TM SYSTEMS CONSULTANTS

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Quality & Environment Management System Training Based On ISO 9001 & ISO 14001 Standards

(Duration: 1.5 days, 12 hrs, Day 1: 8.30am – 5.30pm, Day 2: 8.30am – 12.30pm)

A Training Program specially designed for **ALPHA CONSULTING ENGINEERS PTE LTD**

This training program aims to enhance the participants' understanding and knowledge to better implement an effective Company's Quality & Environmental Management System (QEMS) to ISO 9001:2000 and ISO 14001:2004 standards.

Training Program Outline

Day 1 – 8.30AM – 12.30PM

- **Key Elements of ISO9001 Standard**
- **Overview of Quality Management System (QMS) - QMS Flowchart**
- **QMS Policy & Objectives**
- **QMS & Project Documentation – Procedures S1, S2, S3**
- **Tea Break (20 mins)**
- **Project Design Phase – Procedures M3, M4**
- **Discussion Session I**

Day 1 – 1.30PM – 5.30PM

- **Project Construction Phase – Procedure M7**
- **Testing & Commissioning Phase – Procedure M8**
- **Tea Break (20 mins)**
- **Internal & Customer Feedback Analysis & Reporting – Procedure QE2**
- **Discussion Session II**

Day 2 – 8.30AM – 12.30PM

- **The Singapore Green Plan 2012 – 'Towards Sustainable Development'**
- **Global Climate Change (Video Clips)**
- **Discussion Session III**

Training Methodology

The training program is delivered in lecture format which incorporates discussion sessions and video clips.

Training Equipment Required

The training equipment required are computer laptop, portable media projector, flipcharts, whiteboard and markers, etc.

ISO 9001

THE LAST PAGE

Miscommunication

Memo from CEO to Manager:

Today at 11 o'clock there will be a total eclipse of the sun. This is when the sun disappears behind the moon for two minutes. As this is something that cannot be seen every day, time will be allowed for employees to view the eclipse in the parking lot. Staff should meet in the lot at ten to eleven, when I will deliver a short speech introducing the eclipse, and giving some background information. Safety goggles will be made available at a small cost.

Memo from Manager to Department Head:

Today at ten to eleven, all staff should meet in the car park. This will be followed by a total eclipse of the sun, which will appear for two minutes. For a moderate cost, this will be made safe with goggles. The CEO will deliver a short speech beforehand to give us all some information. This is not something that can be seen every day.

Memo from Department Head to Floor Manager:

The CEO will today deliver a short speech to make the sun disappear for two minutes in the form of an eclipse. This is something that cannot be seen every day, so staff will meet in the car park at ten or eleven. This will be safe, if you pay a moderate cost.

Memo from Floor Manager to Supervisor:

Ten or eleven staff are to go to the car park, where the CEO will eclipse the sun for two minutes. This doesn't happen every day. It will be safe, and as usual it will cost you.

Memo from Supervisor to staff:

Some staff will go to the car park today to see the CEO disappear. It's a pity this doesn't happen everyday.

ABC PTE LTD

SUMMARY OF ACHIEVEMENT OF QUALITY OBJECTIVES & PERFORMANCE INDICATORS

Period of Assessment: January 2008 to December 2008

S/No	Objectives	Performance Indicator	Results Achieved				Responsible Department
			Mar 2008	Jun 2008	Sep 2008	Dec 2008	
A. Customer & Key Processes Management							
1.							Marketing
2.							Design & Drafting
3.							Authorities Submissions
4.							
B. Quality Management							
5.	No. of non-conformances raised during each formal audit of QMS	Not more than 4 non-conformances raised per formal audit.					Quality Management

Approved by : _____ Date : _____

CEO

ABC PTE LTD

QUALITY OBJECTIVES & PERFORMANCE INDICATORS

S/No	Objectives	Performance Indicator	Responsible Department
A. Customer & Key Processes Management			
1.			Marketing
2.			Design / Drafting
3.			Authorities Submission
4.			
B. Quality Management			
1.	No. of non-conformances raised during each formal audit of QMS	Not more than 4 non-conformances raised per formal audit.	Quality Management.

Note : Design / Drafting Change Orders, Authorities Submission to be monitored by the concerned department/s are defined as process deficiencies attributed to the Company that are due to any of the following reasons :-

A) Communication Issues & Problems
B) Resource Allocation Issues & Problems
C) Non-compliance With Working Procedures
D) Training & Design / Drafting / Authorities Submission Competency Issues & Problems
E) Vendor's Quality & Reliability Issues
F) In-House Quality Control Process Inadequacy

Approved by : _____ Date : _____

CEO

ABC PTE LTD

MONITORING & MEASUREMENT AND ANALYSIS OF DATA PLAN

S/No	Monitoring & Measurement				Analysis of Data			
	Parameter/ Characteristic	Frequency	Method	Responsible Department	Purpose	Frequency	Method	Responsible Department
A. Customer & Key Process Management								
1.		Continuous / Monthly	To collate & record customer complaints received.	Marketing	Confirm quality objective met & identify any area for improvement	Half-Yearly	Qualitative & Quantitative	Quality Management
2.		Continuous / Monthly	To collate & record ECO initiated in-house	Design & Drafting	Confirm quality objective met & identify any area for improvement	Quarterly	Qualitative & Quantitative	Quality Management
3.		Continuous / Monthly	To collate & record occurrence of item rejects	Authorities Submission	Confirm quality objective met & identify any area for improvement	Quarterly	Qualitative & Quantitative	Quality Management
4.		Continuous / Monthly	To collate & record occurrence of warranty claims by Customer		Confirm quality objective met & identify any area for improvement	Quarterly	Qualitative & Quantitative	Quality Management
B. Quality Management								
1.	No. of non-conformance per formal audit	Each formal audit	To collate & record non-conformances reported	Quality Management	Confirm quality objective met & identify any area for improvement	Each formal audit period	Qualitative & Quantitative	Quality Management

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MONITORING & MEASUREMENT AND ANALYSIS OF DATA FORM - MARKETING FUNCTION

Quality Objective :

(Monthly) Updated on : _____
Date

Monitoring & Measurement						Analysis					
S/N	Date of Receipt of Adverse Issue	Description of Adverse Client Feedback	Parties Responsible	Date Issue Resolved with Client	Issue Resolved By	Reasons for Adverse Client Feedback				Quality Objective Met?	Improvement Area (if any)
						A*	B*	C*	D*	Yes / No	Ref. No.

Updated By: _____
Name & Designation

Reviewed & Endorsed By: _____
Name & Designation

*Note : * Reasons : A* - Communication Issues ; B* - Resource Allocation Issues ; C* - Non-compliance of Working Procedures ; D* - Training & Competency Issues.*

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MONITORING & MEASUREMENT AND ANALYSIS OF DATA FORM - DESIGN & DRAFTING FUNCTION

Quality Objective :

(Monthly) Updated on : _____
Date

Monitoring & Measurement						Analysis					
S/N	Date of Discrepancy / Deficiency	Description of Discrepancy / Deficiency	Parties Responsible	Date Resolved	Issue Resolved By	Reasons for Discrepancy / Deficiency				Quality Objective Met?	Improvement Area (if any)
						A*	B*	C*	D*	Yes / No	Ref. No.

Updated By: _____
Name & Designation

Reviewed & Endorsed By: _____
Name & Designation

*Note : * Reasons : A* - Communication Issues ; B* - Resource Allocation Issues ; C* - Non-compliance of Working Procedures ; D* - Training & Competency Issues.*

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MONITORING & MEASUREMENT AND ANALYSIS OF DATA FORM - AUTHORITIES SUBMISSION FUNCTION

Quality Objective :

(Monthly) Updated on : _____
Date

Monitoring & Measurement						Analysis					
S/N	Date of NC / NA	Description of Non-compliance (NC) / Non-approval (NA)	Parties Responsible	Date Resolved	Issue Resolved By	Reasons for Non-compliance / Non-approval				Quality Objective Met?	Improvement Area (if any)
						A*	B*	C*	D*	Yes / No	Ref. No.

Updated By: _____
Name & Designation

Reviewed & Endorsed By: _____
Name & Designation

*Note : * Reasons : A* - Communication Issues ; B* - Resource Allocation Issues ; C* - Non-compliance of Working Procedures ; D* - Training & Competency Issues.*

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MONITORING & MEASUREMENT AND ANALYSIS OF DATA FORM - QUALITY MANAGEMENT FUNCTION

Quality Objective : < 4 Nos. of Non-conformances Raised In Each Formal Audit Session.

Updated On : _____
Date

Monitoring & Measurement				Analysis						
S/N	Period of System Audit	Type of System Audit (Internal / External)	Department Concerned for Non-conformances	No. of Non-conformances per System Audit	Nos. for Reasons for Occurrence of Non-conformances			Ref. No. of Non-conformances per System Audit	Quality Objective Met?	Improvement Area (if any)
					Human Factors	System Procedures Factors	Environmental Factors		Yes / No	Ref No.

Updated By: _____
Name & Designation

Reviewed & Endorsed By: _____
Name & Designation

ISO 14001

The alternatives: Clean, available but also costly



WIND POWER: Wind turbines in Scotland. Wind, solar, geothermal and tidal power account for just 1 per cent of the world's energy.

PHOTO: REUTERS

» What are they?

Renewable energies occur naturally and can be tapped again and again, unlike fossil fuels such as coal or oil which take millions of years to form and can be used only once.

Renewables include firewood, hydro, wind, solar, geothermal and tidal power.

The main renewable energy used worldwide is "biomass", mainly firewood or organic waste which accounted for about 10 per cent of world primary energy use in 2004.

Second was hydropower with a 2 per cent share. Other major types of renewables – wind, solar, geothermal and tidal power – made up just 1 per cent. By contrast, fossil fuels supply about 80 per cent of world energy.

» How long have they been around?

The International Energy Agency (IEA) calls biomass such as firewood "the oldest form of renewable energy exploited by mankind".

Ancient Egyptians harnessed the wind for sailing perhaps 5,500 years ago. Hydropower turbines and solar-powered steam engines were first used in the 19th century.

Harnessing of geothermal power and tidal power began in the 20th century in Europe.

» What are the advantages?

Clean energies do not run out and can be tapped in many parts of the world, meaning they can help governments break dependence on imported energy.

Wind, solar and wave energy do not produce carbon dioxide (CO_2). Plant-derived fuels which are burnt, such as biomass and biofuels, produce only the same amount of CO_2 that those plants originally absorbed.

Clean energies also do not release other toxic pollutants associated with burning fossil fuels, and they do not have the risks or waste-storage problems involved with nuclear power.

» What are the disadvantages?

Cost. Many renewable energies cannot compete without subsidies against fossil fuels, even with oil at US$60 (S$92) a barrel.

The capriciousness of the natural elements – wind, sun, tides etc – used to power plants and turbines is also a problem. Hydro and tidal power projects can cause huge disruptions to human and marine habitats.

» What is the outlook?

The IEA projects that renewables will gain overall to supply 13.7 per cent of world primary energy by 2030 from 13.2 per cent in 2004. If governments do more to promote them, the share could rise to 16 per cent.

The European Renewable Energy Council and Greenpeace issued a 2007 report projecting half of all energy could come from renewables by 2050, with the biggest shares by then for wind and solar power followed by hydro, biomass, geothermal and ocean energy.

REUTERS

Cutting carbon emissions

CARBON dioxide is the main culprit in Singapore's greenhouse gas emission. The aim is to bring emissions to 25 per cent below 1990 levels by 2012. Five key sectors that use energy are targeted.

POWER GENERATION SECTOR
This is the largest primary source of CO_2 emissions.

Aim: Improve power generation efficiency; encourage use of cleaner, less carbon-intensive fuels like natural gas.

Existing:

» Between 2000 and 2005, electricity generated by natural gas has grown from 19 to 74 per cent. Natural gas emits 40 per cent less carbon dioxide per unit of electricity generated.

» Use of energy efficient power generation technology.

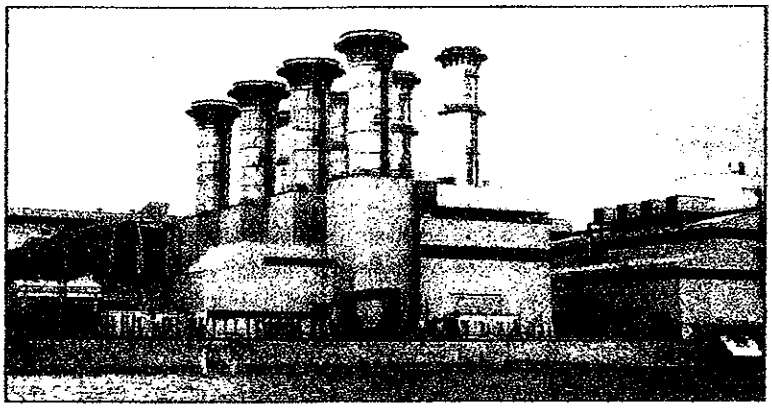
» Since 2000, energy from incinerated waste contributed up to two per cent of energy supply.

» Funding for renewable energy like solar power.

Proposed:

» Emissions standards for power plants.

» Encourage reporting of CO_2 emissions to raise awareness of energy use and identify areas for improvement.



HIGHER STANDARDS: Setting emissions standards for power plants like Senoko power plant (above) has been been proposed.

INDUSTRY

Aim: Improve energy efficiency to cut carbon intensity. Capitalise on business opportunities, including exporting carbon-efficient technology, and carbon trading.

Existing:

» Energy audit schemes, like the $10 million Energy Efficiency Improvement Assistance Scheme to co-fund energy audits. As of May last year, 18 applications have been approved.

» Tax incentives for energy efficient equipment.

Proposed:

» Generate heat and electricity together. Using waste heat from combustion can increase energy efficiency of power generation from 40 to 50 per cent to more than 75 per cent. Trigeneration – the simultaneous generation of power, heat and chilled water – is being test-bedded.

» Promote energy-efficient industrial equipment through tax incentives, minimum energy-efficiency standards and energy labelling.

» Encourage energy audits.

TRANSPORT

Aim: Minimise emissions by managing usage, improving fuel efficiency and promoting use of cleaner fuels and green vehicles. Vehicle population in 2006: 776,571.

Existing:

» Mechanisms like the Certificate of Entitlement system, Electronic Road Pricing, and schemes like car sharing and Park-and-Ride.

» Taxes pegged to engine capacity and petrol tax based on volume.

» Voluntary fuel economy labelling.

» Green vehicle rebate.

Proposed: Mandatory fuel economy labelling, further support for the use of vehicles using compressed natural gas, review of the green vehicle rebate, cultivating fuel-efficient habits and promoting public transport and car-pooling.

BUILDINGS

Aim: Boost energy-efficient design and technologies, conservation, and natural light and ventilation – energy use can be cut by 35 per cent.

Existing: Minimum energy-efficiency standards focusing on heat transfer, building labelling schemes like the Green Mark, energy audits and use of solar energy.

Proposed: Review of insulation standards for non-air-conditioned buildings like schools and HDB flats, promoting energy-efficient designs and practices, promoting solar energy, and expanding building labelling.

HOUSEHOLDS

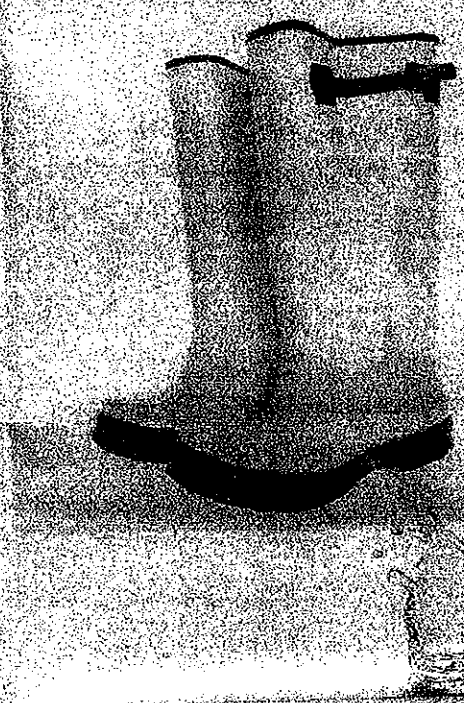
Aim: Get people to buy energy-efficient appliances, and to have energy saving habits.

Existing: Voluntary energy labelling, "green corners" in stores like Best Denki, and public education.

Proposed: Mandatory labelling and minimum efficiency standards for energy-intensive appliances like air-conditioners and fridges, and increasing public awareness.

Weathering it

Soon after becoming party to the Kyoto Protocol in 2006, Singapore's Ministry of the Environment and Water Resources drew up a tentative National Climate Change Strategy. Using projections from the United Nations' Intergovernmental Panel on Climate Change's Third Assessment Report, it identified key vulnerabilities, past efforts as well as current ones to cope with possible climatic change, and identified future measure.



LAND LOSS AND FLOODING

Coastal erosion and some land loss could result from a substantial rise in sea level, states the strategy outline, using the 2001 projection of a 88cm rise by 2100. That figure has since been revised down – to up to 59cm.

Higher sea levels also make it harder for rainwater to drain into the sea, worsening inland flooding when heavy rains or storms hit.

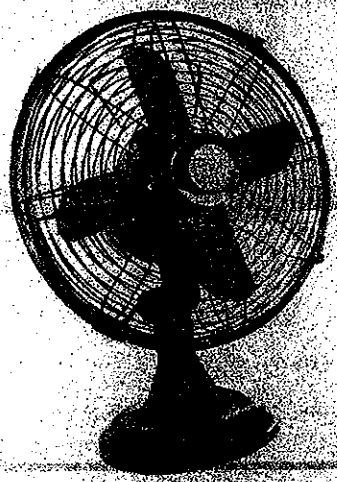
To minimise such effects, PUB requires that all coastal land be built 40cm higher than the new sea level after an 88cm sea level rise. Since 1991, the minimum platform level for reclaimed land has to be 125cm above the highest recorded tide.

There is also a storm water management system to minimise flooding, as well a work on flood-prone areas.

WATER RESOURCE IMPACT

If sea levels went up by 88cm, sea water could flow into some coastal reservoirs. Fitting more steel plates on tidal gates will act to stem that.

Rising temperatures could also affect rainfall and its seasonal distribution, changing the water levels in reservoirs. Such unpredictability affects planning for water resources.



HIGHER ENERGY DEMAND AND HEAT STRESS

When the heat is on, so are the air-conditioners. The result: Rising temperatures could mean using lots more energy.

The answer: Bring down temperatures with more greenery, which is what the Urban Redevelopment Authority and the National Parks Board are doing, as well as changing building layout and design.

The Housing Board is also working with NParks to develop a planning tool to quantify the amount of green going into a designproject. This Green Plot Ratio helps designers balance the green versus grey in estates.

IMPACT ON ISLAND AND MARINE BIODIVERSITY

Rising sea levels could lead to a loss of mangroves – and that could worsen coastal erosion, affecting places like Sentosa, East Coast Park and Sungei Buloh.

Rising seawater temperatures could also affect marine life.





PUBLIC HEALTH IMPACT

Climate change also cause changes in patterns of communicable diseases around the world. Because Singapore sits in a area where diseases like dengue are endemic, such diseases are a worry.

Thus, the National Environment Agency has a comprehensive programme to control vectors like mosquitos and rodents, which can spread disease.

Getting ready for rising sea levels

Measures are in place to deal with the effects of climate change

BY ARTI MULCHAND

THE little red dot has no wish to be red-hot or submerged.

The good news is that measures, including those long in place like minimum heights for reclaimed land, are helping to protect Singapore from some of the effects of climate change like rising sea levels.

In 1991, the Public Utilities Board had set the minimum platform levels for new reclamation projects at 125cm above the highest recorded tide, to "ensure proper drainage of the reclaimed land", said a PUB spokesman.

This means that areas such as Changi East and the Tuas View Extension will be able to cope with even the highest sea level rise of 59cm, as projected by the United Nations' Intergovernmental Panel on Climate Change (IPCC) earlier this month.

Other measures have also been put into place to deal with some of the anticipated consequences at five key points of vulnerability.

These range from land loss and flooding, to the impact on Singapore's water resources (see other story), said the National Climate Change Strategy, developed by the Ministry of the Environment and Water Resources and the National Environment Agency (NEA).

The strategy paper points out that for Singapore – a tropical island city-state – issues like warming temperatures and rising sea levels are real concerns requiring anticipatory measures.

It was launched last April, along with Singapore's signing of the Kyoto Protocol, an international agreement to curb pollution by reducing gas emissions from various sources, including air-conditioners, cars and large coal-fired power plants.

Thus, in anticipation of seawater being able to get into reservoirs here, there are plans for more steel plates in tidal gates.

An ongoing two-year study by the NEA – the first of its kind here – is looking at the possible impact of climate change, including changes in rainfall patterns, sea levels and possible extreme weather conditions, and to identify strategies to help deal with the problems, said the NEA.

The world's vulnerability to potential climate change made headlines in the weeks following the release of the report summary of the IPCC report, which said that signs of global warming are "unequivocal" and that human activity is the main cause.

The report is a "screaming siren" compared to just a wake-up call from the last report, released in 2001, Greenpeace's spokesman said.

Among other findings, the report states that global average temperatures could rise between 1.1 and 6.4 deg C, and that sea levels are likely to rise by 18cm to 59cm.

Heatwaves and heavy rains are "very likely" to become more frequent.

Authorities here are awaiting the full IPCC report, expected to be released in May. It is expected to make regional projections of climate change effects that can feed into Singapore's study.

NEA's spokesman has also said that inter-agency task forces, like those previously formed in response to dengue and the haze, will be formed to deal with "likely scenarios arising out of climate change".

Also watching matters closely are environmentalists and agencies like the Climate Change Organisation, Singapore, and the Singapore Institute of International Affairs (SIIA).

Last month, SIIA and oil company Shell Singapore released a special report outlining the key environmental challenges for Singapore and the region, with information culled from an experts' roundtable discussion in September last year, one of which was to build awareness along different avenues and target specific stakeholders.

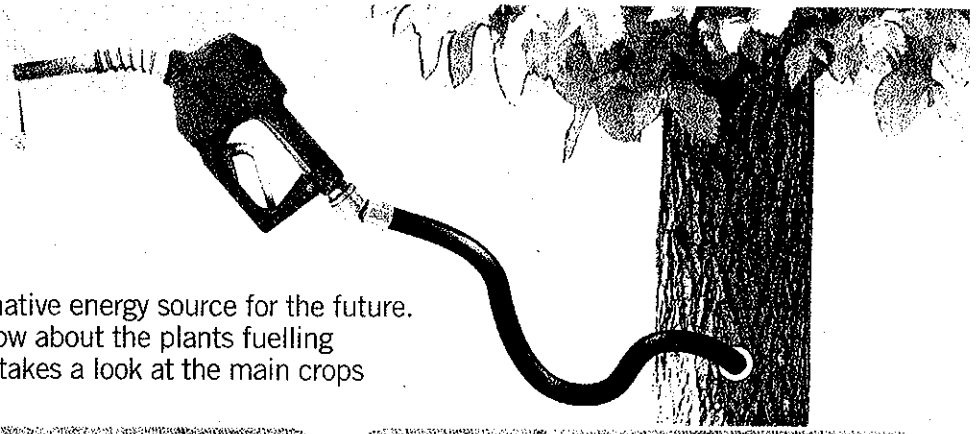
Another major challenge: translating climate change findings for the layman, so he understands how such issues are directly relevant to his life.

Roundtable participants also pointed to the need for more Asia-centric research on climate change, since most current research is being done in the West.

They also highlighted the need for "regional political will to effect change in Asia", such as through Asean.

arti@sph.com.sg

The good, the bad the ugly



Biofuels are seen as an alternative energy source for the future. But just how much do we know about the plants fuelling the industry? Jessica Cheam takes a look at the main crops

OIL PALM



» **Where:** Malaysia and Indonesia
» **Uses:** Vegetable oil, soap, washing powder
» **Production:** 37 million tonnes last year
» **How green is it?** Critics argue that high demand has led in some cases to deforestation, loss of biodiversity, forest fires and climbing food prices. But in some countries in Africa, growing oil palm has helped create income for poor communities.

» **Fast fact:** Oil palm has a high oil yield. It can yield 5 tonnes of oil per hectare; jatropha yields about 2 tonnes, rapeseed yields 1.5 tonnes and soya bean is the worst performer at 0.5 tonnes.

JATROPHA CURCAS



» **Where:** South America, China, India
» **Uses:** Fertiliser, soap
» **Production:** Exact production is not clear, but it currently makes up less than 1 per cent of global biodiesel fuel produced annually.
» **How green is it?** Has great potential as it is non-edible and can grow on land that does not compete with food crops. But methods to cultivate it for commercial production have not been proven.

Rural communities growing jatropha extensively can also increase their income and gain energy independence.

SUGAR CANE



» **Where:** Brazil, United States
» **Uses:** Food, sugar, mats, ethanol
» **Production:** More than 1 billion tonnes of sugar cane a year. Global production of ethanol as fuel in 2006 was around 40 billion litres.
» **How green is it?** If grown sustainably, it can reduce greenhouse gas emissions by 90 per cent, compared to fossil fuels.

Brazil's ethanol production also helps it to enhance its energy security.

SOYA BEAN



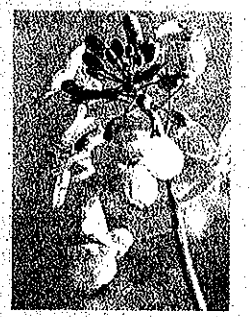
» **Where:** East Asia
» **Uses:** Food, oil, flour, milk substitute
» **Production:** 215 million tonnes a year
» **How green is it?** Critics argue that biofuels made from soya bean are to blame for rising food prices. It also has a lower yield than oil palm and jatropha, for example, and in some countries, soya cultivation has led to deforestation.

MAIZE



» **Where:** Central and North America
» **Uses:** Food, animal feed
» **Production:** About 700 million tonnes a year
» **How green is it?** Also used extensively for food, so exacerbates the food versus fuel conflict. The grain required to produce fuel to fill one car tank (240kg of maize for 100 litres of ethanol) could feed one person for a year. On the other hand, poor farmers growing the crop benefit from higher prices.

RAPESEED



» **Where:** China, Canada and India
» **Uses:** Animal feed, vegetable oil
» **Production:** 47 million tonnes a year.
» **How green is it?** In Europe, rapeseed (which makes up 80 per cent of the European Union's production) helps the EU meet its biofuel targets. But some scientists say rapeseed biodiesel could produce up to 70 per cent more greenhouse gases than fossil fuels because of how it is processed and produced.

PHOTOS: DESMOND LIM, INTERNET, ISTOCK GRAPHICS: TIEN CHUNG PING

Rising palm oil prices take steam out of biofuels industry

2 out of 3 operational plants here have stopped production, but some firms remain optimistic

BY JESSICA CHEAM

LESS than three years since Singapore identified biofuels as one of the new growth areas and opened its first biodiesel plant to much fanfare, the fledgling industry has fallen victim to soaring palm oil prices.

Of the three operational plants here, two have stopped production and one is cutting production to a minimum.

Palm oil, used as the main raw material for biodiesel, has shot past US$1,000 (S$1,382) a tonne and recently hit a record of US$1,418, making it impossible for biofuel makers to continue business. Three years ago, palm oil cost only US$450 a tonne.

The first plant here, built by Singapore-based Continental BioEnergy, began production in August 2006. It has an annual capacity of 150,000 tonnes.

Its spokesman told The Straits Times: "We've cut back production to a minimum that just meets our previous commitments. We're desperately looking for other feedstocks now."

Some alternative raw materials used in biofuels include soya bean or rapeseed, but these produce less oil per hectare than oil palm.

Singapore's second US$20 million plant with an annual capacity of 100,000 tonnes is by Nexsol, a joint venture between Germany's Peter Cremer, a global trader of commodities, and Malaysia's Kulim Berhad, which runs oil palm plantations. The third is a US$130 million plant of 600,000 tonnes capacity by Australia's Natural Fuel (NFL).

Nexsol's chief executive John Hall said that its Singapore plant, now running at 75 per cent of its total capacity, will shut down next month. It has also shut down its Malaysia plant.

"The biofuels industry here today is almost non-existent. The cost of palm is too high," said Mr Hall, adding that more incentives are needed to grow a local market.

NFL's spokesman said it has also stopped production at its local plant, which is currently refining only crude glycerine, used in food, cosmetics and pharmaceuticals. However, NFL said it has secured a contract for a supply of jatropha as feedstock for its Singapore plant early next year.



PHOTO: BLOOMBERG

HIGH PRICE: Palm oil is used as the main raw material for biodiesel. It has shot past US$1,000 per tonne, making it impossible for biofuel makers to continue business.

The jatropha plant, grown in countries such as India and China, is regarded to have great potential for biofuels. It is a leafy shrub that can grow to 5m, is non-edible and grows on semi-arid land unsuitable for food crops.

This could address environmental issues of clearing land for such crops and rising food prices when food crops are used as biofuels instead. Critics say this is the downside of such fossil fuel alternatives. Nexsol and Continental are also currently sourcing jatropha as an alternative feedstock.

Singapore's biofuels industry is not the only one that is flagging. Across the Causeway, only two or three plants – out of 90 licences issued – are in production, said an industry source.

The news is not all bleak: Finnish firm Neste Oil recently said it will build the world's largest biodiesel facility on Singapore's shores for $1.2 billion. It will start operations in 2010.

Although market watchers have questioned Neste's recent move at a time where palm oil prices are volatile, Neste's spokesman said it believed biofuel targets and mandates in the pipeline will boost the market. In the European Union, for example, leaders have committed to setting a binding minimum target of 10 per cent of biofuel usage in transportation by 2020.

Besides palm oil, Neste is sourcing other raw materials too. Long-term contracts will help the company ride out short-term price fluctuation, it said, adding that its patented "NExBTL" technology allowed it to use any vegetable oil or animal fat, yielding quality fuel that greatly reduces emissions.

This "second generation" technology – with biofuels developed from non-edible or discarded plant parts – is an area the Economic Development Board (EDB) is throwing its weight behind. Its head of energy, chemical and engineering services, Mr Law Tat Win, said EDB still "believes that the biofuels industry is here to stay."

Biofuels will be "an important source of fuel to meet the global energy demand... Technology will be key.

"Hence, the focus is on working with industry, research institutes and universities to develop a strong base of biofuels expertise here," said Mr Law.

Some Singapore-listed firms also remain positive: biodiesel firm Van Der Horst Energy, and electronics maker Europtronic have announced big plans to grow their biodiesel business, using jatropha as feedstock.

Meanwhile, debate rages on about how green alternative fuels really are.

The Singapore Environment Council's executive director Howard Shaw said although the use of biofuels is touted as a solution to energy security issues, "even the greenest of the green have been divided on its merits."

"More research and studies have to be done before a clearer picture can emerge," he said.

jcheam@sph.com.sg

FAST FACTS

WORLDWIDE, biofuels still make up less than 1 per cent of transportation fuel.

Current technologies can push this to 3 per cent, but increasing capacity beyond that would require significant technology breakthroughs.

Biofuels are meant to reduce carbon emissions as the plants grown for fuel absorb carbon during their lifetime before they are burnt as fuel. Critics, however, say the total emissions created in the production of biofuels, by clearing forest land for example, amount to more than the emissions it saves.

Demand is expected to expand almost 20 per cent per year through 2011, to 92 million tonnes, despite recent concerns over their impact on the environment and world food supplies.

There are two main types of biofuels: bioethanol, from crops like sugar cane and corn; and biodiesel, from vegetable oils.

Biodiesel may be used in its pure form in newer engines without engine damage.

The industry is also researching alternative crops, to move away from using food crops. Biomass such as plant waste, algae and wood chips are some examples.

» SCIENCE TALK

Clearing the biofuels smokescreen

Biofuels are seen as greener than fossil fuels but could cause more harm than good

By Keith Carpenter

AS EUROPEAN countries strive to meet their targets for the substitution of fossil fuels by biofuels, and as the United States forges ahead with producing ethanol from corn, the world is questioning if these are bold moves that will save the planet – or environmental madness.

Are biofuels good? Will they lead to a reduction in greenhouse gas emissions? Or are they bad, leading to rising food prices, the destruction of rainforests, the depletion of wildlife diversity and water shortages? Will producing them consume more energy than the biofuels themselves contain, generating more greenhouse gases than burning fossil fuels would?

The answer is: It depends.

Some biofuels are good and some are not so good.

It depends on what the fuel is, how and where the biomass was produced, what else the land could have been used for, how the fuel was processed and how it is used.

There are many different biofuels, but the two that are widely available commercially are ethanol, usually blended in petrol, and biodiesel.

Ethanol

ETHANOL is produced by fermentation of starch and sugars, just as it has been for centuries in beer, wine and spirits. The current major sources are corn, sugar cane, sugar beet and cassava. Put simply, producing ethanol from sugar cane in the tropics, particularly in Brazil, and using it to replace petrol is good for the environment and makes economic sense, even with today's level of technology.

Producing it from corn is much less beneficial, although still better than burning fossil fuel. It has resulted in rising corn prices.

It is projected that 30 per cent of the corn produced in the US will be converted into ethanol this year.

Coupled with a global reduction in stockpiles and a poor harvest in the Ukraine, this has led to sharply rising prices.

So why is there such a strong drive for ethanol as a fuel in the US? The answer really is energy security.

The Energy Independence and Security Act of 2005 set the following target: for biofuels to provide 30 per cent of America's energy needs.

The environment is not mentioned in the title of the Act. Its purpose is to reduce dependence on imported crude oil.

Looking forward, the situation is more optimistic.

There is large investment in alternative technology to produce ethanol from cellulosic waste, such as waste timber. A range of alternative crops is being studied for the production of ethanol and other alcohols as fuel.

These have great potential to reduce dependence on crude oil and, at the same time, lower greenhouse gas emissions.

The situation in Brazil and the tropics is quite contentious. Destroying virgin rainforest in order to plant crops is clearly bad for the environment, no matter what the crops are used for.

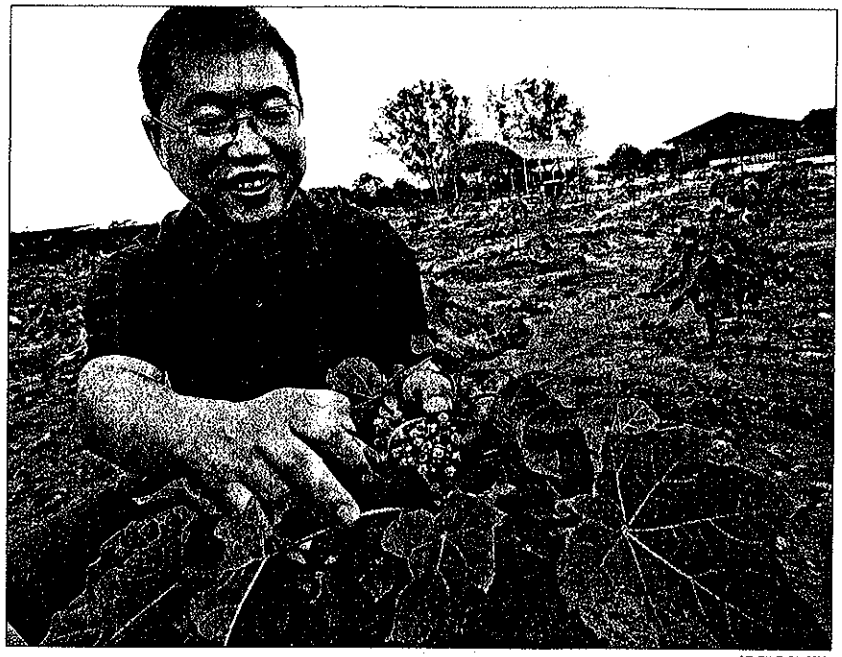
However, there does not have to be any link between rainforest destruction and the cultivation of sugar cane or cassava for fuel.

In Brazil, for example, according to the Sugar Cane Industry Association, only 1 per cent of the available arable land is used for ethanol production. It would be possible to double production without any impact on farming practices or rainforests.

Cassava is a relatively hardy crop that can be grown on marginal land. Although it requires more processing than sugar cane, it could provide a source of ethanol in some countries, with no impact on rainforests.

Biodiesel and natural oils

THE current generation of biodiesel is a chemically modified natural oil known as Fatty Acid Methyl Ester (Fame). It can be produced from any natural oil and even waste cooking oil. Current major sources are rapeseed or canola oil and palm oil. Others are soya bean, castor oil, sunflower seeds and, in the Philippines, even coconut oil.



ST FILE PHOTO

THE DRIVE FOR A GREENER FUEL: Two scientific organisations in Singapore have been studying the *Jatropha curcas* plant as a potential source of biodiesel. It is hardy and does not compete with food crops for arable land.

Converting the palm oil produced on an existing plantation into Fame biodiesel makes very good environmental sense. Making the conversion from other sources is also generally good for the environment, although it depends a little on how the crop was grown.

However, palm oil is a valuable commodity. It is used in many consumer products and as cooking oil. It is in high demand and as the supply is limited by the current plantation capacity, its price is rising.

Currently, it is a better commercial proposition to sell refined palm oil than to convert it into biodiesel.

However, the conversion of palm oil into biodiesel keeps upward pressure on the price. A high price may drive people to create palm plantations in what was previously a forest. We do not know whether this will happen and if it can be prevented, given that the amount of palm oil used for biodiesel is presently very small.

Biodiesel has an optimistic future, as Fame can be produced from waste oils.

New processes, such as the Neste Oil process, can convert any oil or fat into high-quality diesel. Finnish oil refiner Neste Oil is building the world's biggest biodiesel plant in Singapore at a cost of $1.18 billion.

Potential new crops may be able to replace palm and rapeseed. Two new sources are *Jatropha curcas* and marine algae. Both are under development around the world and are being studied here.

Jatropha is a hardy crop that can be cultivated on marginal land. It is not farmed commercially on a large scale yet, but plantations are being developed in China, Indonesia, India and Africa.

It will take some time to develop reliable farming practices, but it holds promise as a source of oil independent of rainforests and of arable land for food production.

Marine algae was studied for many years in the US but this was never taken to a commercial scale for fuels, although there are a few examples of its commercial use in speciality chemicals and as food supplements.

They potentially will not compete with food crops for land, but would require large marine ponds.

Although large-scale cultivation, harvesting and processing do not appear commercially viable at present, it is hoped that with modern biological techniques and modern processing, they could become a feasible source of biomass for fuels and chemicals.

The Singapore perspective

SINGAPORE is very well placed to take advantage of the developments in the next generation of biofuels. There are several active research and development organisations and commercial biodiesel plants, including the new-technology Neste Oil process.

Jatropha is being studied by the Temasek Life Sciences Laboratory and the Institute of Environmental Sciences and Engineering (IESE). The Tropical Marine Sciences Institute is studying marine algae, as is the Institute of Chemical and Engineering Sciences (ICES).

The ICES is also studying cellulosic ethanol, biomass gasification and the production of methanol via fermentation. The ICES and the IESE have both developed enzymatic Fame biodiesel processes, while ICES, the National University of Singapore (NUS) and the Nanyang Technological University (NTU) are investigating different aspects of biogas production from waste.

A promising technology is the gasification of biomass to synthesis gas, or syngas, and then making synthetic fuel from the syngas. The ICES, NTU and NUS are researching different aspects of this technology.

Many of these R&D labs are also investigating the conversion of biomass to chemicals. Although not covered in this article, this will be an equally important use for our natural resources in future.

Most biofuels have some positive impact when used to replace fossil fuels, provided that they do not involve the destruction of virgin rainforests.

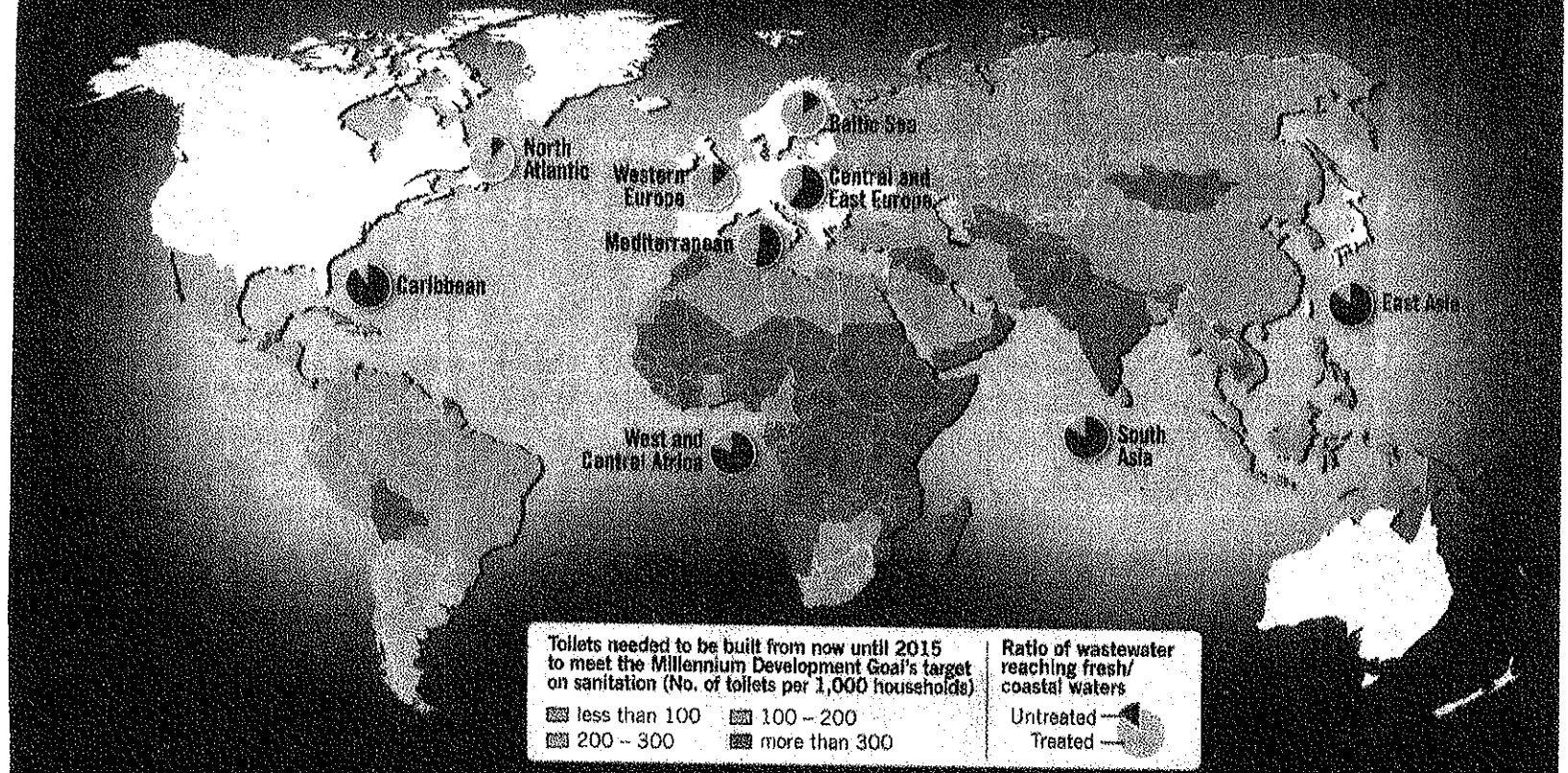
There are difficulties, as there always are with new technology.

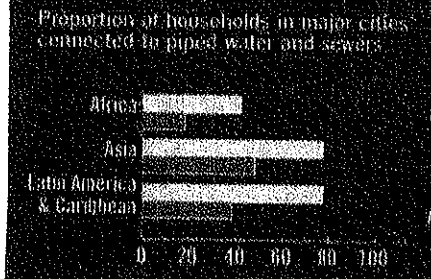
But biofuels are a potentially valuable weapon against climate change if developed within a proper framework of environmental assessment and a true understanding of the total impact of their production and use on the environment.

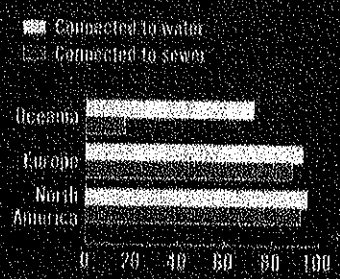
The writer is the executive director of the Institute of Chemical and Engineering Sciences (ICES), an institute of the Agency for Science, Technology and Research. This article represents his personal view. Dr P.K. Wong of ICES provided much of the information for this article.

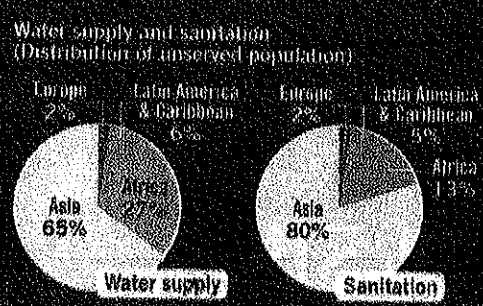
Water blues

Today is World Water Day. This year, issues of sanitation will be highlighted to mark International Year of Sanitation 2008. More waste water is generated and dispersed today than at any other time in history. An estimated 1.1 billion people lack access to safe drinking water, and 2.6 billion lack adequate sanitation. About 3,900 children die of water-borne diseases every day.









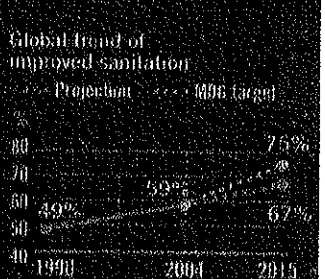


Table A.1 – Examples of activities, products and services and their associated environmental aspects and impacts

Activity/Product/ Service	Aspects	Actual and potential impacts
Activity: Road construction		
Mechanical compaction	Emission of particulate matter to air (dust)	Pollution of air
Construction during heavy rain[a]	Discharge of soil and gravel to land and water	Additional depletion of non-renewable natural resources (replacement of gravel-small stones) Degradation of localized land Erosion of soil Pollution of water Degradation of wetland habitat
Activity: Boiler design (consideration of operational aspects)		
Fuel efficiency	Consumption of fuel	Conservation of non-renewable energy sources (fossil fuels)[d]
Low emissions	Discharges to air	Achievement of air quality objectives
Non hazardous materials	Disposal at end of life	Avoidance of hazardous waste
Activity: Fossil-fuel-based boiler operations		
Operation of boiler	Consumption of heating oil	Depletion of non-renewable natural resources[d]
	Emission of sulfur dioxide (SO_2), nitrous oxide (N_2O) and carbon dioxide (CO_2) (i.e. greenhouse gases)	Pollution of air Respiratory impacts on local residents Acid rain impacts on surface water Global warming and climate change
	Discharge of heated water	Changes to water quality (e.g. temperature)
Storage of boiler fuel in underground tanks	Discharge of oil to land[a]	Pollution of soil Pollution of groundwater
Delivery and transfer of heating oil	Uncontrolled release of heating oil to surface water drain[b]	Pollution of surface water
		Bioaccumulation of toxic substances in fauna
Activity: Agriculture – Grain cultivation		
In field operations during growth stage/phase	Consumption of water	Depletion of groundwater supply
	Use of pesticides	Pollution of soil Bioaccumulation of toxic substances in fauna resulting in chronic adverse health effects or species loss
	Emission of methane (i.e. greenhouse gas)	Global warming and climate change
Activity: Wastewater management		
Agro food industry wastewater treatment	Generation of sludge (which is applied in agriculture)	Soil correction through the addition of nutrients[d]
Product: Printer toner cartridge		
Refillable toner cartridge	Use of raw materials	Conservation of resources[d]
End of life – disposal	Generation of solid waste[c]	Land use
	Recovery and reuse of components	Conservation of natural resources[d]

Table A.1 – Examples of activities, products and services and their associated environmental aspects and impacts *(continued)*

Activity/Product/ Service	Aspects	Actual and potential impacts
Product: Air conditioner		
Consumer operation of unit	Use of electricity[c]	Depletion of non-renewable natural resources
End of life – disposal	Generation of solid waste[c]	Land use
	Recovery and reuse of components	Conservation of natural resources[d]
Service: Maintenance and repair service		
Chemical handling and use	Uncontrolled release during emergency[b]	Pollution of air Pollution of soil Injury to humans
Subcontracted air conditioner repair	Release of ozone-depleting substances (i.e. refrigerant)[a]	Ozone depletion
Service: Transportation and distribution of goods and products		
Fleet operation	Consumption of fuel	Depletion of non-renewable fossil fuels
	Emission of oxides of nitrogen (NO_x)	Pollution of air – ozone production – smog Global warming and climate change
	Generation of noise	Discomfort or inconvenience to local residents
Routine fleet maintenance (including oil changes)	Emission of oxides of nitrogen (NO_x)	Achievement of air quality objectives
	Generation of waste oil	Pollution of soil

[a] Abnormal conditions.
[b] Emergency conditions.
[c] Organization may be able to "influence" aspect.
[d] Beneficial impact.

Table A.2 – Examples of activities, products and services and their associated environmental aspects, objectives, targets, programmes, indicators, operational control, and monitoring and measurement

Aspects	Objectives	Targets	Programmes	Indicators	Operational control	Monitoring and measurement
Activity: Operation of fossil fuel-based boiler						
Consumption of heating oil	Reduce the consumption of non-renewable resources	Reduction of the consumption of heating oil (based on current year consumption) by 20 % within 1 year	Installation of more efficient fuel burners	• Project plan milestones • Consumption of heating oil per working hour of the boiler	• Procedures for installation of modified burners • Procedures for documenting and recording oil consumption	• Quarterly evaluation of progress on project plan • Monthly tracking of oil consumption rates
Discharge of heated water	Minimize the negative impacts to watershed quality from elevated effluent temperature	Reduce mean daily temperature of discharge water by 1 °C by 2008	Facility and design engineers re-engineer operations to extract and re-use heat from wastewater (i.e. co-generation)	• Daily mean temperature of water discharge • Watershed water quality parameters • Number and diversity of marine organisms	• Water quality sampling and analysis procedures • Sampling plan of marine organisms • Co-generation operational procedures • Engineering controls	• Continuous monitoring of temperature of discharge water • Quarterly monitoring of watershed water quality
Product: Air conditioner (consumer operation of unit and end of life – Disposal)						
Use of electricity	Encourage the consumer to use less energy	Reduce the operating temperature by 5 % based on last year's operating temperature by end of current year	Educate consumer on impacts of excessive energy use through distribution of energy-efficient materials with product (e.g. cost savings, reduced environmental impacts)	• Increased customer interest in energy use • Increased customer interest in new energy efficient products	• Design of effective product material • Use of electrical energy • Consideration of customer energy efficiency requests in new product design	Survey of users
Generation of solid waste	Reduce consumer solid waste generation from disposal of packaging by reducing quantity of packaging materials used	Achieve 35 % reduction in packaging material for current product line by 2008	• Redesign product packaging (Engineering Dept., 6 months) • Implement production changes (6 months) • Test run and full production	• Quantity of packaging material per unit • % reduction in packaging material used for product line • Estimated reduction in consumer solid waste generation volume/unit	• Design control procedures • Product packaging procedures	• Quarterly monitoring of quantity of packaging material used (purchased minus scrap) • Product units shipped in product line

Table A.2 – Examples of activities, products and services and their associated environmental aspects, objectives, targets, programmes, indicators, operational control, and monitoring and measurement *(continued)*

Aspects	Objectives	Targets	Programmes	Indicators	Operational control	Monitoring and measurement
Service: Transportation and distribution of goods and products (fleet maintenance)						
Emission of oxides of nitrogen (NO_x)	Increase positive impact on air quality by improving effectiveness of fleet maintenance	Achieve 25 % reduction of NO_x emissions by 2008	• Identify key maintenance parameters for NO_x reduction • Revise maintenance programme to incorporate key NO_x reduction tasks • Optimize fleet maintenance schedule through computer program	• % on-time maintenance • NO_x emissions/km	• Maintenance procedures • Training of maintenance technicians • Computerized notification of scheduled maintenance	• Tracking of maintenance frequency versus schedule • Monitoring of vehicle fuel efficiency • Quarterly testing of vehicle NO_x emissions • Annual assessment of NO_x reductions achieved
Generation of waste oil	Manage oily wastes in conformity with requirements	Achieve 100 % conformity with oily waste disposal requirements at service centres within one year	Develop and implement waste management training programme at service centres	• % of service centre employees trained • Number of waste disposal nonconformities • % of oily waste disposed per requirements	• Waste management procedures • Training programme for service centre employees	• Monitoring of service-centre employee training conducted • Tracking of oily waste disposal quantities and disposal methods • Quarterly assessments of oily waste management practices

TM SYSTEMS CONSULTANTS
14001:2004 Awareness Training

Presented by TENG WYE ANN

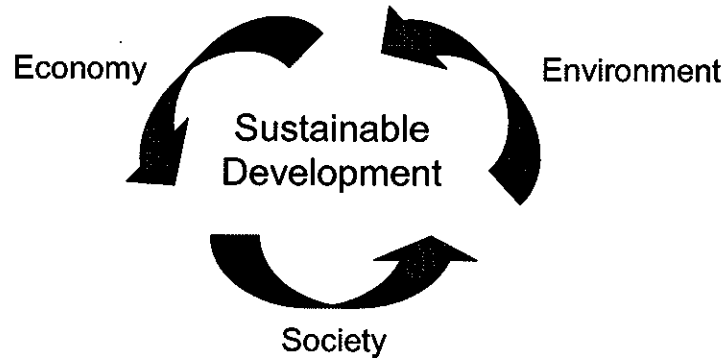
TOWARDS SUSTAINABLE DEVELOPMENT

- **Sustainable Development**, according to the World Commission on Environment and Development, is :-
  "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

- In Hong Kong, this means:
  a) finding ways to increase prosperity and improve the quality of life while reducing overall pollution and waste;
  b) meeting our own needs and aspirations without doing damage to the prospects of future generations; and
  c) reducing the environmental burden we put on our neighbours and helping to preserve common resources.

- Hence, the concept of sustainable development requires change of mindset for full integration of economic needs and social development with environmental conservation. It also requires the Government and all sectors of the community to work hand in hand to achieve a sustainable future.

TOWARDS SUSTAINABLE DEVELOPMENT



TOWARDS SUSTAINABLE DEVELOPMENT

The Challenge For Singapore :

1. Became signatory to the Kyoto Protocol (An international agreement to curb pollution by reducing gas emissions from various sources including air-con, cars, large coal-fired power plants) in Apr 2006.
2. Ministry of Environment & Water Resources and NEA drew up a tentative National Climate Change Strategy (NCCS).
3. Using projections from UN's Inter-governmental Panel on Climate Change's (IPPC's) Third Assessment Report.
4. NCCS identified key vulnerabilities, past efforts and current ones to cope with possible climatic change and implement future measures.

TOWARDS SUSTAINABLE DEVELOPMENT

The Challenge For Singapore :

5. Also watching matters closely are the environmentalists and agencies like the Climate Change Organisation, Singapore and the Singapore Institute of international Affairs (SIIA).
6. One challenge is to build awareness along different avenues and target specific stakeholders.
7. Another challenge is to translate climate change findings for the layman to understand how such issues are directly relevant to his life.
8. To assist in more Asia-centric research on climate change, as most current research is being done in the West.
9. Highlight need for "regional political will to effect change in Asia" through ASEAN.

TOWARDS SUSTAINABLE DEVELOPMENT

The IPPC Report states (among other findings) :

1. Global average temperatures could rise between 1.1 and 6.4 deg C.
2. Sea levels projected for a 59 cm rise by 2100.
3. Heat waves and heavy rains are "very likely" to become more frequent.
4. Signs of global warming are "unequivocal" (understandable and clear) and human activity is the main cause.

TOWARDS SUSTAINABLE DEVELOPMENT

Land Loss & Flooding : (see article on "Getting ready for rising sea levels")

1. Substantial rise in sea level can cause coastal erosion and land loss.
2. Higher sea levels makes it harder for rainwater to drain into the sea, worsening inland flooding when heavy rains or storms hit.
3. To minimise such effects, since 1999, PUB requires all coastal land (including reclaimed land) be built such that the minimum platform level has to be 125 cm above the highest recorded tide.
4. A storm water management system to minimise flooding is in place and work continues on flood-prone areas.

TOWARDS SUSTAINABLE DEVELOPMENT

Water Resource Impact : (see article on "Water Blues")

1. If sea level rise such that sea water could flow into some coastal reservoirs, fitting more steel plates on tidal gates will act to stem it.
2. Rising temperatures could also affect rainfall and its seasonal distribution, changing the water levels in reservoirs. Such unpredictability affects planning for water resources.
3. Construction of the Marina Bay Barrage to increase water resources in Singapore need to take the above into consideration.

TOWARDS SUSTAINABLE DEVELOPMENT

Impact on Island & Marine Biodiversity :

1. Rising sea levels could lead to a loss of mangroves and worsen coastal erosion affecting places like Sentosa, East Coast Park and Sungei Buloh.
2. Rising seawater temperatures could also affect marine life.



TOWARDS SUSTAINABLE DEVELOPMENT

Higher Energy Demand & Heat Stress :

1. Rising temperatures could mean using lots more energy such as use of air-conditioners.
2. URA and National Parks Board help to mitigate this through better layouts and designs of buildings for greater energy efficiency and more natural greenery.
3. BCA's Green Mark scheme and awards to recognise 'green buildings' by the stakeholders from the owner / developer to the building designers and the building contractors.



TOWARDS SUSTAINABLE DEVELOPMENT

Public Health Impact :

1. Climate change can also cause changes in patterns of communicable diseases around the world.
2. Singapore sits in an area where diseases like dengue are endemic is a genuine and serious concern.
3. Thus NEA must always be alert and proactive in developing more effective and holistic strategies to implement comprehensive programmes in controlling vectors like mosquitoes and rodents that can spread diseases.



TOWARDS SUSTAINABLE DEVELOPMENT

CUTTING CARBON EMISSIONS IN SINGAPORE :

(see article on "Cutting Carbon Emissions")

1. Carbon Dioxide is the main culprit in Singapore's greenhouse gas emission.
2. Aim to bring such emissions to 25% below 1990 levels by 2012.
3. Five key energy using sectors targeted, namely, the Power Generation Sector, Industry, Transport, Buildings and Households.



TOWARDS SUSTAINABLE DEVELOPMENT

CUTTING CARBON EMISSIONS :

1. Power Generation Sector

   In Singapore this is the largest primary source of CO_2 emissions.

   Aim : Improve power generation efficiency; Encourage use of cleaner, less carbon-intensive fuels like natural gas.

   Current :

   a. Between 2000 & 2005, electricity generated by natural gas has grown from 19% to 74%. Natural gas emits 40% less CO_2 per unit of electricity generated.

   b. Use of energy efficient power generation technology.

TOWARDS SUSTAINABLE DEVELOPMENT

CUTTING CARBON EMISSIONS :

1. Power Generation Sector

   Current :

   c. Since 2000, energy from incinerated waste contributed up to 2% of energy supply.

   d. Funding for renewable energy like solar power.

   Proposed :

   a. Emission standards for power plants

   b. Encourage reporting of CO_2 emissions to raise awareness of energy use and identify areas for improvement.

TOWARDS SUSTAINABLE DEVELOPMENT

CUTTING CARBON EMISSIONS :

2. Industry

Aim : Improve energy efficiency to cut carbon intensity; Capitalise on business opportunities, including exporting carbon-efficient technology and carbon trading.

Current :

a. Energy audit schemes like the $10 mil Energy Efficiency Assistance Scheme to co-fund energy audits on firms in industry has grown from 19% to 74%. Natural gas emits 40% less CO_2 per unit of electricity generated.

b. Tax incentives for energy efficient equipment.

TOWARDS SUSTAINABLE DEVELOPMENT

CUTTING CARBON EMISSIONS :

2. Industry

Proposed :

a. Generate heat and electricity together. Using waste heat from combustion can increase energy efficiency of power generation from 40 - 50% to more than 75 %. Trigeneration - the simultaneous generation of power, heat and chilled water is being test-bedded.

b. Promote energy efficient industrial equipment through tax-incentives, minimum energy efficiency standards and energy labelling.

c. Encourage energy audits.

TOWARDS SUSTAINABLE DEVELOPMENT

CUTTING CARBON EMISSIONS :

3. Transport

Aim : Minimise emissions by managing usage, improving fuel and promoting use of cleaner fuels and green vehicles; Vehicle population in 2006 – about 777,000.

Current :

a. Mechanisms like the COE system, ERP and schemes like car sharing and Park-and-Ride.
b. Taxes pegged to engine capacity and petrol tax based on volume.
c. Voluntary fuel economy labelling.
d. Green vehicle rebate.



TOWARDS SUSTAINABLE DEVELOPMENT

CUTTING CARBON EMISSIONS :

3. Transport

Proposed :

a. Mandatory fuel economy labelling, cultivate fuel-efficient habits.
b. Further support for use of vehicles using compressed natural gas.
c. Review of green vehicle rebate.
d. Promote use of public transport and car-pooling.



TOWARDS SUSTAINABLE DEVELOPMENT

CUTTING CARBON EMISSIONS :

4. Buildings

   Aim : Boost energy-efficient design and technologies, conservation, and natural light and ventilation – energy use can be cut by 35%;

   Current :

   a. Minimum energy-efficiency standards focusing on heat transfer.
   b. Building labelling schemes like the 'Green Mark'.
   c. Energy audits.
   d. Use of solar energy.

TOWARDS SUSTAINABLE DEVELOPMENT

CUTTING CARBON EMISSIONS :

4. Buildings

   Proposed :

   a. Review of insulation standards for non-air-conditioned buildings like schools and HDB flats.
   b. Promoting energy-efficient designs and practices.
   c. Promoting solar energy.
   d. Expanding building labelling.

TOWARDS SUSTAINABLE DEVELOPMENT

CUTTING CARBON EMISSIONS :

5. Households

   Aim : Get people to buy energy-efficient appliances and to have energy saving habits.

   Current :

   a. Voluntary energy labelling, "green corner" in stores and public education.

   Proposed :

   a. Mandatory labelling and minimum efficiency standards for energy-intensive appliances like air-conditioners and fridges.
   b. Increasing public awareness.



TOWARDS SUSTAINABLE DEVELOPMENT

CLEAN ENERGIES : (see article on "The Alternatives – Clean, available but also Costly" & "The Good, Bad and Ugly of Biofuels")

1. What are they?
   a. Unlike fossil fuels such as coal and oil which take millions of years to form and used only once, renewable energies occur naturally to be tapped again and again.
   b. Renewable energies include firewood, hydro, wind solar, geothermal and tidal power.
   c. Main renewable energy used worldwide is "biomass" mainly firewood or organic waste accounting for about 10% of world primary energy use in 2004.
   d. Next is hydropower with 2% share with the rest of renewable energies being just 1%. (Fossil fuel supply over 80% of world energy)



TOWARDS SUSTAINABLE DEVELOPMENT

CLEAN ENERGIES :

2. <u>How long have they been around?</u>
   a. Int'l Energy Agency (IEA) calls biomass such as firewood "the oldest form of renewable energy exploited by mankind".
   b. Ancient Egyptians harnessed the wind for sailing probably 5,500 years ago.
   c. Hydropower turbines and solar-powered steam engines were first used in the 19th century.
   d. Harnessing of geothermal power and tidal power began in the 20th century in Europe.

TOWARDS SUSTAINABLE DEVELOPMENT

CLEAN ENERGIES :

3. <u>What are the advantages?</u>
   a. Clean energies do not run out and available in many parts of the world which can make governments less dependent on imported energy.
   b. Wind, solar and wave energy do not produce CO_2.
   c. Plant-derived fuels which are burnt such as biomass and biofuels, produce only the same amount of CO_2 that those plants originally absorbed .
   d. Clean energies also do not release other toxic pollutants associated with burning of fossil fuels and do not have the risks or waste-storage problems involved with nuclear power.

TOWARDS SUSTAINABLE DEVELOPMENT

CLEAN ENERGIES :

4. <u>What are the disadvantages?</u>
   a. Cost. Many renewable energies cannot compete without subsidies against fossil fuels even with current high oil prices.
   b. The 'unpredictable nature' of the natural elements such as wind, sun and tides, etc. used to power plants and turbines is also a problem.
   c. Hydro and tidal power projects can cause huge disruptions to human and marine habitats.



TOWARDS SUSTAINABLE DEVELOPMENT

CLEAN ENERGIES :

5. <u>What is the outlook?</u>
   a. IEA projects renewable energies will gain overall to supply 13.7% of world primary energy by 2030 fro 13.2% in 2004. If governments do more to promote them, the share could rise to 16%.
   b. The European Renewable Energy Council and GreenPeace issued a 2007 report projecting half of all energy could come from renewable energies by 2050 with the biggest shares by then for wind and solar power followed by hydro, biomass, geothermal and ocean energy.



TOWARDS SUSTAINABLE DEVELOPMENT

Typical Recent Findings on Energy Efficiency of Singapore Buildings :

1. Energy Consumption in local buildings have risen at a faster rate particularly in the last three years.
2. About 30% to >60% of the energy consumption in buildings are due to air-conditioning.



TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN (SGP) 2012 :

1. Air & Climate Change Facts & Issues
   a. Global climate change due to greenhouse gas emissions. S'pore contribute less than 1% of global greenhouse gas emissions.
   b. PM (particulate matter) 2.5 (microns or smaller) is linked to numerous cases of respiratory and cardiovascular problems. US Environmental Protection Agency sets this standard at 15μg/Nm^3. S'pore is currently at 22μg/Nm^3 level.
   c. Vulnerability to trans-boundary air pollution.



TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN (SGP) 2012 :

1. Air & Climate Change Facts & Issues
   d. Prevention, monitoring, enforcement and education is our strategy to manage air pollution.
   e. New law to comply to Euro IV emission standards for new diesel vehicles.
   f. Develop technological advancements in renewable energy through various initiatives e.g. Innovation for Environmental Sustainability (IES) Fund.



TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN (SGP) 2012 :

1. Air & Climate Change
   Targets :
   a. To maintain PSI (Pollutant Standards Index) for ambient air within 'good' range for 85% of the year and within 'moderate' range for the remaining 15%.
   b. To reduce ambient PM (particulate matter) 2.5 (microns or smaller) level to within annual average of 15μg/Nm^3 by 2014.
   c. To improve carbon intensity (i.e. CO_2 emission per GDP Dollar) by 25% from 1990 level by 2012.



TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN :

1.1 Ambient Air

Key Thrusts & Focus :

a. Manage emission from stationary sources
- review regulatory measures for stationary sources.
- encourage co-regulation of emission from stationary sources by industry.

b. Manage emission from mobile sources
- review regulatory measures for mobile sources
- encourage co-regulation of emission from mobile sources by industry and consumers.



TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN :

1.2 Climate Change

Key Thrusts & Focus :

a. Promote energy efficiency
- develop enablers to make consumers more energy / fuel efficient.
- improve energy management practices of businesses.

b. Promote use of clean energy
- promote use of cleaner energy such as natural gas.

c. Demonstration projects on renewable energy
- renewable energy projects (such as those on solar & biomass).



TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN (SGP) 2012 :

2. Water Facts & Issues
   a. Current population of 4 million consumes 1.4 mil m^3 of water/day.
   b. 14 existing reservoirs and 15th reservoir (Marina Basin) under construction. Damming of Sungei Punggol and Sungei Serangoon to create a new catchment area.
   c. Diversification of water supply sources – local catchment areas, imported water from Johor, NEWater plants (existing 4 nos.), desalination plants (existing 1 no.).

TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN (SGP) 2012 :

2. Water Facts & Issues
   d. Managing the demand side of water.
   e. Community outreach initiatives e.g. Water Efficient Homes (WEH) programme with do-it-yourself kits help reduce domestic per capita consumption from 165/ a day in 1999 to 160/ in 2005. 68 of the 84 constituencies have gone through the WEH programme. 1 in 3 households have installed water saving devices which can save up to 5% of monthly water expenses.
   f. Water Efficient Buildings (WEB) programme launched and by Dec 2005, 743 buildings have achieved the WEB status.

TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN (SGP) 2012 :

2. Water Facts & Issues

f. Revised trade effluent standard come into effect in 2005 for new industries. Existing industries have 2 year grace period to comply.

g. Erosion and sediment control measure – Brown to Clear (B2C) programme and legal requirement on earth control measures for construction sites.

h. Reduction of flotsam in river and canals with additional flat-booms and gratings and litter-prone drains covered up.

i. Environmental Impact Assessment prior to developments on land.



TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN (SGP) 2012 :

2. Water

Targets :

a. Increase catchment areas from 50% to 67% of S'pore land surface.

b. Increase water supply from non-conventional sources, e.g. desalination and water reclamation, to at least 25% of S'pore water demand.

c. Ensure water quality continues to meet international standards.



TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN (SGP) 2012 :

2. Water

Targets :

d. Reduce per capita domestic water consumption to 155/ per day by 2012.

e. Partner the 3Ps (public & private sectors and personal) to generate greater awareness of importance of conserving, valuing and enjoying water with sense of shared ownership of our water resources.



TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN :

2. Water

Key Thrusts & Focus :

a. Water for all
- diversify our water supply through the 4 sources.
- promote greater R&D efforts in water and used water technologies and other areas.
- ensure potable water quality continues to meet international standards

b. Conserve
- promote use of water-efficient household fittings and appliances
- continue to work with various non-domestic sectors to reduce water consumption.



TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN :

2. Water

Key Thrusts & Focus :

c. Value
   - encourage community to change their water usage behaviour and habits and educate them on the implications of living in water catchment areas.
   - inculcate amongst young Singaporeans the mindset of valuing our water resources.

d. Enjoy
   - encourage users of our water resources to take ownership of and enjoy them.



TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN (SGP) 2012 :

3. Waste Management Facts & Issues
   a. The amount of waste being disposed had jumped six-fold over 30 years.
   b. At this rate, a new incineration plant would have to be built every 5 to 7 years and a landfill every 25 to 30 years.
   c. 4 strategies to tackle solid waste problem – reduce volume of waste through incineration; reduce volume of waste sent to incineration plants through recycling; cut down volume of waste sent to landfills; cut down volume of waste generated through waste minimisation.
   d. Between 2000 and 2005, S'pore overall recycling rate rose from 40% to 49%.



TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN (SGP) 2012 :

3. Waste Management

   Targets :

   a. Increase overall waste recycling rate from 44% to 60% by 2012.

   b. Extend the lifespan of Semakau Lanafill to 50 years, strive towards 'zero landfill' and 'close the waste loop'.

   c. Reduce the need for new incineration plants to 1 in every 10-15 years.



TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN :

3. Waste Management

   Key Thrusts & Focus :

   a. Reduce waste at source
      - work with industry to reduce waste.
      - reduce excessive usage of plastic bags in retail sector.

   b. Get more to participate in recycling
      - more recycling programmes.
      - more publicity for recycling.
      - recognition for recycling efforts.



TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN :

3. Waste Management

   Key Thrusts & Focus :

   c. Build more infra-structural support for recycling
      - more recycling bins in public areas.
      - greater convenience in depositing recyclables.
      - help to set up more recycling facilities.

   d. Enhance waste industry capability
      - promote innovative technologies to recycle and reduce waste.

   e. Develop a market for recycled products
      - improve the quality of recycled products.
      - promote the use of recycled products.

TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN (SGP) 2012 :

4. Conserving Nature Facts & Issues

   a. Tracts of primary and secondary rainforests in Bukit Timah and Central Catchment Nature Reserves.

   b. Mangroves and mudflats abound in Sungei Buloh Wetland Reserve.

   c. Bukit Batok Nature Reserve have diverse habitats for plants and animals.

   d. Rich marine biodiversity in Chek Jawa (Pulau Ubin)

   e. Dilemma of competing land use.

TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN (SGP) 2012 :

4. Conserving Nature

   Targets :

   a. Keep nature areas for as long as possible.
   b. Verify and update information on indigenous flora and fauna through biodiversity surveys.
   c. Establish more parks and green linkages.
   d. Set up a National Biodiversity Reference Centre.

TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN :

4. Conserving Nature

   Key Thrusts & Focus :

   a. Conserve nature areas
      - conserve our biodiversity.
      - monitor and update our biodiversity information.
   b. Make parks and nature accessible
      - put in place new parks and park connectors.
   c. Know our biodiversity
      - promote nature awareness.
   d. Create a biodiversity hub
      - set up a National Biodiversity Reference Centre (NBRC).
      - collaborate with research instituitions.

TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN (SGP) 2012 :

5. Improving Public Health Facts & Issues
   a. Dengue cases remain the top priority in terms of proactive intervention and control ('Mozzie Wipeout'). 'Rat Attack' programme island-wide to eradicate rodent breeding grounds and reduce their population.
   b. Food grading system for over 16,000 eateries combined with regular inspections, rigorous enforcement and extensive public education.
   c. Hawker Centres Upgrading Progamme – 10 yr scheme from 2001 to 2010 for all 109 hawker centres.
   d. 800 coffee shops for Toilet Upgrading Programme with NEA subsidy of $5K each.

TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN (SGP) 2012 :

5. Improving Public Health

   Targets :
   a. Increase community ownership to sustain a high standard of public health.
   b. Become a leading regional centre in epidemiological surveillance and research on vector-borne diseases.
   c. Maintain low incidence of vector-borne and food-borne diseases.

TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN :

5. Improving Public Health

   Key Thrusts & Focus :

   a. Ownership through improved hygiene habits & practices
      - improve cleanliness and hygiene of public places.

   b. Control of vectors and prevention of vector-borne diseases
      - improve vector control methods and understand vector behaviour through R&D.
      - partner the community to lower occurrence of vector-borne diseases through public education and raising public awareness.

TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN :

5. Improving Public Health

   Key Thrusts & Focus :

   c. Monitor and improve Indoor Air Quality (IAQ) in public places
      - upgrade and enhance recommended best practices, train IAQ personnel and facility managers to improve building management skills.
      - survey and conduct research to create a healthy indoor environment.

TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN (SGP) 2012 :

6. International Environmental Relations Facts & Issues
   a. Recognise that today's emerging environmental challenges are trans-boundary in nature to be resolved through international co-operation.
   b. At international level, S'pore is party to a number of multilateral environmental agreements. In May 2005, ratified the Stockholm Convention on Persistent Organic Pollutants and acceded to the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade.



TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN (SGP) 2012 :

6. International Environmental Relations Facts & Issues
   c. Regionally, tackling trans-boundary haze through ASEAN framework. Hosting ASEAN Specialised Met Centre to serve as early warning system on impending adverse weather conditions.



TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN (SGP) 2012 :

6. International Environmental Relations

   Targets :

   a. Continue to work closely with ASEAN neighbours on common environmental concerns.

   b. Enhance capacity-building partnerships with other developing countries.

TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN (SGP) 2012 :

6. International Environmental Relations

   Targets :

   c. Intensify collaboration with partners at regional and global levels to tackle environmental challenges.

   d. Remain committed to international environmental efforts and obligations under international environmental treaties.

TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN :

6. International Environmental Relations

Key Thrusts & Focus :

a. Relations Enhancement
   - participate in international environmental agreements and their activities and programmes.
   - seek opportunities for greater collaboration with our international partners.

b. Capacity Building
   - share S'pore's environmental experience to contribute towards global sustainable development.



TOWARDS SUSTAINABLE DEVELOPMENT

SINGAPORE GREEN PLAN :

6. International Environmental Relations

Key Thrusts & Focus :

c. Industry Partnership
   - profile S'pore as an attractive venue for water and environmental events.

d. Community Partnership
   - promote awareness of environmental issues among the youths.



ENVIRONMENT

Defined as :

- Surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans and their interrelation.

Note : "Surroundings" in this context extend from within an organization to the global system.

ENVIRONMENTAL ASPECT

Defined as :

Element of an organization's activities or products or services that can interact with the environment.

Note - A significant environmental aspect has or can have a significant environmental impact.

ENVIRONMENTAL IMPACT

Defined as :

Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects.

ENVIRONMENTAL MANAGEMENT SYSTEM

Defined as :

Part of an organization's management system used to develop and implement its environmental policy and manage its environmental aspects.

Note 1 – A management system is a set of interrelated elements used to establish policy and objectives and to achieve those objectives.

Note 2 – A management system includes organizational structure, planning activities, responsibilities, practices, procedures (3.19) processes and resources.

PREVENTION OF POLLUTION

Defined as :

Use of processes, practices, techniques, materials, products, services or energy to avoid, reduce or control (separately or in combination) the creation, emission or discharge of any type of pollutant or waste, in order to reduce adverse environmental impacts (3.7).

NOTE – Prevention of pollution can include source reduction or elimination, process, product or service changes, efficient use resources, material and energy substitution, reuse, recovery recycling, reclamation and treatment.



RATIONALE OF EMS

1. To promote and enhance sustainable development.
2. Eliminate and / or reduce global environmental problems (e.g. ozone layer depletion, global warming / greenhouse effect, deforestation, acid rain, loss of species in flora and fauna).
3. Appropriate and adequate action responses to pressure and legal requirements from government, business community and the general public.



BENEFITS OF EMS

1. Provide confidence to interested parties with emphasis on pollution prevention, regulatory compliance and continual improvement.
2. Framework to balance and integrate economic and environmental interests.
3. Improving cost control by conserving input materials and energy and minimizing waste generation.

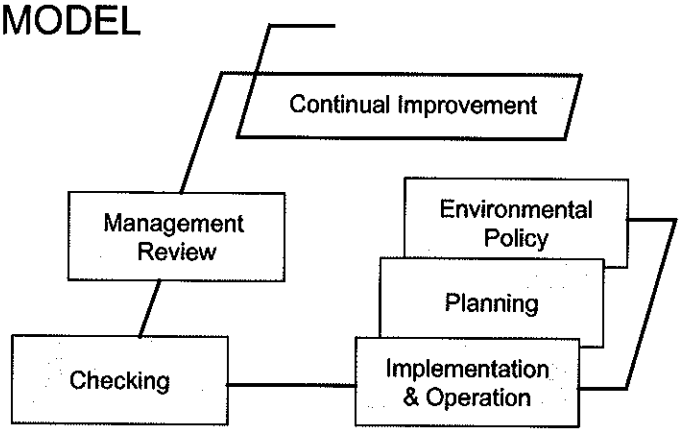


BENEFITS OF EMS

4. Planning for environmentally friendly or conscious designs of products and services.
5. Using environmentally friendly or conscious production & installation methods and systems to conserve natural resources and minimise utilities costs.
6. Reducing incidents that result in liability
7. Promoting environmental awareness among suppliers, contractors, and all persons working for and on behalf of the organisation



EMS MODEL



EMS MODEL

BASED ON PDCA METHODOLOGY:

PLAN - establish objectives & processes necessary to deliver results in accordance with organization's environmental policy

DO - implement the processes

CHECK - monitor & measure processes against environmental policy, objectives, targets, legal & other requirements and report the results

ACT- take actions to continually improve performance of EMS

ENVIRONMENTAL MANAGEMENT STANDARDS

ISO 14001:2004 - Environmental Management Systems - Requirements with Guidance for Use

ISO 14004:2004 – Environmental Management Systems -General Guidelines on Principles, Systems and Supporting Techniques

ISO 19011 – Guidelines for Quality and/or Environmental Management Systems Auditing

ISO 14020, 14021, 14024, ISO/TR 14025 – Environmental Labels & Declarations

ISO 14031, ISO/TR 14032 – Environmental Performance Evaluation

ISO 14040, 14041, 14042, 14043, ISO/TR 14047, ISO/TS 14048, ISO/TR 14049 – Life Cycle Assessment

ISO/TR 14062 – Environmental Management – Integrating Environmental Aspects into Product Design & Development

(TR - Technical Reference; TS - Technical Standard)

FEATURES OF ISO 14001:2004 STANDARD REQUIREMENTS FOR AN EMS

ISO 14001:2004 Main Clauses :

1. Scope
2. Normative references
3. Terms & definitions
4. Environmental management system requirements
   - 4.1 General requirements
   - 4.2 Environmental policy
   - 4.3 Planning
   - 4.4 Implementation and operation
   - 4.5 Checking
   - 4.6 Management review

Features of ISO 14001:2004 Requirements For EMS

Environmental Policy

1. Statement by the organization of its intentions and principles in relation to its overall environmental performance
2. Provides a framework for action and for the setting of its environmental objectives and targets
3. Commitment to:
   a. Continual Improvement
   b. Prevention of Pollution
   c. Compliance with Environmental Legislation and Regulations
4. Communicated to all Employees and interested parties
5. Available to the Public



Features of ISO 14001:2004 Requirements For EMS

Planning Elements ("PLAN")

1. Identifying Environmental Aspects & Impacts
2. Identify applicable Legal and Other Requirements
3. Establish Objectives and Targets
4. Establish Environmental Management Program



Features of ISO 14001:2004 Requirements For EMS

Linking Environmental Aspect & Impact

A source by which an environmental. aspect is identified needs a pathway to a target where the environmental impact takes place.



Features of ISO 14001:2004 Requirements For EMS

Locating Environmental Aspects

1. Facilities – systems for power supply, water supply, heating & cooling, lighting, compressed air, maintenance and waste collection, treatment & disposal, etc.
2. Operational Processes & Activities – raw materials consumption, packaging, rejects, waste generation, utility consumption, etc.
3. Support Functions – transportation, warehousing, purchasing (waste disposal management, suppliers & contractors management), etc.



Features of ISO 14001:2004 Requirements For EMS

Identifying Environmental Aspects

Consider :

1. Emissions to Air
2. Releases to Water & Water Related Bodies
3. Waste Management
4. Contamination of Land
5. Use of Raw Materials and Natural Resources
6. Local Environmental and Community Issues e.g. noise levels



Features of ISO 14001:2004 Requirements For EMS

Identifying Environmental Aspects

Some Basic Techniques :

1. Regulatory Checklists e.g. Environmental Pollution Control Act
2. Life Cycle Assessments
3. Process Flowcharts
4. Mass Balances
5. Environmental Impact Assessment
6. Life Cycle Assessment
7. Hazard & Operability (HAZOP) Study
8. Quantitative Risk Assessment
9. Environmental Exposure Analysis



Features of ISO 14001:2004 Requirements For EMS

Evaluating Significance of Environmental Impact

Condition of Occurrence
- Normal, Abnormal & Emergency

Likelihood of Occurrence
- High, Medium, Low

Severity of Consequence
- High, Medium, Low

Features of ISO 14001:2004 Requirements For EMS

Evaluating Significance of Environmental Impact

Other considerations :

1. Coverage Complete and Accurate ?
2. Influence of Time ?
3. Influence of Internal / External Changes & New Developments ?
4. Ease of Understanding ?

(see Annex - Table A1 in ISO 14004:2004)

Features of ISO 14001:2004 Requirements For EMS

Legal & Other Requirements

1. Identify and have access to legal and other requirements that are applicable to the environmental aspects.

2. Examples of other requirements are
   a. Industry standards and codes of practice,
   b. Agreements with public authorities,
   c. Non-regulatory guidelines.

Features of ISO 14001:2004 Requirements For EMS

Environmental Objective

Overall environmental goal arising from the environmental policy, that an organization sets itself to achieve, and which is quantified where practicable, with commitment towards prevention of pollution.



Features of ISO 14001:2004 Requirements For EMS

Environmental Target

Detailed performance requirement, quantified where practicable, applicable to the organization or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.



Features of ISO 14001:2004 Requirements For EMS

Environmental Objective & Target

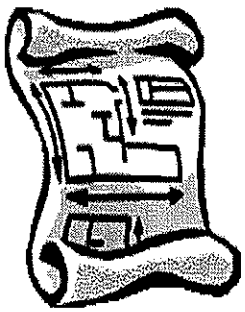
When establishing and reviewing environmental objectives, consider :

1. Legal and other requirements;
2. Environmental aspects;
3. Technological options;
4. Financial, operational and business requirements;
5. Views of interested parties.

(see Annex - Table A2 in ISO 14004:2004)

Features of ISO 14001:2004 Requirements For EMS

Environmental Management Programmes



Programs for achieving objectives and targets should include :

1. Designation of responsibility at each level,
2. Means and time-frame by which they are to be achieved.

Features of ISO 14001:2004 Requirements For EMS

Resources, Roles, Responsibility & Authority

- Management provides EMS resources :
  1. Infrastructure
  2. Information Systems
  3. Training
  4. Human Resources
  5. Technology Resources
  6. Financial Resources
  7. Other Resources
- Management Representative/s :
  - Appointed by top management
  - Ensure EMS requirements are in accordance with ISO 14001
  - Report on EMS performance

Features of ISO 14001:2004 Requirements For EMS

Competence, Training & Awareness

All employees whose work may impact the environment besides being trained and competent must be aware of :

1. the importance of conformance with the EMS,
2. the significant environmental aspects and related impacts of their work activities,
3. their roles and responsibilities in achieving conformity with the EMS,
4. the potential consequences of departure from specified procedures.

Features of ISO 14001:2004 Requirements For EMS

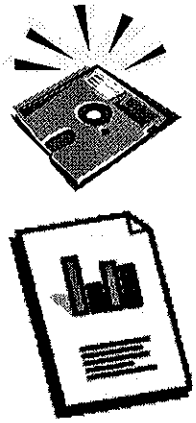
Internal & External Communication

Establish procedures for :

1. Communicating between the various levels and functions of the organization,
2. Receiving, documenting and responding to relevant issues from external interested parties,
3. Communicating environmental aspects externally if so decides,
4. Communicating with public authorities regarding emergency planning.

Features of ISO 14001:2004 Requirements For EMS

EMS Documentation



1. Describes the main elements of the EMS and their interactions
2. Provides direction to related documentation
3. May be integrated with existing documentation system
4. Documentation to be :
   - -Legible
   - -Readily Identifiable
   - -Retained for a Specified Period
   - -Dated
   - -Maintained in an Orderly Manner

Features of ISO 14001:2004 Requirements For EMS

Operational Control ("DO")

1. Identify operations and activities associated with significant environmental aspects in line with Environmental Policy, Objectives & Targets
2. Plan operations and activities by :
   a. Documenting procedures to ensure that no deviations from the environmental policy, objectives and targets occur;
   b. Stipulating operating criteria in the procedures;
   c. Maintaining procedures related to significant environmental aspects of goods and services used

Features of ISO 14001:2004 Requirements For EMS

Operational Control

Areas where typical operational control procedures are required :

1. Energy conservation
2. Noise pollution control
3. MSDS (material safety data sheet) control
4. Waste management
5. Chemical handling and spill control

Features of ISO 14001:2004 Requirements For EMS

Operational Control

Example of What a procedure for chemical handling should contain :

1. Responsibility for purchase from approved vendors with appropriate permits and MSDS
2. Labeling procedures
3. Receipt, transportation, storage and issue and inventory procedures
4. Use of appropriate protective equipment
5. Checks on ventilation/filter requirements
6. Action required in case of spillage or emergency situation
7. Refer to appropriate work instructions

Features of ISO 14001:2004 Requirements For EMS

Emergency Preparedness & Response

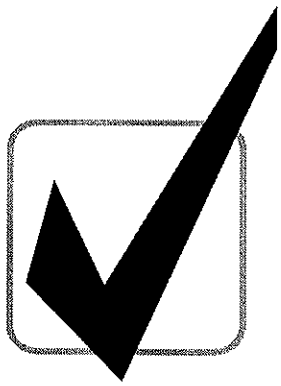
1. Review emergency preparedness and response procedures.
2. Identify potential for accidents and emergency situations and their environmental impacts.

1. Establish methods for prevention of, mitigation of, and response to accidents and emergency situations.
2. Periodically test procedures; review and revise if necessary.

Features of ISO 14001:2004 Requirements For EMS

Checking & Corrective Action Elements ("CHECK" & "ACT")

1. Monitoring and Measurement
2. Evaluation of Compliance
3. Nonconformity, Corrective and Preventive Actions
4. Records Control
5. EMS Internal Audit



Features of ISO 14001:2004 Requirements For EMS

Monitoring & Measurement

1. Monitor and measure characteristics of activities having significant impacts on the environment regularly.
2. Record information to track performance, operational controls and conformance with environmental objectives and targets.
3. Verify, calibrate and maintain monitoring and measuring equipment.
4. Maintain associated records and evaluate for environmental compliance periodically.



Features of ISO 14001:2004 Requirements For EMS

Evaluation of Compliance

1. Evaluate compliance with applicable legal requirements and other requirements regularly.
2. Keep records of such evaluations



Features of ISO 14001:2004 Requirements For EMS

Non-conformance, Corrective & Preventive Action

1. Identify causes of the nonconformity.
2. Identify and implement the necessary corrective action.
3. Modify controls if necessary to avoid recurrence of nonconformance.
4. Record changes resulting from the corrective action.

Features of ISO 14001:2004 Requirements For EMS

Records Control

1. Records should be Legible, Identifiable, Traceable, Stored and Maintained to be Readily Retrievable and Protected against Damage, Deterioration or Loss
2. Records can include :
    a. Information on environmental laws
    b. Complaint records
    c. Training records
    d. Process & Product information
    e. Inspection, maintenance and calibration records
    f. Pertinent contractor and supplier information
    g. Incident reports
    h. Information on emergency preparedness and response
    i. Information on significant environmental aspects
    j. Audit results & Management reviews



Features of ISO 14001:2004 Requirements For EMS

Internal Audit



1. Conducted by impartial and objective persons.
2. Determines if the EMS conforms to the planned arrangements, including ISO 14001.
3. Determines if the EMS has been properly implemented and maintained.
4. Provides information on the results of audits to management.

Features of ISO 14001:2004 Requirements For EMS

Management Review

1. Conducted by top management periodically.
2. Ensures continuing stability, adequacy and effectiveness of the EMS.
3. Addresses possible need for changes to policy, objectives and other elements of the EMS.



ROADMAP TO DEVELOP & IMPLEMENT AN EFFECTIVE EMS

1. Top Management Gives Direction, Commitment & Resources towards EMS
2. Top Management sets Environmental Policy
3. Formation of the EMS Team / Committee & Appointment of Management Representative
4. Develop & Document the EMS Manual, EMS Procedures & Work Instructions
5. Internal Briefing and Awareness Generation on EMS and ISO 14001:2004 Standard requirements



ROADMAP TO DEVELOP & IMPLEMENT AN EMS

6. Implement the EMS throughout the Organisation including all operating work locations and facilities
7. Provide for training of internal EMS auditors
8. Review the implementation of the EMS, covering environmental aspects, applicable legal & other requirements, EMS objectives and EMS Programmes
9. Perform an internal EMS audit and implement corrective & preventive actions and/or make appropriate improvements
10. Conduct a Management Review of the EMS and its effectiveness



KEY SUCCESS FACTORS FOR AN EFFECTIVE EMS

The Organisation should have :

- Top Management Commitment
- Competent and responsible key personnel (other than the EMS personnel) and employees towards environmental management
- Effective internal and external communication amongst staff and with all other interested parties at all times
- Capability in managing changes that affect the EMS e.g. organisational changes, business / marketplace changes, technology changes, process & product changes
- Responsive dealing with any deviations from the EMS through appropriate actions and continual improvement

KEY SUCCESS FACTORS FOR AN EFFECTIVE EMS

Key Tasks for Key Personnel establishing, implementing, maintaining or improving an EMS include the need to :-

1. Recognise that environmental management is among the highest organisational priorities
2. Establish and maintain communication and constructive relations with internal and external interested parties
3. Identify the environmental aspects of the organisation's activities, products and services
4. Identify the legal requirements and other requirements to which the organisation subscribes, that relate to its environmental aspects

KEY SUCCESS FACTORS FOR AN EFFECTIVE EMS

Key Tasks for Key Personnel establishing, implementing, maintaining or improving an EMS include the need to :-

5. Ensure the commitment of management and all persons working for or on behalf of the organisation to the protection of the environment, with clear assignment of accountability and responsibility
6. Encourage environmental planning throughout the company's work operations
7. Establish processes / programmes for achieving environmental objectives and targets



KEY SUCCESS FACTORS FOR AN EFFECTIVE EMS

Key Tasks for Key Personnel establishing, implementing, maintaining or improving an EMS include the need to :-

8. Provide appropriate and sufficient resources, including training, to comply with applicable legal requirements and with other requirements to which the organisation subscribes, and to achieve environmental objectives and targets on an on-going basis
9. Evaluate environmental performance against the organisation's policy, objectives and targets and seek improvement where appropriate
10. Establish a management process to audit and review the EMS and to identify opportunities for improvement of the system and resulting environmental performance
11. Encourage contractors and suppliers to establish an EMS



ISO 14001:2004 STANDARD

4.3.1 ENVIRONMENTAL ASPECTS

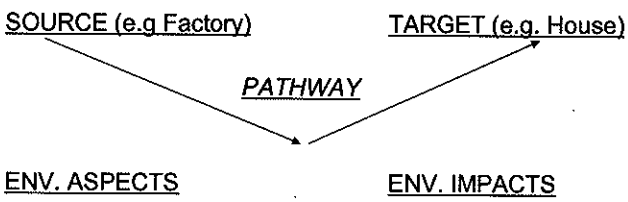
Requirements

a. Identify environmental aspects, considering :
   - direct and indirect
   - Incidents and emergencies
   - Normal and abnormal conditions
   - Legal and other requirements
   - Interested parties
   - Past, current and planned activities
b. Determine significance – evaluate, list in priority – procedures required?
c. Keep information current – process change, new products, etc
d. Consistent with policy, objectives and targets

ISO 14001:2004 STANDARD

4.3.1 ENVIRONMENTAL ASPECTS

Notes :



ISO 14001:2004 STANDARD

4.3.1 ENVIRONMENTAL ASPECTS

Notes

Consideration given to aspects related to Organization's activities, products and services during the following phases :

a. Design and development
b. Construction processes



ISO 14001:2004 STANDARD

4.3.1 ENVIRONMENTAL ASPECTS

Notes

Some Environmental Aspects found in Facilities, Work Activities / Work Processes and Support Functions of an Organisation :

Aspects	Impacts
Energy Consumption	Depletion of Natural Resource Air pollution, global warming
Water Usage	Depletion of Natural Resource
Use of excessive paper	Depletion of Natural Resource
Electricity Use.	Air pollution & global warming.
Disposal of Office Waste e.g. toner cartridges, food waste, etc	Air & Land Pollution



ISO 14001:2004 STANDARD

4.3.1 ENVIRONMENTAL ASPECTS

Notes - *Examples of Aspects and Impacts*

Aspects	Impacts
Sox & Nox Emissions.	Acid Rain.
Discharges to streams.	Degradation of aquatic habitat and water quality.
Spills & Leaks.	Soil, surface water & groundwater contamination.
Electricity Use.	Air pollution & global warming.
Timber Use.	Deforestation.



ISO 14001:2004 STANDARD

4.3.1 ENVIRONMENTAL ASPECTS

Notes - *Examples of Aspects and Impacts*
COOLING TOWERS – Operation & Maintenance

Aspects	Impacts
Water consumption.	Depletion of scarce resource.
Bleed-off.	Water pollution from treatment chemicals.
Emission of water mists.	Potential health hazard from bacteria.
Treatment chemicals storage, handling & potential spills.	Water & soil pollution, health hazard.
Electricity consumption.	Air pollution & global warming.



ISO 14001:2004 STANDARD

4.3.1 ENVIRONMENTAL ASPECTS

Notes - *Examples of Aspects and Impacts*
CHILLERS – Operation & Maintenance

Aspects	Impacts
Release of refrigerants.	Ozone Depletion.
Electricity consumption.	Air pollution & global warming.
Lubricants, oil, grease & used rags disposal. final	Potential air, water and land pollution from treatment and disposal.



ISO 14001:2004 STANDARD

4.3.1 ENVIRONMENTAL ASPECTS

Notes - *Examples of Aspects and Impacts*
COMPRESSORS – Operation & Maintenance

Aspects	Impacts
Storage & disposal of lubricants / compressor Oil.	Potential soil and water pollution.
Electricity consumption.	Air pollution & global warming
Discharge of oily condensate.	Water pollution.



ISO 14001:2004 STANDARD

4.3.1 ENVIRONMENTAL ASPECTS

Notes - *Examples of Aspects and Impacts*
WASTEWATER TREATMENT PLANT – Operation & Maintenance

Aspects	Impacts
Storage, leaks & spills of process wastewater.	Potential soil and water pollution, safety & health hazards.
Storage, handling, leaks & spills of treatment chemicals.	
Sludge collection & disposal .	
Discharge of treated effluent.	
Plant Failure or Ineffective Treatment.	



ISO 14001:2004 STANDARD

4.3.1 ENVIRONMENTAL ASPECTS

Notes - *Examples of Aspects and Impacts*
AIR SCRUBBERS – Operation & Maintenance

Aspects	Impacts
Emissions of air pollutants.	Air pollution.
Failure or Ineffective treatment.	.
Wet scrubbers – treatment & discharge of scrubbing solutions.	Water pollution.
Chemicals storage, handling, spills & leaks.	



ISO 14001:2004 STANDARD

4.3.1 ENVIRONMENTAL ASPECTS

Notes - *Examples of Aspects and Impacts*
BOILERS – Operation & Maintenance

Aspects	Impacts
Emission of flue gases. contaning CO_2, Sox, Nox.	Air pollution,global warming, Acid rain.
Consumption of fuel – gas / oil.	Depletion of non-renewable fossil fuel.
Discharge of condensate warming.	Water pollution, global
Feed-water consumption.	Depletion of a scarce resource.
Disposal of used oil, oil filters	Soil and groundwater pollution.
Heat rejection.	Atmospheric warming, wastage of recoverable energy.

ISO 14001:2004 STANDARD

4.3.1 ENVIRONMENTAL ASPECTS

Notes - *Examples of Aspects and Impacts*
BOILERS – Operation & Maintenance

Aspects	Impacts
Mishandling, improper storage. potential for spills,& leaks.	Contamination of drainage systems, Air, water and land. pollution.
Inappropriate treatment & disposal.	
Re-usable, recyclable or recoverable wastes.	Wastage of resources.

EMS Video Clips

Q & A Session

END OF TRAINING

TM SYSTEMS CONSULTANTS

Presents

QUALITY MANAGEMENT SYSTEM TRAINING BASED ON ISO 9001:2000

Introduction to Quality

- UK Study
  - ☺Only 4% of dissatisfied customers complain, 96% don't complain but 91% don't come back
  - ☺One dissatisfied customer tells on average, 9 other people about his dissatisfaction
  - ☺It costs 5 times as much to create new customers than to retain an existing one
  - ✪Hence ensuring quality of delivered product / services to meet customer's requirements is of paramount importance

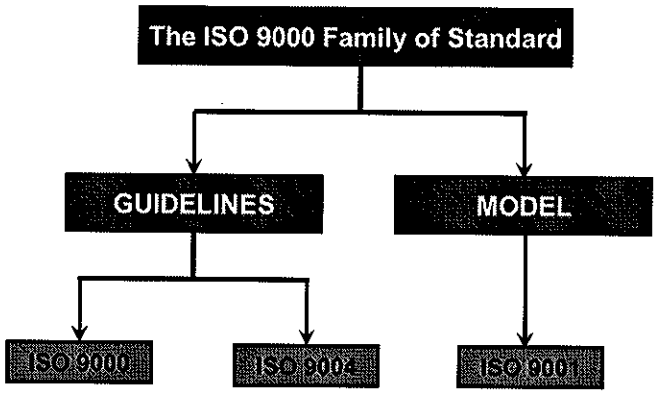
Introduction to Quality

- Misconceptions
  - ☺High Costs
    - an upfront cost exist but saved may times over as work is done right the first time with less costly mistakes
    - time is money when a task need to be rectified
  - ✪A Paper Generator
    - most documentation exist as objective evidence even before QMS is developed

Introduction to Quality

- Misconceptions (cont'd)
  - ☺The Responsibility of Only the Quality Manager
    - effective QMS is responsibility of all from top management to workers
  - ✪There is a choice whether to implement QMS in a project

ISO 9000:2000 Standards



8 Quality Management Principles

- 1. Customer Focused Organisation
  - ☺Dependent on customers
  - ☺Should understand current & future customer needs & meet their requirements
  - ☺Strive to exceed customer expectations

8 Quality Management Principles

- 2. Leadership
  - ☺Leaders establish unity of purpose and direction of organisation
  - ☺They should create and maintain internal environment in which people can be fully involved in achieving organisation's objectives

8 Quality Management Principles

- 3. Involvement of People
  - ☺People at all levels are the essence of organisation
  - ☺Their full involvement enables their abilities to be used for organisation's benefit

8 Quality Management Principles

- 4. Process Approach
  - ☺Desired result achieved more efficiently when related resources and activities are managed as a process

8 Quality Management Principles

- 5. System Approach to Management
  - ☺Identify, understand and manage a system of interrelated processes for a given objective to improve organisation's effectiveness and efficiency

8 Quality Management Principles

- 6. Continual Improvement
  - ☺Should be a permanent objective of the organisation

8 Quality Management Principles

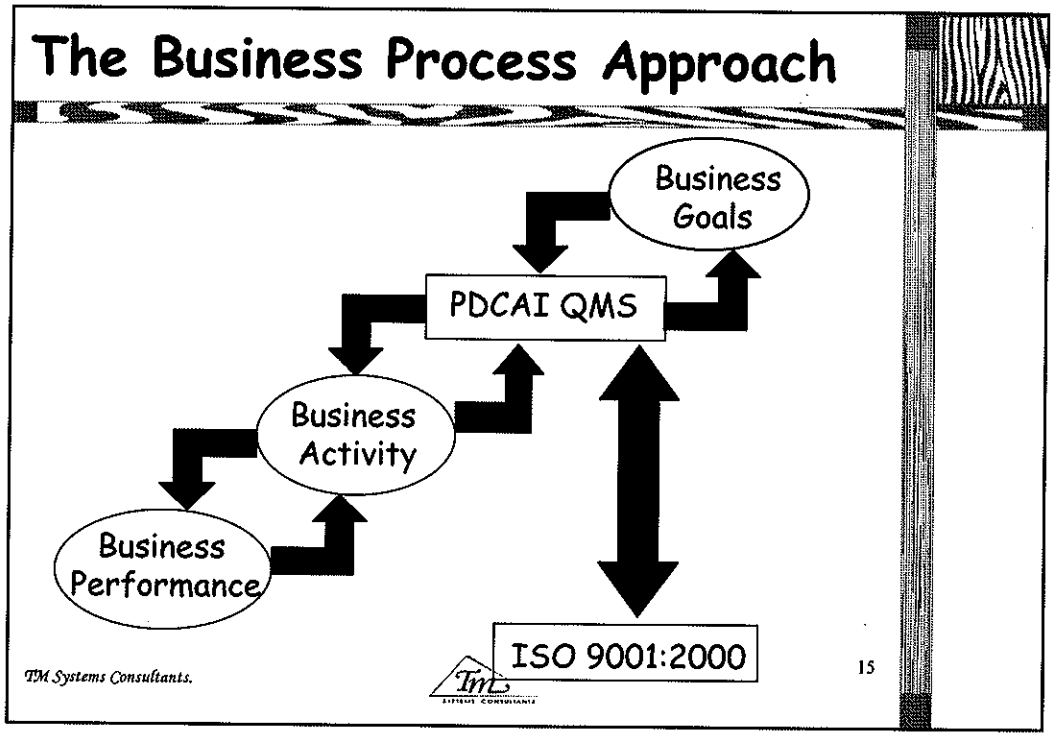
- 7. Factual Approach to Decision Making
  - ☺Effective decisions are based on the analysis of data and information

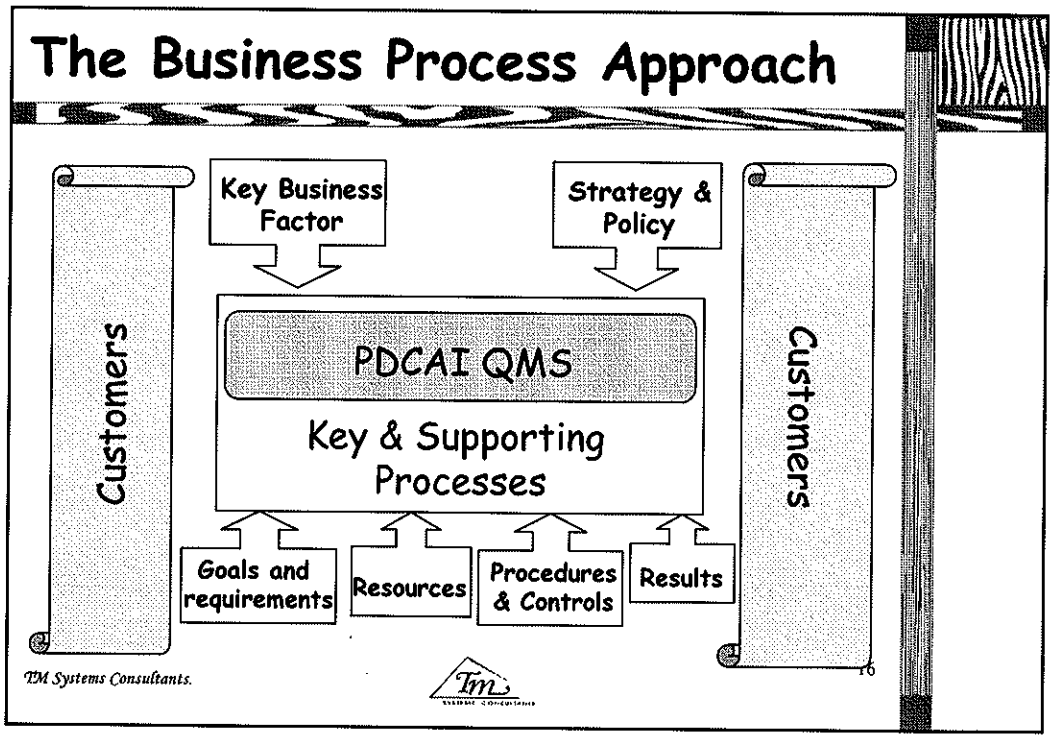
8 Quality Management Principles

- 8. Mutually Beneficial Supplier Relationship
  - ☺Organisation & suppliers are interdependent
  - ☺A mutually beneficial relationship enhances ability of both to create value

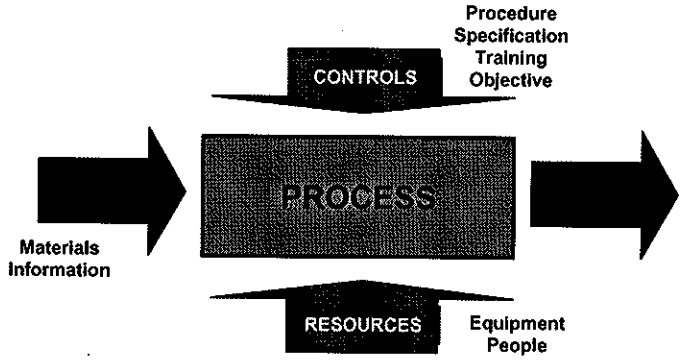
8 Quality Management Principles

- Think About The Following :-
  - ☺For each of the 8 Quality Management Principles, which clauses of ISO 9001:2000 might relate?
  - ☺Do thy relate in a strong, medium or weak sense?
  - ☺Give good examples of above as seen in a company.


The Business Process Approach
Business Goals
PDCAI QMS
Business Activity
Business Performance
ISO 9001:2000
TM Systems Consultants.
15


The Business Process Approach
Key Business Factor
Strategy & Policy
Customers
PDCAI QMS
Key & Supporting Processes
Customers
Goals and requirements
Resources
Procedures & Controls
Results
TM Systems Consultants.
16

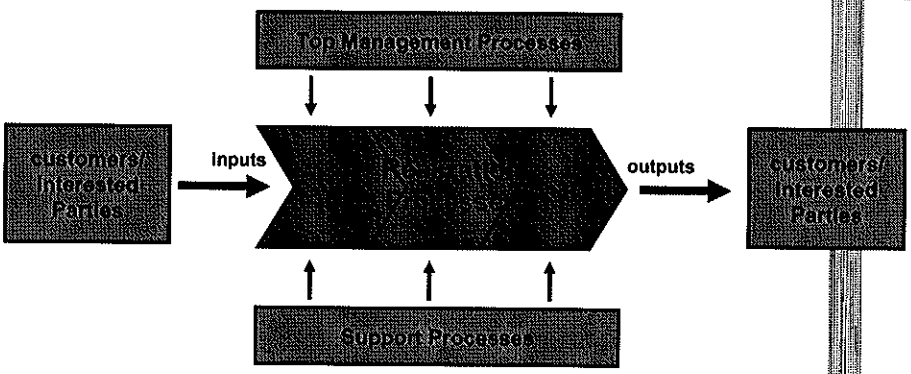
What is a Process?



TM Systems Consultants.

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Process Approach

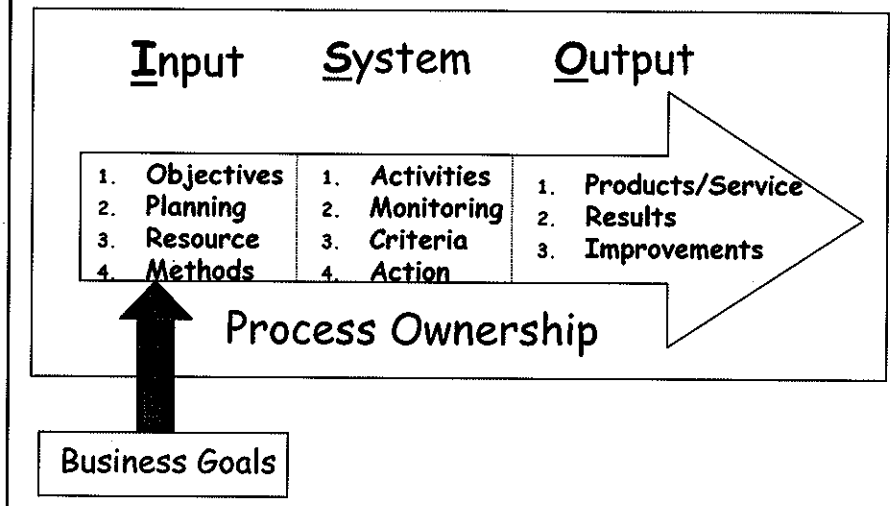


Top management processes include - planning, allocation of resources, management review
Realization processes include - customer related processes, design and development, product realization
Support processes include - training, maintenance

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18

Process Management



Process Management: QA to QM?

Tiger Woods (Golf) → ' Eagle '

David Beckham (Soccer) → ' Goal '

Process Management: QA to QM?

Procedures

1. Driven by completion of tasks
2. Steps Completed by different people in different Departments with different objectives
3. Discontinuous
4. Focus on satisfaction of roles
5. Define sequence of steps to execute a task

Processes

1. Driven by achievement of desired outcomes
2. Completed by different people with the same objectives-departments do not matter
3. Flow to conclusion
4. Focus on satisfying customers
5. Transform inputs into outputs through sequences

Process Management: QA to QM?

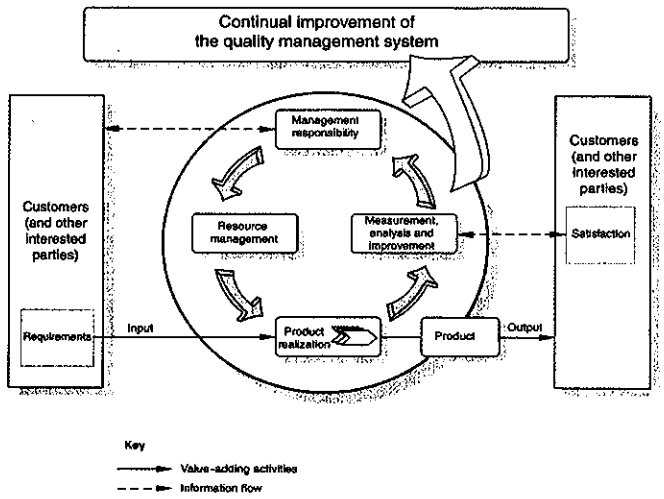
Procedures

6. Driven by humans
7. They exist- they are static
8. Cause people to take actions & decisions

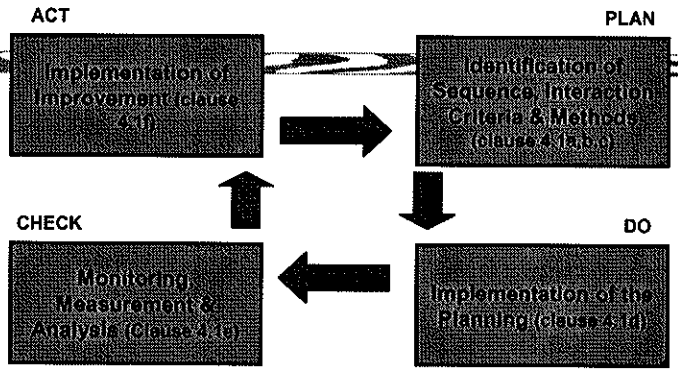
Processes

6. Driven by physical forces
7. They behave- they are dynamic
8. Cause things to happen

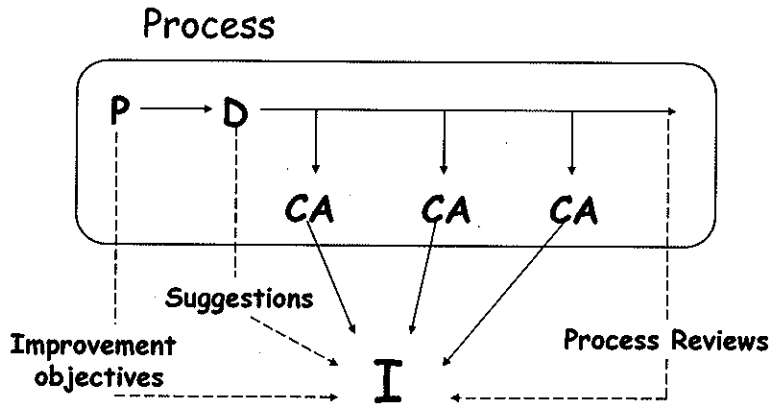
Model of a Process-based Quality Management System



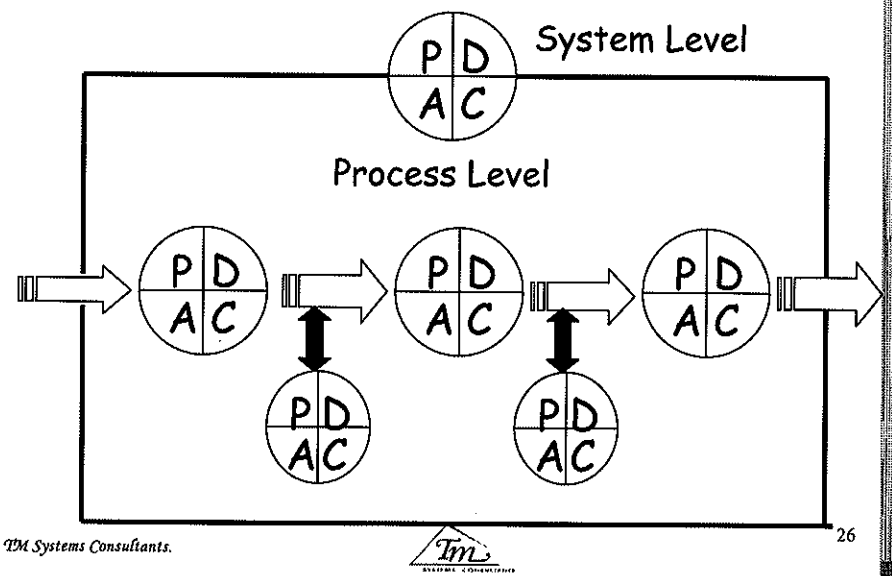
PDCA Cycle applied to ISO 9001:2000 Clause 4.1



P-D-C-A-I ?

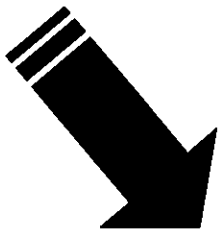


The PDCA Cycle



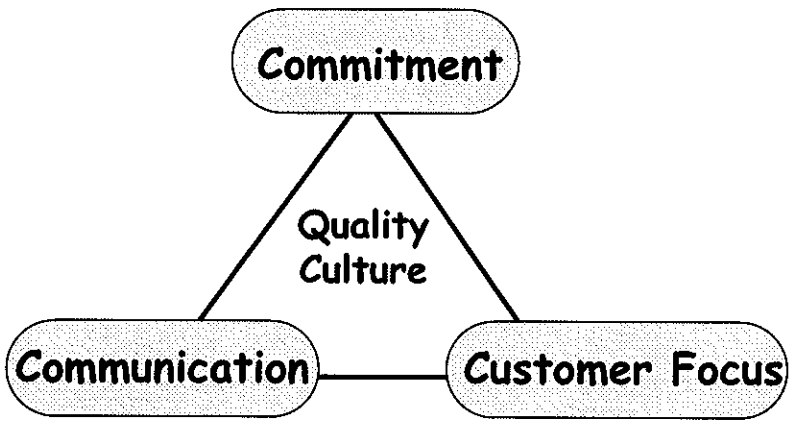
A Process Approach to Audits

CONformance



PERformance

Organisation Quality Culture



8 Quality Management System

- Alpha Consulting Engineers Pte Ltd
  ☺QMS Flowchart

Cl.5.3 Quality Policy

Top management shall ensure that the quality policy

a) is appropriate to the purpose of the organization,
b) includes a commitment to comply with requirements and continually improve the effectiveness of the quality management system,
c) provides a framework for establishing and reviewing quality objectives,
d) is communicated and understood within the organization,
e) is reviewed for continuing suitability.

Cl.5.3 Quality Policy

- Alpha Consulting Engineers Pte Ltd
  ☺Quality Policy

Cl. 5.4.1 Quality Objectives

Top management shall ensure that quality objectives, including those needed to meet requirements for product (see 7.1 a) are established at relevant functions and levels within the organization.

The quality objectives shall be measurable and consistent with the quality policy.

Cl. 5.4.1 Quality Objectives

- Alpha Consulting Engineers Pte Ltd
  ☺Quality Objectives

Cl. 4.2.2 Quality Manual

The organization shall establish and maintain a quality manual that includes :

a) the scope of the quality management system, including details of and justification for any exclusions

b) the documented procedures established for the quality management system, or reference to them, and

c) a description of the interaction between the processes for the quality management system.

Cl. 4.2.3 Control of Documents

Documents required by the quality management system shall be controlled. Records are a special type of document and shall be controlled according to the requirements given in 4.2.4.

A documented procedure shall be established to define the controls needed

a) to approve documents for adequacy prior to issue,
b) to review and update as necessary and re-approve documents,
c) to ensure that changes and the current revision status of documents are identified,
d) to ensure that relevant versions of applicable documents are available at points of use,
e) to ensure that documents remain legible and readily identifiable,
f) to ensure that documents of external origin are identified and their distribution controlled, and
g) to prevent the unintended use of obsolete documents, and to apply suitable identification to them if they are retained for any purpose.

Cl. 4.2.3 Control of Documents

- Alpha Consulting Engineers Pte Ltd
  - ☺QEMSP
    - Section S1 - Document Control
    - Section S2 - Documentation of QEMS Procedures
    - Section S3 - Documentation of Project Quality Plan

Cl. 7.3.1 Design and Development Planning

The organization shall plan and control the design and development of product.

During the design and development planning, the organization shall determine

a) the design and development stages,
b) the review, verification and validation that are appropriate to each design and development stage, and
a) the responsibilities and authorities for design and development.

The organization shall manage the interfaces between different groups involved in design and development to ensure effective communication and clear assignment of responsibility.

Planning output shall be updated, as appropriate, as the design and development progresses.

Cl. 7.3.2 Design and Development Inputs

Input relating to product requirements shall be determined and records maintained (see 4.2.4). These inputs shall include

a) functional and performance requirements,
b) applicable statutory and regulatory requirements,
c) where applicable, information derived from previous similar designs,
d) other requirements essential for design and development.

These inputs shall be reviewed for adequacy. Requirements shall be complete, unambiguous and not in conflict with each other.

Cl. 7.3.3 Design and Development Outputs

The outputs of design and development shall be provided in a form that enables verification against the design and development input and shall be approved prior to release.

Design and development outputs shall

a) meet the input requirements for design and development,
b) provide appropriate information for purchasing, production and for service provision,
c) contain or reference product acceptance criteria, and
d) specify the characteristics of the product that are essential for its safe and proper use.

Cl. 7.3.4 Design and Development Review

At suitable stages, systematic reviews of design and development shall be performed in accordance with planned arrangements (see 7.3.1)

a) to evaluate the ability of the results of design and development to meet requirements, and
a) to identify any problems and propose necessary actions.

Participants in such reviews shall include representatives of functions concerned with the design and development stages(s) being reviewed. Records of the results of the reviews and any necessary actions shall be maintained (see 4.2.4).

Cl. 7.3.5 Design and Development Verification

Verification shall be performed in accordance with planned arrangements (see 7.3.1) to ensure that the design and development outputs have met the design and development input requirements.

Records of the results of the verification and any necessary actions shall be maintained (see 4.2.4).

Cl. 7.3.6 Design and Development Validation

Design and development validation shall be performed in accordance with planned arrangements (see 7.3.1) to ensure that the resulting product is capable of meeting the requirements for the specified application or intended use, where known.

Wherever practicable, validation shall be completed prior to the delivery or implementation of the product.

Records of the results of validation and any necessary actions shall be maintained (see 4.2.4).

Cl. 7.3.7 Design and Development Changes

Design and development changes shall be identified and records maintained.

The changes shall be reviewed, verified and validated, as appropriate, and approved before implementation.

The review of design and development changes shall include evaluation of the effect of the changes on constituent parts and product already delivered.

Records of the results of the review of changes and any necessary actions shall be maintained (see 4.2.4).

Cl. 7.3 Design & Development

- Alpha Consulting Engineers Pte Ltd
  - ☺QEMSP
    - Section M3 - Design Control
    - Section M4 - Design Change Control

Cl. 7.5.1 Control of Product / Service Provision

- Alpha Consulting Engineers Pte Ltd
  - ☺QEMSP
    - Section M7 - Construction Process Control

Cl. 7.5.1 Control of Product / Service Provision

- Alpha Consulting Engineers Pte Ltd
  - ☺QEMSP
    - Section M8 - Testing & Commissioning

Cl. 5.2 Customer Focus

Top management shall ensure that customer requirements are determined and are met with the aim of enhancing customer satisfaction (see 7.2.1 and 8.2.1).

Cl. 5.2 Customer Focus

- Alpha Consulting Engineers Pte Ltd
  - ☺QEMSP
    - Section QE2 – Feedback Reporting

Cl. 8.2.1 Customer Satisfaction

As one of the measurements of the performance of the quality management system, the organization shall monitor information relating to customer perception as to whether the organization has met customer requirements.

The methods for obtaining and using this information shall be determined.

Customer Satisfaction

Why has the requirement for monitoring of customer satisfaction been included in ISO 9001?

- "Customer satisfaction" is recognized as one of the driving criteria for any organization
- In order to evaluate if the product meets customer needs and expectations, it is necessary to monitor the extent of customer satisfaction
- Improvements can be made by taking action to address any identified issues and concerns.

Customer Satisfaction

Monitoring
Customer Complaints
Is
NOT
Adequate

Cl. 8.2.1 Customer Satisfaction

- Alpha Consulting Engineers Pte Ltd
  - ☺QEMSP
    - Section QE2 - Feedback Reporting

Cl. 8.3 Control of Non-conforming Product

The organization shall ensure that product which does not conform to product requirements is identified and controlled to prevent its unintended use or delivery.

The controls and related responsibilities and authorities for dealing with nonconforming product shall be defined in a documented procedure.

The organization shall deal with nonconforming product by one or more of the following ways:

a) by taking action to eliminate the detected nonconformity;
b) by authorizing its use, release or acceptance under concession by a relevant authority and where applicable, by the customer;
c) by taking action to preclude its original intended use or application.

Cl. 8.3 Control of Non-conforming Product

Records of the nature of nonconformities and any subsequent actions taken, including concessions obtained, shall be maintained (see 4.2.4).

When nonconforming product is corrected it shall be subject to re-verification to demonstrate conformity to the requirements.

When nonconforming product is detected after delivery or use has started, the organization shall take action appropriate to the effects, or potential effects, of the nonconformity.

Cl. 8.3 Control of Non-conforming Product

- Alpha Consulting Engineers Pte Ltd
  - ☺QEMSP
    - Section QE2 - Feedback Reporting

Cl. 8.5.1 Continual Improvement

The organization shall continually improve the effectiveness of the quality management system through the use of the quality policy, quality objectives, audit results, analysis of data, corrective and preventive actions and management review.

What is Continual Improvement?

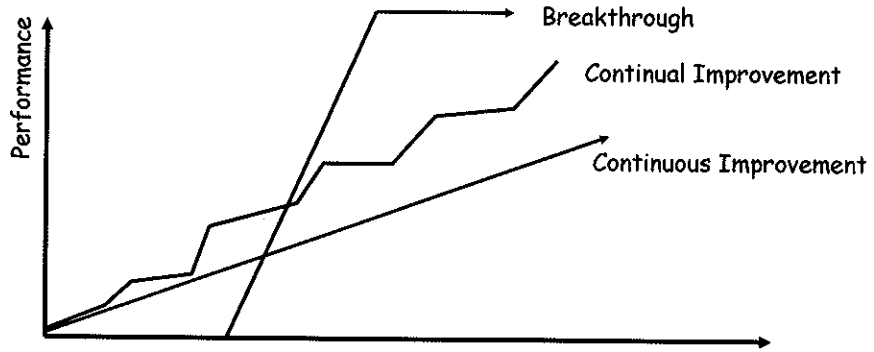
- Continual improvement is a type of change that is focused on increasing the effectiveness and / or efficiency of an organisation to fulfil its policy and objectives
- Put simply :
  - ☺It means 'GETTING BETTER ALL THE TIME'

Gradual or Incremental

- There are three types of improvement
  - ✓ Continuous improvement
    - Gradual never-ending change
  - ✓ Continual improvement
    - Incremental change
  - ✓ Breakthrough
    - Are also improvement, but in one giant leap
- Continual improvement is one of the requirement in ISO 9001:2000

Improvement

Differences between 'Continuous', 'Continual' improvement and 'Breakthrough'



8.5.1 Continual Improvement

Plan to improve the QMS continually

Further Notes

a. Continual improvement is pro-active actions taken by the management to :-
   1. Enhance product / service provision.
   2. Increase effectiveness and efficiency of processes, and
   3. Meet growing customers' expectations as well.

b. The organization can continually improve QMS through review of quality policy, quality objectives, audit results, analysis of data, corrective and preventive actions and management review.

Cl. 8.5.1 Continual Improvement

- Alpha Consulting Engineers Pte Ltd
  - ☺QEMSP
    - Section QE2 - Feedback Reporting

Cl. 8.5.2 Corrective Action

The organization shall take action to eliminate the cause of nonconformities in order to prevent recurrence. Corrective actions shall be appropriate to the effects of the nonconformities encountered.

A documented procedure shall be established to define requirements for

a) reviewing nonconformities (including customer complaints),
b) determining the causes of nonconformities,
c) evaluating the need for action to ensure that nonconformities do not recur,
d) determining and implementing action needed,
e) records of the results of action taken (see 4.2.4), and
f) reviewing corrective action taken.

Cl. 8.5.2 Corrective Action

Document procedure for eliminating the root causes of nonconformities and recurrence

Further Notes

a. Organization shall take corrective action to eliminate cause(s) of non-conformities.
b. The actions taken shall be effective and to prevent recurrence.

Cl. 8.5.2 Corrective Action

- Alpha Consulting Engineers Pte Ltd
  - ☺QEMSP
    - Section QE2 - Feedback Reporting

Cl. 8.5.3 Preventive Action

The organization shall determine action to eliminate the causes of potential nonconformities in order to prevent their occurrence. Preventive actions shall be appropriate to the effects of the potential problems.

A documented procedure shall be established to define requirements for

a) determining potential nonconformities and their causes,
b) evaluating the need for action to prevent occurrence of nonconformities,
a) determining and implementing action needed,
b) records of the results of action taken (see 4.2.4), and
c) reviewing preventive action taken.

Cl. 8.5.2 Preventive Action

Document procedure for eliminating the root causes of potential nonconformities and prevent occurrence

Further Notes

a. Organization shall take preventive action to eliminate cause(s) of potential non-conformities.
b. Action taken should prevent occurrence.

Cl. 8.5.2 Preventive Action

- Alpha Consulting Engineers Pte Ltd
  - ☺QEMSP
    - Section QE2 - Feedback Reporting

In Summary

- ISO 9001:2000 emphases on :
  - ☺Top management involvement
  - ☺ Customer satisfaction
  - ☺ Continual improvement

In Summary

- ISO 9001:2000 based on :

  ☺Process approach - Plan-Do-Check-Act

  - Plan : establish objectives and processes necessary to deliver results in accordance with customer requirements and the organization's policy
  - Do : implement the processes
  - Check : monitor and measure processes and product against policy, objectives, etc
  - Act : taken actions to continually improve the process performance

Auditing Skills and Techniques

- Communication Skills
- Questioning Skills
- Listening Skills
- Non-verbal Communication

Communication Skills

Communication Skills

☺Most important attribute of the Auditor

- Auditor should :
  - Know what you are going to say in advance
  - Seek to clarify your thoughts and to examine the purpose before you start to communicate
  - Assess the person to whom you are going to speak in order to assist you in the choosing of the rights words
  - Be tactful and diplomatic

Communication Skill

Always think before speaking.

The aim of communication is to get information across to the other person so that he or she knows exactly what is meant. Therefore use words and terminology that is familiar to the auditee.

(See article on "Miscommunication")

Questioning Skills

Questioning

1 Any questions asked need to :
- Yield the information required
- Not suggest an answer
- Not contain emotive words or implications

2 Effectiveness will depend to a large extent on how well the Auditor uses questions

Types of Questioning

☺ There are three main types of questioning

- Closed questions
- Open questions
- Leading questions

Types of Questioning

Types of Questioning

Page 1 of 3

1 Closed Questions

Definition : Can be answered with a 'YES' or 'NO' or with a word or two.
Usage : To obtain / establish specific facts / information.
Over use can make auditee feel that he / she is being subjected to interrogation and thus making him / her feel pressurised which in turn may cause resentment and reduce cooperation.
Can be used to great effect where auditee is very talkative or takes off at tangents.
Example : Do you have a drawing register ?
What is the calibration period for the testing equipment ?
Is this the latest specification ?

Types of Questioning

Types of Questioning

Page 2 of 3

2 Open Questions

Definition : Cannot be answered with a simple 'YES' or 'NO'.
5W and 1H - who, what, where, when, why and how
Usage : A useful way of starting an audit as it gives auditee an opportunity to explain what happens and also help to put him / her at ease.
Tends to encourage auditee to talk freely.
Does not restrict auditee in his / her choice of answer.
Example : How do you inspect your products ?
Can you tell me how drawings are updated ?
What are your responsibilities ?
Explain to me, describe or show me ...

Types of Questioning

Types of Questioning

3 Leading Questions

Definition : Contain within its form and content the anticipated answer. Is suggestive; Auditor often assuming the answer and putting words into the auditee's mouth.

Usage : Sometimes useful as a means of helping very nervous or shy auditees to start talking.

Example : You will be completing the audit next week, won't you ?
The foreman doesn't update this list, does he ?
To perform this task, you will need to be well-verse in computing.
You are literate in computing aren't you.

In Summary

1 You will have the opportunity to ask a mixture of questions using different types of questioning technique

2 To determine the appropriate type of questioning technique to be used :

a. Identify what you want to know

b. Decide the best way to achieve that purpose

Note : - No one type of questioning is better than another
- It is best to select the type of questioning which will get the result you need.

Listening Skills

Listening Skills

1 For effective communication to take place, it is essential to do more than 'hear' the message which is being spoken

2 Intelligent and active listening means :
- **Attending to**
- **Hearing**
- **Understanding**
- **Responding**

3 To listen effectively means taking an active part in the interaction

Listening Skills

- Listening Skills & Techniques

  4 Listening demands audience participation
  - **Feedback is an essential part of being a skilled listener**

  5 Passive listening occurs when the individual hears the message but fails to communicate this to the auditee

NOTE : TALK LESS YOURSELF and LISTEN MORE

Listening Skills

Important Factors that May Hinder Effective Listening

1 **Selective Attention**

Definition : The ability of the Auditor to process only part of the information which he / she receives and to ignore the rest.

Note : Individual do not react equally to all possible 'background noises' in the environment. For example ticking of the clock, pictures on the wall and traffic noise.
Therefore if one is bored or uninvolved in the interaction, these 'background noises' may be noticed / felt. Attention may shift and important information may be missed.
It is then necessary to compensate for these distractions by concentrate harder on the task in hand.

Listening Skills

Important Factors that May Hinder Effective Listening

2 Premature Conclusions

Definition : Jumping to a hasty and possibly wrong response.

Note : Impatient.
Caution may allow you to obtain more information.
Always try to hear the auditee out before formulating a response.

Listening Skills

Important Factors that May Hinder Effective Listening

3 Personal Prejudices

Definition : Preconceived opinion / bias resulting from personal judgement.

Note : Deeply rooted convictions and personal opinion may distort understanding and influence behaviour and can create an obstacle to effective listening and understanding.
It is therefore important to put such prejudices aside during auditing.

Listening Skills

Listening Skill - Special Care

1 Auditor must listen and appear interested in any information received. One of the worst 'turn-offs' to the auditee is for the auditor to appear switched off.

2 Try to understand how the auditee views the audit. Is it just a mass of questions ?

3 When you ask a question, the normal human reaction is to start thinking about the next question and then wait for a suitable slot in which to ask this question. Auditors must control this and make sure they listen carefully to the answers.

4 Do not interrupt the auditee's response without cause.

5 Acknowledge the response.

Listening Skills

Summary - Listening Skills

Effective listening can be summarised as follows :

1 Listening demands concentration - try not to let your thoughts wander

2 Provide feedback

3 Be aware of the effects of responding emotionally

4 Withhold any evaluation until the auditee has finished

5 Try to be sensitive to your own prejudices and views

6 Prepare yourself - read procedures and manuals
If you are familiar with the system, listening and understanding is more effective

Non-Verbal Communication

Non-Verbal Communication

1 Folding arms - defensive mood
2 Tapping fingers or foot - impatience, boredom, not interested
3 Nail biting - nervous
4 Leaning forward - showing interest
5 Hand in pocket - unwilling to cooperate

Auditor Destroyer or Builders

DESTROYER	BUILDER
- Negative mind-set	- Positive mind-set
- Assume you are bad	- Hope you are OK
- Enjoy deficiencies	- Sensitive to emotions
- Enjoy inflicting pain or embarrassment	- Try to reduce pain or embarrassment
- Gossip	- Maintain confidentiality
- Arrogant	- Polite
- Subjective	- Objective
- Raise surprises	- Discuss concerns

Auditor Behaviour

☺During the audit, there are a number of rules to be observed :

- Do's

- Prepare for the audit	- Control the audit
- Assist the auditees	- Listen to the auditees
- Obtain objective evidence	- Be concise
- Compliment the auditee	- Be tactful
- Ensure fairness	

Auditor Behaviour

Rule - Do's

Prepare for the audit	Trained in the skills and techniques of audit Know the procedures There is no substitute for good preparation
Control the audit	Do not be sidetracked Adhere to agreed programme / schedule Do not be led or misled Do not get 'bogged down'
Assist the auditees	In areas where there is misunderstanding or misinterpretation
Listen to the auditee	Be a good listener and patient
Obtain objective evidence	Judgements can only be made on the basis of facts
Compliment the auditee	Highlight good points
Be concise	Keep the questions short and to the point
Be tactful	Need to gain cooperation from auditees
Ensure fairness	Avoid 'nit-picking' and where necessary, benefit of doubt should be given to auditees

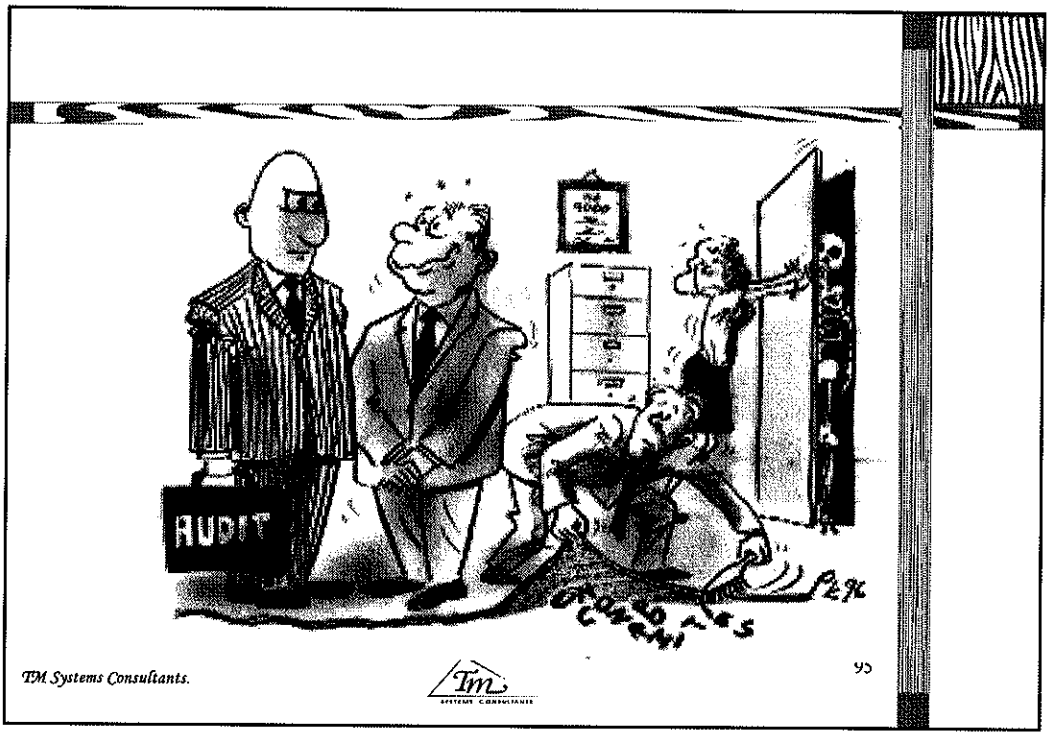
Auditor Behaviour

☺During the audit, there are a number of rules to be observed :

- Don'ts



- Be sarcastic
- Be negative
- Be sidetracked
- Be Late
- Compare auditee with other
- Swear
- Criticise
- Argue
- Discuss personalities


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