skywalks whenever possible and encourage students to do the same
- Use exterior doors that have vestibules installed

Our intention is to meet or exceed all recommendations from the Shanghai Education Commission (SEC) related to outside air exposure to students and closing of the school due to poor air quality. The school monitors outdoor air quality conditions and takes action whenever AQI levels rise to unhealthy levels.

Outdoor activities during school hours, after school and during sporting events may need to be restricted, moved indoors or canceled. The AQI guidelines clarify the AQI levels and decision points when school modifies, postpones or cancels outdoor activities. You can also find instructions on how to obtain AQI measurements. The air quality guidelines for CISSA, APAC, and SISAC are included along with helpful charts and graphs with color-coding.

For more information about outdoor air quality, impact on health, and the applicable procedures and policies that guide school decision-making on this topic, visit the following link:

http://www.saschina.org/uploaded/About_SAS/air_quality_at_SAS/Guidelines.pdf

Air Quality Guidelines

Exposure to air pollution can cause short term and long-term health effects. Children are at increased risk of these health effects because they tend to be more physically active, their lungs are still growing, and they are more likely to have asthma or acute respiratory illnesses which can be aggravated when pollution levels are high.

SAS monitors particle pollution (specifically PM2.5) daily because they are historically high in Shanghai and pose the most health risk to our students. PM2.5 are fine particulates in the air, which can get deep into the lungs causing respiratory problems and may even enter the blood stream.

The Air Quality Index (AQI) was designed by the US Environmental Protection Agency (EPA) and is used to determine how clean or unhealthy the air is. Its levels help the public determine when air pollution reaches unhealthy levels. It is our intention to meet or exceed all recommendations from the Shanghai Education Commission (SEC) related to outside air exposure to students and closing of the school due to poor air quality.

Outdoor activities may be restricted if AQI levels are high. The level of physical activity and level of pollutants are taken into consideration when making restrictions.

Since our intentions are to keep the students and staff in the safest environment possible, it is our policy that *hallway and corridor doors of the school shall be kept closed at all times. ***Exterior windows may be left open if AQI is 100 or below (101+ enters the EPA “Unhealthy for sensitive groups” range)***.*

According to the US EPA an AQI of 151-200 is “unhealthy” for the general public and therefore children should avoid prolonged or heavy outdoor exertion. Therefore PE classes held outdoors will be either moved inside or modified to low intensity activities and/or shorter time periods.

The US EPA classifies AQI levels above 200 as “very unhealthy”. At this level all PE classes and recess will be held indoors. Also, any contracted employee of SAS whose normal duties include outside functions must wear a PM2.5 rated facemask. (Provided by contracted company.)

If the AQI levels exceed 300 all school related personnel (except those necessary to maintain campus security) and students will be kept indoors. This does not restrict students and staff from moving between buildings.

How to obtain AQI levels:

- Puxi campus uses the US Consulate website at <http://www.stateair.net/web/post/1/4.html>
- Pudong campus uses the SEMC website at <http://www.semc.gov.cn/aqi/home/Station.aspx> and converts the hourly PM2.5 to AQI using http://www.airnow.gov/index.cfm?action=resources.conc_aqi_calc

Afterschool outdoor sporting events will go on as scheduled unless the AQI reaches 200 or more. At this level Coaches shall modify or cancel practice/games or arrange for indoor space if available.

Please note some people may be more sensitive to the health effects of air pollution. These sensitive groups include children with asthma or respiratory illnesses and people with heart or lung disease. If parents of these children have concerns they should speak with their child’s building Principal.

SAS AQI Monitoring Procedures

The AQI will be monitored consistently throughout the day.

An automated system will generate restriction notices when the AQI reaches designated levels. This data will be collected and stored for historical reference.

- If the AQI is between 150 and 200 an ALL school email will be sent indicating the AQI and a reminder that PE classes need to be modified. It is recommended that at this level all classroom doors and windows should also be kept closed.
- If the AQI is > 200 an ALL school email will be sent indicating “AQI is above 200” and a reminder that All PE classes and recess activities must be held indoor until further notice.

AQI levels will continue to be monitored for after school activities.

- If the AQI is between 150 and 200 school Administrators, Nurses, and CISSA Coordinator will be notified by the automated system.
 - CISSA Coordinator will advise coaches to avoid prolonged or heavy exercises during outdoor events.
- If the AQI is >200 school Administrators, Nurses, CISSA Coordinator and HS Activities Director will be notified.
 - ES, MS and HS SISAC Outdoor sporting practices are cancelled or moved indoors
 - Building Administrators notify students of changes
 - CISSA Coordinator and AD contact coaches
- **All outdoor High School sports practices and games – refer to below activities chart Monday – Friday**

Weekend AQI level checked for outdoor sporting Tournaments & Games

- Morning and afternoon checks will be made by the Activities directors and the ASA Nurse
- Sporting teams will follow their appropriate divisions current and agreed upon policies. Exerts are listed below.



CISSA GUIDELINES – China International School Sports Association (MS both campuses)

Practice:

Above 150 AQI = Modified

Above 200 AQI = Cancel

Games:

Anything above 150 AQI = Modified

AQI above 200 = Cancellation

2 p.m. is the cut off time for cancellation of matches via phone call.

On actual Cross River Event day the pollution index is discussed at the coaches meeting. (See Handbook)

| SAS OUTDOOR ACTIVITY RESTRICTIONS BASED ON AQI | | | | | | |
|--|--|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|----------------------------|
| AQI Level | School Hour Activities 7:00 am-3:00 pm | ES, MS & HS SISAC Sports Practice | MS (CISSA) Games/Tournaments | HS (SISAC) Games/Tournaments | HS (APAC) Sports Practice | HS Sport Games/Tournaments |
| 0 - 150 | No Modifications | No Modifications | No Modifications | No Modifications | No Modifications | No Modifications |
| 151 – 200 | PE modified or moved indoors | Activities MODIFIED or moved indoor | Activities MODIFIED or moved indoor | Activities MODIFIED or moved indoor | Activities MODIFIED or moved inside | No Modifications |
| 201 – 250 | All activity cancelled or moved inside | Activities CANCELLED or moved inside | Activities CANCELLED or moved inside | Activities CANCELLED or moved inside | Same as above | Activities MODIFIED |
| 251 – 300 | Same as above | Same as above | Same as above | Same as above | Activities CANCELLED or moved inside | Same as above |
| 301 and Above | All students and workers kept inside unless moving between buildings | Same as above | Same as above | Same as above | Same as above | Activities CANCELLED |

APAC GUIDELINES – Asia Pacific Activities (HS both campuses)

The Tournament/Festival Director will have jurisdictional authority for the interpretation of the rules and schedule during competitions or festivals. (April 2013 updated)

APAC Guidelines on cancellation of outdoor events due to air pollution.

1. Staging of outdoor activities will depend upon air quality, as measured by the U.S. Air Quality Index (AQI) or its equivalent. Index as follows:
 - a. Level 1 (1-200 AQI): No modification necessary.
 - b. Level 2 (201-300 AQI): The host AD has the authority to modify or suspend activities.
 - c. Level 3 (301-500 AQI): The activity should be suspended and AQI monitored. The activity can resume once the AQI drops below 300.
2. Measurements are taken within an hour of game time.
3. Track and Field maybe modified throughout the day.

SISAC GUIDELINES – Shanghai International Schools Activities Conference (HS both campuses)

For regular season games/matches 200 AQI will be the reading to postpone SISAC outdoor fixtures. This must be communicated by phone/text/email by 2pm on a given day. All attempts will be made to reschedule the games/matches; if unable the result will be a tie (recorded as a draw for league standings).

- For air quality between 150-200 AQI we recommended making adjustments to the length of matches to help reduce sustained exposure (I.e. playing quarters, 30 minutes halves and/or providing longer halftime). If a competing school chooses not to compete with air quality between 150-200 AQI all attempts will made to reschedule the games/matches, if unable to reschedule, the result will be a forfeit charged to that school. (Recorded as a loss and 0 points for league standings)
- For Tournaments/weekend fixtures Air Quality will be checked at the coaches meeting or pre-game and monitored throughout the day to gauge whether a tournament/game needs to be delayed/postponed/modified.
- The Smartphone application 'Air Quality' will be used as the measure gauge for this reading. The host's closest measuring station will be used to gain this figure.
- <https://itunes.apple.com/hk/app/air-quality-china/id526226016?mt=8>.

China Standard Real time readings will be the default setting for the SISAC league structure.

Air Quality Guide for PM2.5

| Air Quality Index (AQI) | PM2.5 Health Effects Statement | PM2.5 Cautionary Statement |
|--|--|--|
| Good (0 - 50) | PM2.5 air pollution poses little or no risk. | None |
| Moderate (51 - 100) | Unusually sensitive individuals may experience respiratory symptoms. | Unusually sensitive people should consider limiting prolonged outdoor exertion. |
| Unhealthy for Sensitive Groups (101 - 150) | Increasing likelihood of respiratory symptoms in sensitive individuals, aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly. | Active Children and adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion. |
| Unhealthy (151 - 200) | Increased aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary effects in general population. | Active Children and adults, and people with respiratory disease, such as asthma, should avoid prolonged outdoor exertion. everyone else, especially children, should limit prolonged outdoor exertion. |
| Very Unhealthy (201 - 300) | Significant aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; significant increase in respiratory effects in general population. | Active Children and adults, and people with respiratory disease, such as asthma, should avoid prolonged outdoor exertion. everyone else, especially children, should limit outdoor exertion. |
| Very Unhealthy (201 - 300) | Serious aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; serious risk of respiratory effects in general population. | Everyone should avoid all outdoor exertion. |
| Beyond Index (> 500) | Extremely High Levels of PM2.5: Steps to Reduce Your Exposure - Click Here | |

*Chart sourced from the US Department of State at:<http://www.stateair.net/web/post/1/4.html>

Shanghai American School inspires in all students:
上海美国学校激励并培养所有的学生:

A lifelong passion for learning
终身学习的热情

A commitment to act with integrity and compassion
诚信与仁爱的信念

The courage to live their dreams.
追求梦想的勇气。



Pudong Campus
1600 Lingbai Road, Pudong District
Shanghai, China, 201201

Puxi Campus
258 Jinfeng Road, Minhang District
Shanghai, China, 201107

Tel: 6221-1445
www.saschina.org