

4. IMPLEMENTING ENERGY / EMISSIONS REDUCTION MEASURES

The Clean Air Charter lists six key areas in which businesses can make a difference to reduce air pollution. Although many of these reductions may result in additional business capital and/or operating costs, every business should look into their business nature, develop a fair, practical and cost-effective air quality management policy.

7-7-7 Care-for-Air Public Guideline

The HKGCC and the BCE have developed the "7-7-7 Care-for-Air" Guideline for the general public to take immediate, practical steps to contribute to improving air quality at home, at work and while travelling, especially when the Air Pollution Index is high.

Make That Little Effort at Home

1. Switch off unnecessary domestic appliances - make use of natural light and ventilation.
2. Don't use standby mode - turn off appliances completely when not in use.
3. Set a comfortable room temperature - don't over cool or over heat.
4. Avoid using the tumble drier.
5. Don't use products containing VOCs, e.g. paints, hair and personal care sprays, etc.
6. Reduce direct emissions from cooking, e.g. thaw food in the fridge before cooking, postpone your BBQ, etc.
7. Don't smoke.



Make That Little Extra Effort at Work

1. Activate "sleep" mode in office equipment during office hours, including photocopiers, scanners and printers.
2. Don't use standby mode after working hours - turn off unnecessary equipment completely including the computer.
3. Minimise photocopying to reduce ozone emissions.
4. Wear clothing that keeps you comfortable in the office.
5. Make conference calls or use other electronic media to reduce travelling for business meetings.
6. Adopt flexible working hours to reduce emissions caused by traffic congestion.
7. Use products with zero or low VOCs during renovations.

Make That Little Extra Effort on the Road

1. Reduce unnecessary travel.
2. Use the stairs wherever possible to save energy.
3. Walk or ride a bicycle for short journeys.
4. Use public transport.
5. Plan your travel or carpool to avoid single-passenger car trips.
6. Stop using vehicles that emit black smoke.
7. Don't leave the engine idling.



Offices and Workplaces

Various organisations have provided tips that are relevant to reducing energy consumption in commercial premises in Hong Kong. Below are some examples of practical measures.

Ventilation and Air Conditioning Systems

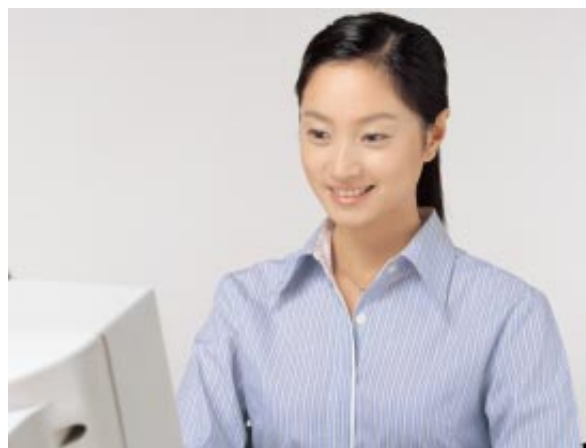
Energy and emissions reduction measures for ventilation and air conditioning include:

- Setting the temperature of air-conditioned rooms to a comfortable temperature;
- Cleaning air-conditioning systems and dust filters regularly;
- Using water-cooled air conditioning systems instead of the air-cooled type;
- Encouraging staff to wear suitable clothing (e.g. allowing staff not to wear suits);
- Installing thermometers to monitor the room temperature; and
- Installing carbon dioxide (CO₂) sensors to monitor indoor air freshness and to control the operation of the fresh air intake.

Tip:

If the temperature of an air-conditioned room were set one degree higher, the electricity consumption would be reduced by 10%.

*Source:
Health, Safety and Environmental Report 2004
Towngas Website: www.towngas.com*



Reduce Emissions from Air-Conditioning

In Hong Kong, power used for air-conditioning accounts for 1/3 of the total consumption. If the temperature of all air-conditioned venues is raised by one degree Celsius, we can save more than 300 million units of electricity a year. This means the population can save \$300 million in electricity tariffs, reduce about 200,000 tonnes of carbon dioxide, 800 tonnes of sulphur dioxide, 400 tonnes of nitrogen oxides and 30 tonnes of respirable suspended particulates annually.

Given such a high level of energy consumption for air-conditioning, workplace temperature should be adjusted to a comfortable level, but not excessive, to encourage energy conservation and to reduce emissions. Companies should make reference to the relevant standard recommended by the HKSAR Government, i.e. setting air-conditioning temperature at 25.5°C during the summer months.

Source: HKSAR Government



Use of Water-cooled Evaporative Chiller

In 2004, The Hong Kong and China Gas Company Limited (Towngas) saved over 500,000 kWh at their North Point Headquarters by becoming the first commercial organisation in Hong Kong to replace air-cooled condensers with water-cooled evaporative chillers. Other initiatives such as keeping the office temperature between 23-27°C and implementing a chiller sequencing programme also help to further reduce the electricity consumption.

Source: Health, Safety and Environmental Report 2004, Towngas Website: www.towngas.com

Office Equipment

Actions that you can take to reduce energy consumption or emissions into the air associated with office equipment include:

- Replacing electrical appliances and office equipment with more energy-efficient models with an Energy Label (see *Appendix C*);
- Turning monitors off during lunch hours and at the end of the day, or when you are away from the workplace;
- Activating the "sleep" mode in office equipment during office hours for photocopiers, scanners and printers; and
- Turning unnecessary equipment off (including computers).



Think twice before you make copies Use energy efficient equipment

Office indoor air quality will be affected by emissions in a poor ventilated printing room. Therefore, office equipment, such as photocopiers and laser printers, should be placed in the area with good ventilation. To reduce emissions, you are also advised to:

- Think twice before you copy or print – how many you need and don't copy/print too much.
- Avoid fault printing by checking the operation condition and mode setting before pressing the button.
- Photocopy on both sides of paper and shrink the size of a document if possible.

If you are looking for photocopiers or printers, look for ones that are recognised as being energy efficient. Products with the ENERGY STAR, for example, meet strict energy efficiency guidelines set by the US Environmental Protection Agency and US Department of Energy.

In addition to energy-saving appliances, an emulsion aggregation toner that uses 35% less energy than conventional toners has been developed, thus minimising carbon dioxide emissions.

Source: Fuji Xerox Hong Kong

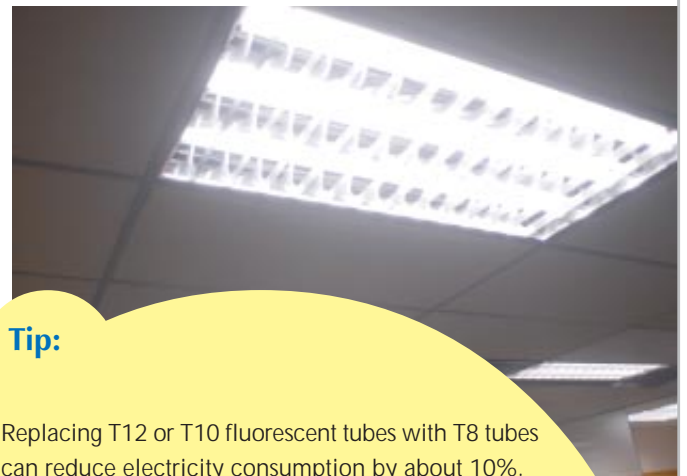
Lighting

Measures to reduce energy consumption or emissions from lighting include:

- Replacing conventional fluorescent tubes or light bulbs (e.g., T12 or T10 fluorescent tube) with energy efficient models;
- Upgrading existing lighting systems by installing quasi-electronic ballast (QEB);
- Using shorter fluorescent tubes for over-illuminated areas;
- Reducing the number of fluorescent tube for over-illuminated areas;
- Installing occupancy sensors to control lighting in areas that are used infrequently, (e.g. conference rooms);
- Making use of daylight whenever possible; and
- Turning lighting off if it is not needed (e.g. during lunchtime and after work). Place "Save Energy" stickers near the switch as a reminder.

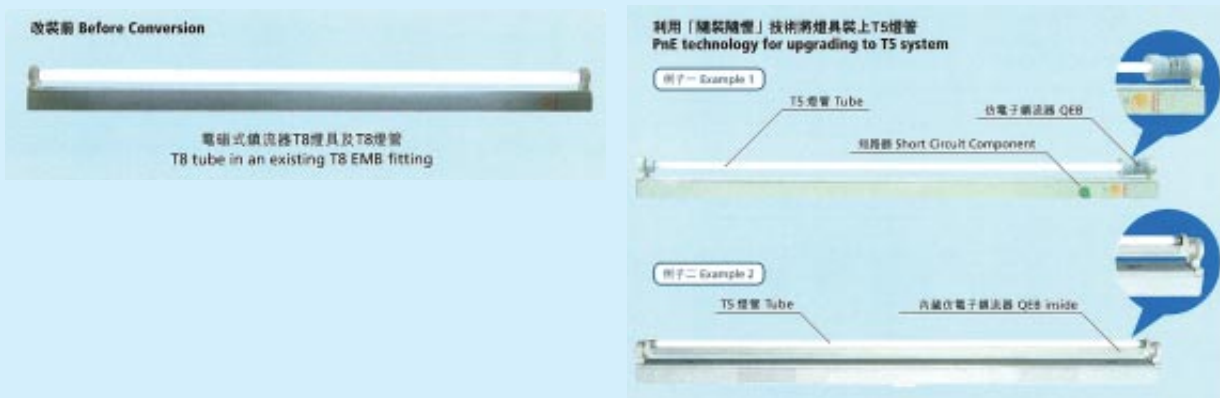
Tip:

- Replacing T12 or T10 fluorescent tubes with T8 tubes can reduce electricity consumption by about 10%.
- Replacing electromagnetic ballasts in T12, T10 or T8 fittings with electronic ballasts can reduce about 20-25% of electricity consumed.
- Replacing T12, T10 or T8 fluorescent light fittings (with electromagnetic ballasts) with T5 fluorescent light fittings (with electronic ballasts) can reduce about 30% to 40% of electricity consumed.
- Replacing incandescent light bulbs with compact fluorescent lamps (CFL) can reduce energy consumption by 70%-80%.
- Using shorter tubes can save 30% to 60% on electricity consumption.
- Reducing the number of fluorescent tubes can cut electricity consumption by about 33%.



Upgrading T8 tubes to the T5 system with a Quasi-Electronic Ballast (QEB)

For upgrading lighting to the T5 system, a T8 tube can be replaced with a T5 tube together with a Quasi-electronic Ballast (QEB) attached as an end cap or inside a fitting.



The energy savings and payback period for a real example are shown below:

From	To	Energy Savings (%)	Payback Period (Yrs)	Resulting Lighting Level (compared to existing lighting level) (%)
1200 mm T8 (Electromagnetic ballast (EMB))	T5 system with (Quasi Electronic Ballast)	33	3.5	118
3 x 1200 mm T8 (EMB)	2 x T5 with Redirection	56	1.8	89

Source: Retrofit with Energy Efficient Fluorescent Lighting System (www.emsd.gov.hk)

Case Study: Wing's Trading Co. Ltd.

Wing's Trading Co. Ltd. occupies a typical office in Kwun Tong. The first floor is used as an office and has an area of approximately 7,000 m². The third floor is used for storage and as a show room. Office cooling is provided by both a water-cooling tower and window-mounted or split-type air conditioners.

The company does not make any significant direct emissions into the air from this site, however, as with all offices, the consumption of energy will contribute indirectly towards emissions to air from power stations, through the use of energy. Wing's Trading has a good understanding of the importance of saving energy and the company is implementing the following measures to reduce the energy consumption during their operations:

1. During lunchtime, lighting at workstations is turned off and the "sleep" mode for office equipment is activated.
2. Only authorised persons are permitted to adjust the room temperature.
3. Water-cooling type air conditioning systems are used instead of air-cooling type systems.
4. Energy-saving light bulbs are used in the pantry.
5. Air-conditioners in the pantry are switched off outside the lunch hour and fans are used instead for ventilation.
6. Only a limited number of light bulbs are switched on in the pantry outside the lunch hour to minimise the energy usage.
7. Air-conditioners and lights are switched off in meeting rooms when these are not in use.

The above measures are general and can be applied to all offices.

Every Member of Staff Needs to Contribute



A "Clean-air Drama" played by children at JEC's Group Briefing session

"Every member of staff should contribute to environmental protection," Mr James Graham, Chief Executive of Jardine Engineering Corporation (JEC) said. "Therefore, we launched the JEC Clean Air Campaign Award to mobilise colleagues with information and action to protect the environment."

The awards cover three categories, namely Clean Air Technology, Best Outdoor Clean Air, and Best Indoor Clean Air awards. The Campaign is open to all JEC's 3,000 technical and general employees.

Forbes recently reported that a number of Hong Kong companies were forced to raise remuneration levels to attract expatriates put off by the air quality in Hong Kong. Hong Kong's status as the financial capital of Asia can and will be threatened if it loses its ability to retain key local and foreign executives. A survey conducted by A.C. Nielsen also showed that most executives knew of someone who had left or was thinking of leaving Hong Kong because of the deteriorating air quality. Together with buzzing media reports, the entire business and public community has become concerned with our polluted air.

Mr Graham looked at the issue from a different angle. "We should take action to protect our air and therefore the health of our people, starting with ourselves and the actions we can take," he said.

As one of the early signatories of the Clean Air Charter, JEC has pledged to reduce emissions by giving advice to clients as well as in its own operations on matters like fuel choices and use, regular maintenance and energy efficiency techniques, cut down on waste through effective recycling schemes in the office and workplaces, and adopt energy-efficient practices in daily businesses. To be a responsible corporate citizen, a number of proactive measures have been taken throughout the company.

"We have implemented an Environmental Management System in the third quarter of 2006, with the aim of achieving ISO 14001 certification by 2007," Mr Graham explained. "We encourage the sale of environmentally friendly products – as of July 2006, more than 39% of our clients purchased diesel generator sets which met the US's EPA Tier 1 Emissions Standards, while a further 6% required that Tier 2 standards were met. JEC also closely monitors to ensure that ultra low sulphur diesel is used in company's vehicles."

Within the company, JEC has also taken measures to reduce electricity usage. By way of example, energy saving T5 fluorescent tubes are used in place of conventional tubes, saving an estimated 38.6 MWh of electricity per year. Lights are switched off whenever possible – lighting at respective zones in the main office has to be manually turned on, whilst they are switched off by default after 7:45 pm daily. In line with government recommendations, JEC have maintained relative humidity and indoor air temperature at government recommended levels since August 2006 and regularly monitors the chilled water that it is using from the building owners in the premises that it occupies which helps to ensure that energy use is minimised for the cooling of its premises.

"Apart from the Awards, we ask each of our colleagues and associates to support the clean air initiative from top management to apprentices in the workplace. JEC will be reporting on the progress made in its support of the Clean Air Charter at the end of 2006," Mr Graham said.



Vehicles, Machinery and VOCs

Vehicle Movement / Idling

Measures to reduce emissions into the air and energy consumption associated with use of vehicles include:

- Replacing pre-EURO or EURO I/II type medium/heavy goods vehicles with EURO IV type vehicles;



- Planning journeys to avoid congested roads, steep hills, road construction, etc.;
- Avoiding driving for short trips;
- Switching off engines when idling - Driving off as soon as possible after starting and switching off the engine if idling for a long time;



- Buying a fuel efficient car (*compare the fuel consumption of different cars before making a purchase decision. Ask the dealer for a fuel consumption rating of a car*);
- Considering alternative fuel vehicles (e.g., hybrid car);
- Walk or ride a bicycle for short journeys;
- Use public transport.

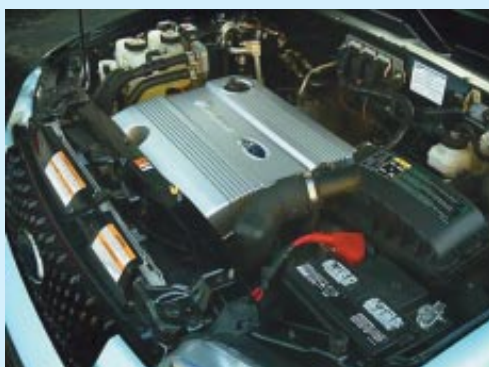


Tip:

According to the information from the Website of the City of Toronto, Canada, an idling diesel engine will burn about 2.5 litres per hour and an idling gasoline engine will burn about 3.5 litres per hour. It is estimated that ten seconds of idling uses more fuel than restarting the engine.

Hybrid Vehicles

Hybrid vehicles are more environmentally friendly than conventional vehicles and these types of vehicles are available on the Hong Kong market now. The technology uses a combination of a petrol engine and an electric motor drive to improve fuel efficiency and reduce emissions.



Typical fuel consumption and emissions from hybrid vehicles are about 50% below equivalent, conventionally powered vehicles.

In the Policy Address 2006 announced on 11 October 2006, the HKSAR Chief Executive, Mr Donald Tsang proposed that a 30% reduction in first registration tax will be given to people purchasing vehicles with low emissions and high fuel efficiency (environmental friendly vehicle, such as hybrid vehicles), subject to a ceiling of \$50,000 per vehicle.

Cleaning the Air in the Streets

In our busy streets, air pollution is mainly caused by motor vehicles, particularly diesel vehicles, such as trucks, buses and light buses. Pollutants such as particulates and nitrogen oxides are often trapped between the tall buildings that line the streets.

Obviously we need more green vehicles on the streets, especially on busy corridors. And there are practicable measures to reduce pollution from vehicles, as demonstrated by The Kowloon Motor Bus Company (1933) Limited (KMB).

As one of the largest public transport companies in Hong Kong, KMB makes around 2.8 million passenger trips daily. As at 31 October 2006, among the 4,037 buses in the KMB bus fleet, 3,450 buses achieve Euro II or above emission standards, with 450 and 563 buses achieving Euro III and close to Euro IV emission standards respectively. In early 2006, KMB took the lead to introduce two Euro IV double deck buses to Hong Kong. With the most advanced technology in environmental protection, the Euro IV engine reduces emissions of nitrogen oxides and particulates by 30% and 80% respectively when compared with the Euro III engine.

Since 2001, KMB has used ultra-low sulphur diesel (ULSD) in its entire fleet, significantly reducing exhaust emission levels of sulphur oxides, nitrogen oxides and particulates. Catalytic converters have

been retrofitted on all KMB buses with pre-Euro or Euro I engines. With the catalytic converters and the use of ULSD, the exhaust emissions of pre-Euro or Euro I buses have been improved to Euro I and II engine standards respectively.

Buses equipped with Continuous Regeneration Traps (CRTs) can achieve a significant reduction in particulate matter and reduce smoke levels to virtually zero. Currently we have 563 Euro III-engined buses equipped with CRTs plus an exhaust gas recirculation device, which are able to meet emission standards at a level close to Euro IV engine standards.

Recently, KMB has also upgraded its Traffic Operations Management System for more efficient deployment of its "Euro buses". KMB notes the emission standards for all its buses and screens the database for all bus routes requiring emission standards at Euro II or above. Whenever there is an ad-hoc bus arrangement calling for replacement of any bus running on a busy corridor, the system will alert staff in the event of any mismatch involving a non-Euro II or above bus, thus guaranteeing that they select the appropriate bus type.

Currently, all KMB buses running on Yee Wo Street, Hennessy Road, Queensway and Des Voeux Road Central, and 90% of KMB buses operating on Nathan Road, are at Euro II or above standard.



全城投入 為藍天打氣

Clean Air for a Cool Hong Kong

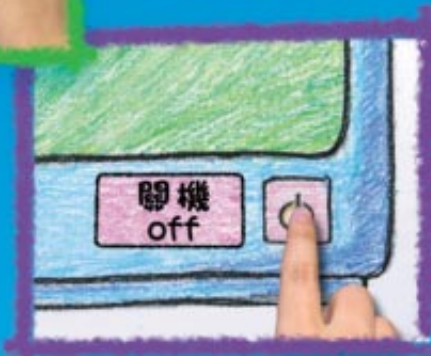
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◦ **停車熄匙**
Turn off idling engines

◦ **選用環保私家車和
提早更換舊型柴油
商業車輛**
Select environmentally
friendly vehicles and
convert older diesel
commercial vehicles into
newer models in
advance



◦ **電器不使用就關掉**
Switch off appliances when
not in use



◦ **穿著輕便衣服**
Wear light clothing



◦ **盡量乘搭公共交通工具**
Take public transport as
much as possible



◦ **選用節省能源的電器**
Use energy-efficient appliances



◦ **選用不含揮發性有機
化合物的產品**
Select products with no
volatile organic compound
contents



環境保護署
Environmental Protection Department

Machinery and Equipment

Measures can be employed to reduce energy consumption from machinery and equipment include:

- Installing energy-efficient motors;
- Not using oversized motors, which are inefficient when running at part load (e.g., 85% load);
- Lubricating motors and drive bearings frequently to avoid overheating and power loss;
- Adhering to the maintenance schedules recommended by manufacturers;
- Cleaning heating coils in electric boilers regularly; and
- Reducing the number of lifts or escalators in service after normal working hours and on holidays.



Energy Saving for Lifts/Escalators

Hong Kong is densely populated with a high density of high-rise commercial and residential buildings. Therefore, lifts are essential for almost every building.

As lifts are used frequently, they are one of the facilities that consume the most energy in a building. To save energy, property management companies can switch some lifts to standby mode after office hours or during off-peak hours to reduce the number of lifts in use. Old model of lifts can be upgraded through a modernisation plan to install a modern Variable Voltage Variable Frequency (VVVF) motor drive system, so that the lifts are driven by microcomputer rather than traditional mechanical controls. After incorporating the VVVF motor drive system, it provides smoother acceleration and deceleration of the AC traction machine, and enables the lift to operate at a slower speed during a short running distance. Therefore, the energy consumption can be reduced. In addition, lighting and ventilation systems can be modified to enable automatic switch-off when the lifts are not in use, and this helps to save energy.

For escalators, sensors can be installed, so that the escalators can automatically stop when not in use to conserve energy.

Source: Chevalier International Holdings Ltd.



VOCs

The following practices can reduce VOC emissions:

- Avoiding use of aerosol consumer products such as hairspray, air freshener, deodorants, and insecticides which often use VOCs as their propellants. Non-aerosol consumer products are usually in pump, solid, liquid, gel, or roll-on forms;
- Avoiding use of solvent-based paints by selecting water-based paints as alternatives. If solvent-based products cannot be avoided, applying them with hand brushes or rollers instead of spray systems to reduce the use of thinners, which will also minimise overspray and wastage;
- Avoiding use of VOC-containing products such as organic cleaning solvents;
- Selecting “zero-VOC”/“non-VOC” products or those with a green label (e.g. awarded by the Green Council); and
- Storing VOC-containing products in air-tight containers.



VOCs Reduction by Using Soy-based Ink in the Printing Industry

The U.S. EPA launched a Waste Reduction and Innovative Technology Evaluation project, focused on the use of soy-based inks as a substitute for petroleum based inks in printers. Soy-based inks are produced from renewable resources and emit lower amounts of VOCs during the printing process. Results have shown that approximately 17% more petroleum-based inks were used on a per sheet printed basis. Significantly less volatile components were found in the soy-based inks (0.8%) than in the petroleum-based inks (4.6%).

Green Pagoda Printing Co. Ltd., a 40-year-old printing company, has replaced traditional ink with soy offset ink in some printing products. Though the cost of using soy offset ink is slightly higher than that that of traditional ink, the printing quality associated with soy offset is better, particularly where more than four colours are required.

General Production-type Businesses

There are some simple procedures that can help reduce emissions from production-type businesses. These include:

- Checking, cleaning and maintaining exhaust pipes regularly to avoid the accumulation of dust (which increases the energy efficiency of the system);
- Estimating emissions based on fuel consumption to monitor performance and to identify improvements;
- Monitoring air pollution control equipment regularly to ensure that the efficiency with which pollutants removed is kept at the designated level; and
- Installing suitable emissions control measures.

Air Control Measures

Wet scrubbers, adsorption by activated carbon, electrostatic precipitators, cyclones and fabric filters are the most common air pollution control equipment used to treat flue gas from emissions stacks. Different emissions control technologies and their applications are summarised below.

Emissions Control Technology	SO ₂	NO _x	PM	VOCs
Wet Scrubber	✓	✓	✓	✓
Adsorption by activated carbon				✓
Electrostatic precipitator			✓	
Cyclone			✓	
Fabric filter			✓	



Example of a wet scrubber

Wet Scrubber

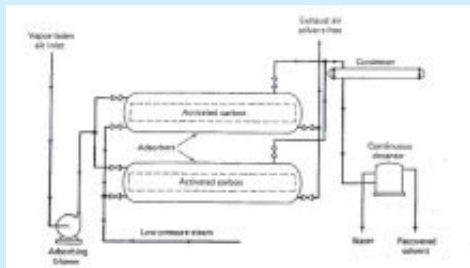
Wet scrubbing systems can be used to control sticky emissions that would plug filter-type collectors. This type of pollution control equipment is used to control both particulate and gaseous emissions simultaneously, to control acidic/alkaline/odorous gases, to recover soluble dusts and powders.

Cost-effective Measures for Cooling Air at Spunbond Nonwoven (S.Z.) Co. Ltd.'s Processing Workshop

Spunbond Nonwoven (S.Z.) Co. Ltd is a non-woven cloth manufacturing factory. The total site area is about 14,500 m². Poly-propylene (PP) is the main raw material to manufacture non-woven cloth. PP is melted and then bonded as a cloth (this technology is called 'Spunbond'). Heaters are used in the process and mechanical ventilation fans are provided in the processing workshop. However, the temperature inside the processing workshop is still high due to the heat release from the melter.

In order to reduce the indoor air temperature at the processing workshop, Spunbond Nonwoven uses a cost-effective and innovative measure called a "Water Cooled Screen" to reduce the indoor air temperature. The double layer water-cooled screen is installed on the windows. A water pipe with sprinklers is installed at the top of the screen. The water is sprayed onto the screen at the top and is collected in a sump at the bottom, to be recirculated. Air passing through this screen is cooled by about 3-5°C.





Typical Solvent Recovery System using Activated Carbon Adsorption

Adsorption Using Activated Carbon

Adsorption means the attachment of molecules to the surface of a solid. Adsorbed materials are attached onto the surface of a material, like dust on a wall. Adsorption is mostly used to remove VOCs. Activated carbon is the most common adsorbent which is low-cost and can be regenerated.

Electrostatic Precipitator (ESP)

Electrostatic Precipitators (ESPs) are used to remove particulates from flue gases. Particles are given an electric charge by forcing them to pass through a corona (a region in which gaseous ions flow). The electrical field that forces the charged particles to the walls comes from electrodes maintained at high voltage in the centre of the flow lane. Once particles are collected on the plates, they must be removed from the plates without re-entraining them into the gas stream.



Example of an electrostatic precipitator in a factory



Example of a cyclone in a factory

Cyclone

Cyclones provide a low-cost, low-maintenance method for removing particulates from gas streams. The general principle of a cyclone system is that the particulate-laden gas is forced to change direction. As the gas changes direction, the inertia of the particles causes them to continue in the original direction and be separated from the gas stream.

Multiple cyclones have overall mass removal efficiencies of 70 – 90%. However, cyclone collection efficiencies fall off rapidly with particle size, so that control of fine particulates is limited.

Fabric Filter

Fabric filter collectors (baghouses) are another technology used for the removal of particulate matter. The technology is conceptually simple: by passing flue gas through a tightly woven fabric, particulates in the flue gas will be collected by the fabric by sieving and other mechanisms. Baghouses are capable removing 98% to over 99.9% of particulates.



Example of a bag filter in a factory

Without a sustainable environment, we won't be able to produce quality shirts

"Every year we produce 60 million shirts, made from pure cotton. Raw materials are provided by our cotton farm in Xinjiang," Mr Calvin Tsang, General Manager of Site Management and Administrative Services of Esquel Group's production base in Gaoming, said. "The quality of cotton we cultivate is critical to our business."

For this reason, environmental protection has been one of the key management philosophies of Esquel and the Group has made major efforts to reduce the environmental footprint of its operations throughout the world.

To ensure reliability of electricity and steam supply as well as increase energy efficiency for such a high annual production, Esquel has built its own coal-fired power plant near the production base. Emission control measures including electrostatic precipitator (ESP) and flue gas desulphurization (FGD) are implemented at the plant to reduce emissions of sulphur dioxide (SO₂) and particulate matter (PM). In addition, air emissions from the power plant are monitored with a continuous emissions monitoring system (CEMS) (see Figure 1). Real-time data including air pollutant concentrations, air flow parameters such as oxygen content, temperature, flowrate and pressure are obtained and stored in a database, which is also sent to the local authorities regularly for record.

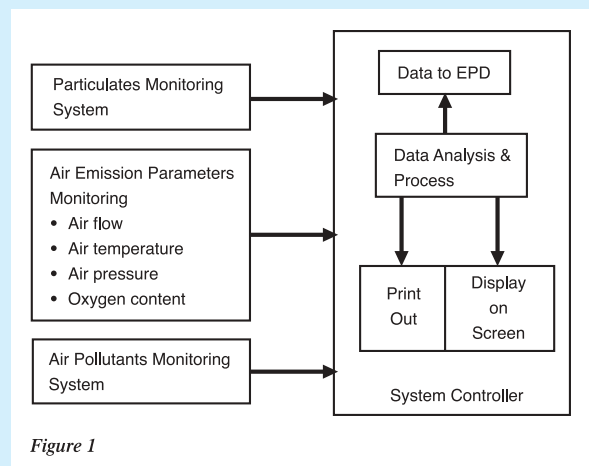


Figure 1



Figure 2

Apart from power generation emissions, production of textiles usually releases fine fibres and cotton dust, which become suspended in the air. A cyclone is a typical, commonly used and effective means for removing dust from such processes (see Figure 2) with removal efficiencies reaching 80%.

At Esquel's factory, an air extraction system is provided in each workshop to collect the fugitive cotton dust or fibres. The collected air is passed through cyclone before being discharged into the atmosphere. Water containing cotton and fibres from the cyclone is sent to Esquel's wastewater treatment plant for treatment and the treated water is reused in the scrubbers.

"The textiles industry employs more people around the world than any other. The companies that make up the industry therefore have much to contribute to social and environmental responsibility," Mr Tsang said.