Seminar on Best Practices for the Construction Industry 2002

Presentations by Winners of C21 Best Practice Awards 2002 on their experience in creating and implementing best practices in their areas of work

Date	:	6 September 2002 (Friday)
Time	:	8.30 am to 12.30 pm
Venue	:	Construction Industry Training Institute Function Hall 200 Braddell Road Singapore 579700

The Award Guidebook, Nomination Form for C21 BPA 2003 and details of presentation slides on C21 BPA 2002 winning practices are contained in the CD

Construction 21
BEST PRACITCE AWARD

Building and Construction Authority

Seminar on Best Practices for the Construction Industry 2002

8.30am	Registration
8.50am	Guests to be Seated

Presentation by C21BPA 2002 Award Winners

9.00am	Air Flushing System to Improve Indoor Air Quality *Mr. Lek Siang Hwa (Vice President (M&E), CPG Consultants Pte Ltd)*
9.30am	Innovative Crack Injection Repair System for Concrete Structures *Mr. Felix Tan (Managing Director, Unifor Construction Pte Ltd)*
10.00am	Quality Management Tools for Improved Performance in Construction Projects *Mr. Lee Ho Mein (Deputy QA/QC Manager, Woh Hup (Private) Limited)*
10.30am	Tea Break

Presentation by C21BPA 2002 Merit Winners

11.00am	Developing a Corporate Export Culture for Expansion to Regional Markets *Mr. Gan Eng Oon (Executive Chairman, DP Architects Pte Ltd)*
11.30am	Application of Precast/Prefabricated Solutions for Institutional Buildings *Mr. Kueh Lip Kuang (Vice President (C&S), CPG Consultants Pte Ltd)*
12.00pm	Integrated System for Order, Production and Logistics Management for the Ready-Mixed Concrete Industry *Mr. Neo Chia Wui (Assistant Manager (TQM), RDC Holdings Pte Ltd)*
12.30pm	End of Seminar

Air Flushing System to Improve Indoor Air Quality

Seminar on Best Practices for the Construction Industry 2002

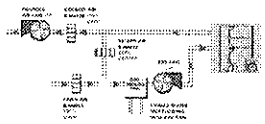
Use of Air Flushing System to Improve Indoor Air Quality

Scope of Presentation

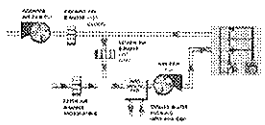
- ✓ Description of Air Flushing System
- ✓ Creativity and Innovation
- ✓ Effectiveness
- ✓ Impact on Industry
- ✓ Pervasiveness
- ✓ Sustainability
- ✓ Best in Class

Air Flushing System

- Flushing fan connected to return air duct in AHU room through motorised damper
- Air Flushing System runs automatically by BAS before chiller starts
- AHU supplies 100% fresh air to the workspace without re-circulating return air
- Flushing fan sucks foul air from the enclosed workspace and discharges to exterior
- Two complete air changes are introduced to the workspace

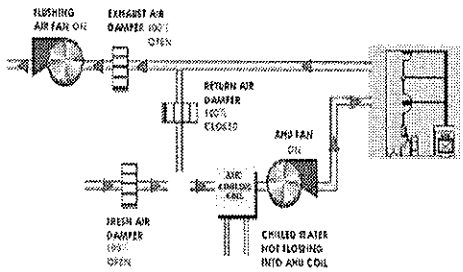


Schematic with AHU in Flushing Mode



Schematic with AHU in Normal Operation

Air Flushing System



Schematic with AHU in Flushing Mode

Creativity and Innovation



- First to be applied in the construction industry by us in Singapore in the ACMV system for the Major Retrofitting of MND Complex in 1986
- The practice is driven and spearheaded by our organisation to overcome the problem of foul air built up after ACMV system stops operation at the end of the day or over the weekend
- Simple to implement and solve the problem at its root cause
- Incorporated in all major projects with central air-conditioning system undertaken by CPG Consultants (formerly known as PWD Consultants)

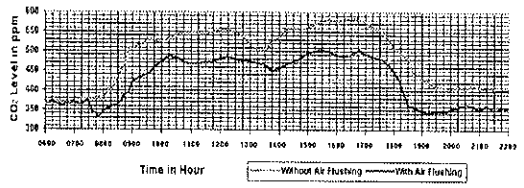


Effectiveness

- Pollutants within the space will accumulate over time. These pollutants are the main contributors to "Sick Building Syndrome"
- Because pollutants are difficult to measure, CO_2 level was used as a performance indicator.
- A CO_2 sensor is installed in the return air path to monitor CO_2 level in parts per million (ppm)
- Traditional way to reduce the CO_2 level is to dilute the air space with about 10% fresh air from outside
- Air flushing system replaces the air in the enclosed space with 100% fresh air before it is occupied
- Measurements of CO_2 level show that the practice is effective and there is marked reduction in CO_2 and hence pollutant level

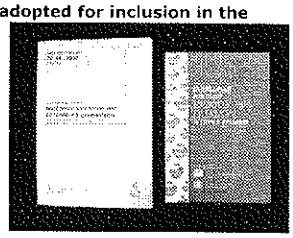
Effectiveness (cont'd)

- CO_2 level in workspace is less than 510 ppm after air flushing
- This is much lower than the maximum permissible level of 1,000 ppm stipulated under the *Guidelines for Good Indoor Air Quality for Office Premises*



Impact on Industry

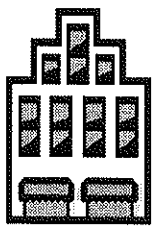
- Our practice has been adopted for inclusion in the
  - ☑ *SS CP 13 - Mechanical Ventilation and Air-conditioning in Buildings* in 1999
  - ☑ *Guidelines for Good Indoor Air Quality for Office Premises* in 1996 (available for download from *http://www.env.gov.sg/info/publications/INDEX.HTM*)



- It is easy for other firms to adopt the practice
- Some other M&E consultants are incorporating air flushing system in their design. For example, the system is provided in the new URA Centre, HDB Centre and Republic Plaza.

Impact on Industry (cont'd)

- The practice has addressed the pressing issue of improving indoor air quality and preventing buildings from the possible "Sick Building Syndrome"
- As a result, the practice helps to provide a more healthy and productive environment for the occupants of buildings
- It will reduce staff absentee rate as experienced by the Inland Revenue Authority of Singapore (IRAS)



Impact on Industry (cont'd)



The number of days of sick leave taken by IRAS staff housed in Revenue House in 2001 has reduced by nearly half when compared with the same period in 1997 as reported in the Lianhe Zaobao on 6 Nov 2001

Pervasiveness

- This practice has become part of our standard design concept to be followed by the mechanical engineers throughout the whole company
- Since the successful application of the concept to MND Complex, we have incorporated the air flushing system in all the major projects undertaken by us:



- ✓ Environment Building
- ✓ Revenue House
- ✓ SIR Building
- ✓ The Treasury
- ✓ Tuas Checkpoint
- ✓ Woodlands Checkpoint
- ✓ MITA Headquarters
- ✓ New Parliament House
- ✓ Traffic Police Headquarters
- ✓ MOE Building
- ✓ Cantonment Complex
- ✓ New MFA Headquarters
- ✓ New Phoenix Park
- ✓ SCDF Headquarters

Pervasiveness (cont'd)

- The occupants of the buildings that have been provided with air flushing system will benefit from the practice
- They enjoy full fresh air from the air-conditioning system every morning they come to work
- A more healthy and productive environment is provided for the workers
- Reduction in staff absentee rate will be an immediate tangible benefit

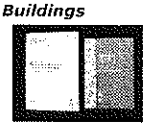


Sustainability

- The practice has been implemented since 1986 in MND Complex when major retrofitting was carried out
- We tried this concept as a user of the building ourselves and we monitored the CO_2 level of the building using the automatic trend logging of the Building Automation System
- We found the air flushing system to be very effective
- We have since applied the concept to other Government buildings designed by us and implemented it as a standard practice

Sustainability (cont'd)

- Our concerted effort of ensuring the long-term sustainability of the practice is evident through our feedback to PSB's Technical Committee responsible for the revision of CP 13 and Ministry of the Environment's Technical Advisory Committee on Indoor Air Quality
- As a result, the practice has been incorporated in
  - ✓ *Guidelines for Good Indoor Air Quality for Office Premises* (1996) and
  - ✓ *CP 13 :1999 - Mechanical Ventilation and Air-conditioning in Buildings*

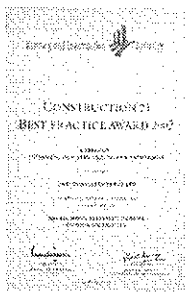


Best in Class

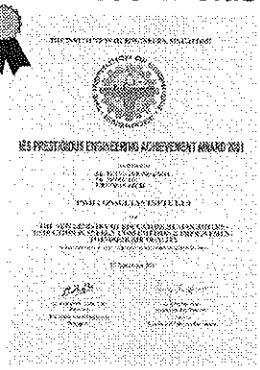
- We first introduced the practice in Singapore in 1986
- The practice has been incorporated in the Guidelines and Code of Practice for all M&E consultants in Singapore to adopt

Best in Class

- We received awards on the practice for:
  - ✓ Revenue House (Energy efficient measures include air flushing system) - Winner of ASEAN's Most Energy Efficient Building Award, 2000
  - ✓ Ministry of Education Building : Reduction in Energy Consumption and Improvement to Indoor Quality - Institution of Engineers Singapore's Prestigious Engineering Achievement Award, 2001
  - ✓ Construction 21 Best Practice Award 2002 for Improving Industry Practice & Technologies, BCA



Best in Class (cont'd)





THANK YOU

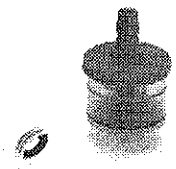
Innovative Crack Injection Repair System for Concrete Structures

UNIFOR Construction Pte Ltd

- UNIFOR Construction Pte. Ltd. Provides Specialist Engineering Services to the Construction Industry.
- Together with our Committed Engineering Staff, we Strive for Business Excellence by:

  - **Providing Innovative and Cost-Effective Solutions for our Clients, and**
  - **Continuously Improving our Skills and Techniques.**

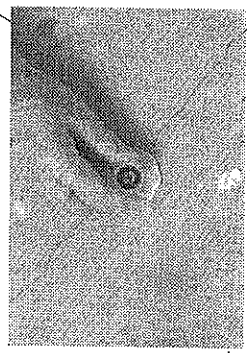
- UNIFOR CONSTRUCTION PTE LTD has achieved an efficient and effective means of concrete repair, by developing a modern and innovative product, the UNIFOR injector, which is easy to use, providing a quick, damage-free quality result.



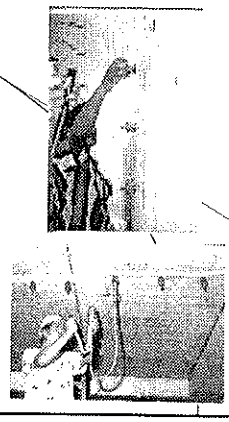
- *Creativity and innovation.*

- The UNIFOR INJECTOR has been designed and developed as an up-to-date solution for structural repair in the construction and building industries.
- **A simple solution** – the injector is small, lightweight, and easy to install.

  Ease of application – the injector is in two main parts. The base is detachable, and is fitted over the crack, preventing damage due to drilling.



- *Effectiveness.*
  - The resin is injected into the bulb, to a pre-determined level.
  - Under self-induced pressure, which is built up by the spring inside the bulb, the resin is steadily forced into the crack.
  - With this steady force of application, the resin is uniformly distributed through the crack.
  - The bulb is transparent; Allowing the applicator to see the resin going into the crack, and thereby is able to recharge the bulb with resin when required.



- *Impact on the Construction Industry.*
-
- The construction industry has had some doubts concerning the effectiveness of crack repair work in the past, due to uncertainties arising from the traditional "Drill and Fix" methods.
- We believe that the UNIFOR INJECTOR is the Best Solution.
- We have identified main problems as follows:

- **Problem 1**

  Damage to the product, by the traditional method of "Drill and Fix", where injectors were inserted into pre-drilled holes along the cracked surface of the concrete products.
-
- **Solution**
- The UNIFOR INJECTOR is simply pasted over the crack, *ELIMINATING* the need to damage the concrete by drilling.
-

- **Problem 2**
- Slow Inefficient Methods, traditionally carried out in several difficult steps,
- and new less effective methods by competitors.
-
- **Solution**
- The UNIFOR INJECTOR has simpler and more effective steps, as highlighted in the following comparisons:

UNIFOR Injector Solutions

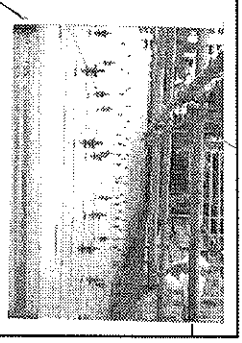
	Traditional Methods	The Solutions
1	**Drilling into concrete is time-consuming and potentially hazardous, and reinforcement may be encountered.**	The Injector is simply pasted over the crack very quickly and easily, and encountering reinforcement is not an issue.
2	**The resin injection needs to be controlled by the applicator, while watching a pressure gauge, ensuring the pressure is constantly maintained.**	The applicator simply views the progress of resin into the crack, through the transparent bulb.
3	**Pre-drilled holes require to be "patched back" with non-shrink grout, to return the concrete surface to it's original smooth state.**	The Injectors are simply scraped off the surface, which is then quickly and easily sanded back to it's smooth state.

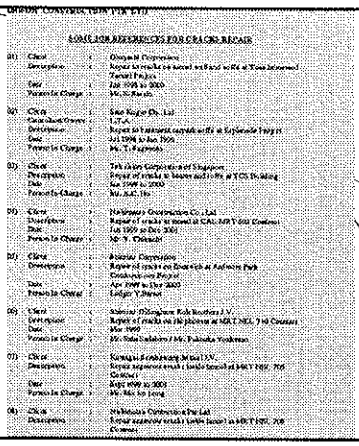
UNIFOR Injector Solutions

	Competitor Methods	The Solutions
1	**Pressure in the Injector container is initially set to zero, requiring a build up of pressure before the resin is able to penetrate the crack.**	The Injector is initially set to an pressure of ONE bar, thus giving the resin a head-start in penetrating cracks.
2	**There are no safety features to prevent the hose from detaching from the injector container, and causing the resin to spray out and injure the applicator.**	The UNIFOR system includes the specially designed clip-on safety nozzle, which is easily detachable to allow the applicator to continue working safely.

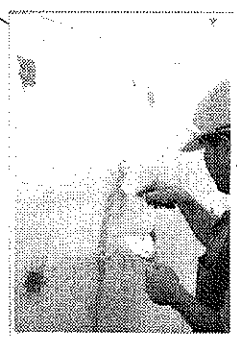
The Future of the UNIFOR Crack Injector

- *Pervasiveness*
-
- Since 1997, Unifor Construction Pte Ltd has increased it's share in the local concrete repair market by more than 300%.
- During which time, the construction industry has faced a marked downturn and extended recession period.
- Our repair projects, involving the use of the UNIFOR Injector, range from the private sector to public sector works, as listed on the following page.





- *Sustainability*
-
- Our Clients are now calling us back for repeat-business for our crack repair work.
- We are aware that our Clients are specifying our methods in their new contract requirements, as in the National Stadium in Kuching, Sarawak.
- We are now bidding new contracts overseas, including Bangladesh and Taiwan.
- We have also received expressions of interest from potential clients in China and Australia.



- *Best In Class*
-
- As a result of our early successes, we sought to establish our Company in the best way possible, and have already achieved ISO 9002 certification. We believe this will set the standards for other repair specialists to follow.

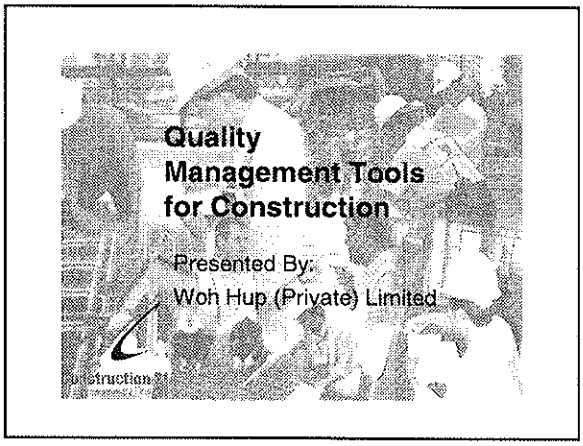


- We have received recommendations from very important clients, including the Land Transport Authority.

We are now looking to set our sights even higher.

The Beginning

Quality Management Tools for Improved Performance in Construction Projects



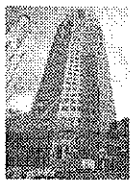
Introduction - The Company

The Company voluntarily embarked on the development and implementation of Quality Systems in the early 90's.

In 1994 they were awarded ISO 9002 certification in recognition of their efforts in demonstrating the managements capability (many companies followed thereafter).



Successful projects through unity and harmonious relationships.



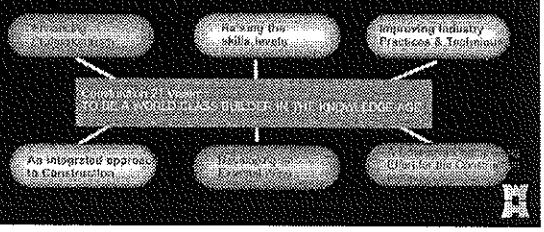




Introduction - Creativity & Innovations

In 1997, Woh Hup introduced 19 new management tools to enhance the effectiveness of its management system.

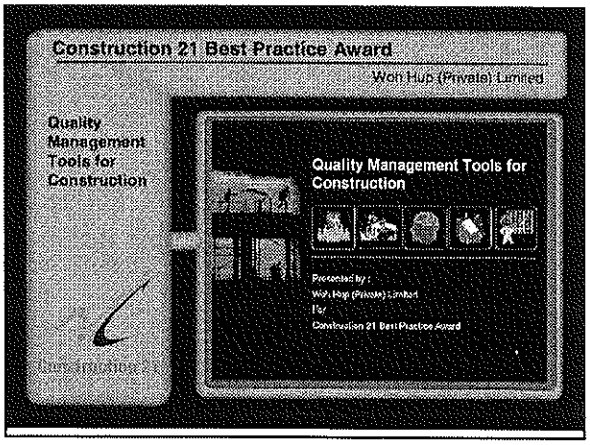
CONSTRUCTION 21: THE SIX STRATEGIC THRUSTS



Construction 21 Best Practice Award

Woh Hup (Private) Limited

Quality Management Tools for Construction



Management Review

Management reporting format is changed from to a quantitative analysis method with the introduction of *Key Performance Indicators.*

Safety:
'Reduction in average frequency and severity rate of accidents.'

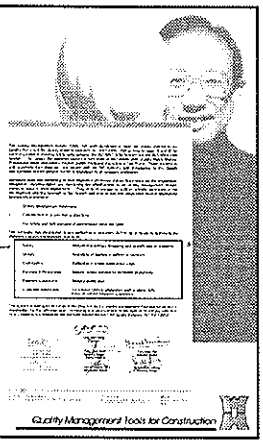
Quality:
'Reduction on number of defects at handover.'

Cost Control:
'Reduction of project construction costs.'

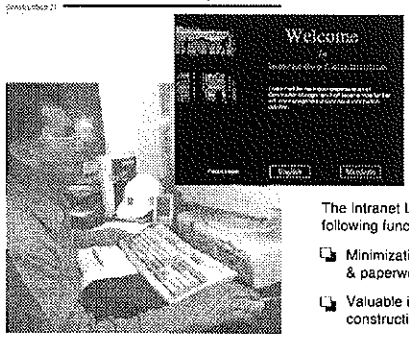
Planning & Productivity:
'Reduce project duration by increased productivity.'

Payment Collections:
'Reduce debtor days.'

Customer Satisfaction:
'Achieve client satisfaction of above 80%.'
(Based on Customer Satisfaction Questionnaire.)



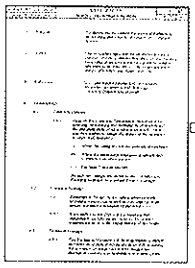
Intranet Library



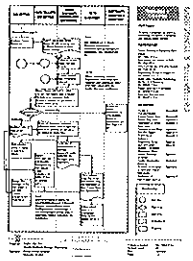
The Intranet Library provided the following functions.

- Minimization of administration & paperwork.
- Valuable information sharing for construction team.

Graphic & Pictorial Reference Materials



Previous Representation – Lengthy and Wordy



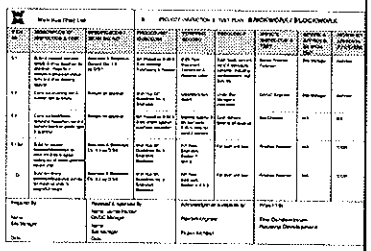
Current Representation – Flowchart Process

Old text based instructions were eliminated for a user friendly series of wall charts & flowcharts.

Quality Management Tools for Construction

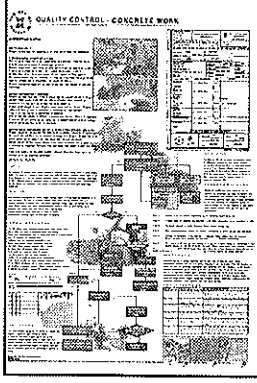
Inspection & Test Plans

- Integrates subcontractor/ main contractor and clients' rep. for checking of works.
- Establishes the following quality control elements.
  - *Acceptance Criteria.*
  - *Hold Points & Verification.*
  - *Frequency of Inspections.*
  - *Applicable Inspection Forms.*



Quality Management Tools for Construction

Company QC Guidelines

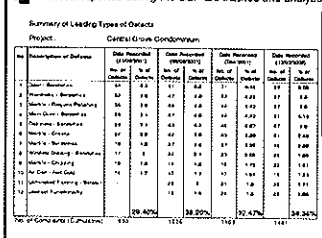


- Guidelines were prepared using CONQUAS Guidelines and years of previous experiences. These were posted on site walls and used to highlight minimum company standards.
- Establish the framework for the standard of workmanship required for the project.

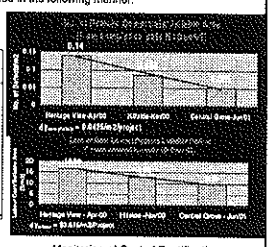
Quality Management Tools for Construction

Defects Management – Tracking System

- Defects reported during the DLP are tracked and analysed in the following manner.



Tracking the Trend, Type & Number of Defects.



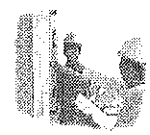
Monitoring of Cost of Rectification.

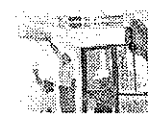
- By understanding the common trends of defects complaints from the end user, we can make provision for them during the design process.
- The lifecycle cost for the works can be more clearly defined during the tender procurement stage.

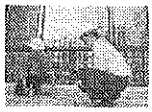
Quality Management Tools for Construction

Project QA/QC Appraisal

- Site appraisal system is used to control works within CONQUAS targets set by the QA/QC & site construction team.
- Site QA/QC engineers regularly track and assess the quality performance of he construction works.
- Any opportunities for improvement is discussed with the QA/QC and Site Managers.







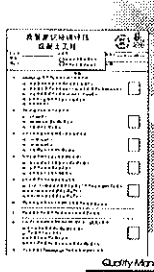
Quality Management Tools for Construction

Training

- Supervisors and foremen are given CONQUAS 21 training at CITI and supplier / Vendor product training is provided prior to starting an activity.
- In-house training is given by experienced construction staff.
  - *Quality Awareness.*
  - *CPMS System Implementation.*
  - *Best Practice of trade operations.*

Tests are in English and Mandarin are carried out on completion of the training and identification of training shown on the site helmet.







Quality Management Tools for Construction

Effectiveness "Substantial progress towards intended aims"

Safety:

- *Av. Frequency Rate for the projects is ~45% less than the National Average.*
- *Av. Severity Rate is 18% of the National Average.*



Quality:

- *No. of defects dropped by ~60%.*
- *Labour cost dropped by ~40%.*



Cost Control:

- *Project Cost has reduced by ~20%.*
- *Av. wastage of materials has decreased by ~40%.*



Effectiveness "Substantial progress towards intended aims"

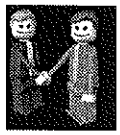
Planning & Productivity:

- *Productivity has improved by ~40%, resulting in the manpower usage to drop by ~35%.*



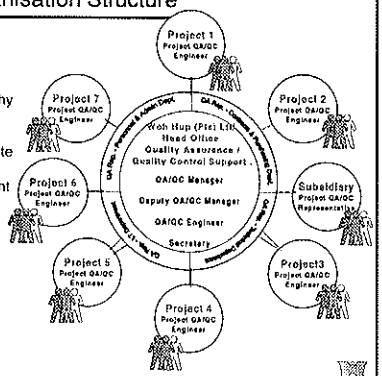
Client Satisfaction:

- *Almost half of our percentage turnover is from repeat business.*
- *Our customers have constantly scored us at an average score of 88%, which is 8% higher than the target score.*



QA/QC Organisation Structure

All the staff have embraced management's new philosophy and taken ownership of their respective responsibilities. Department QA Rep's and Site QA/QC Engineer's work together with the management to facilitate this initiative.

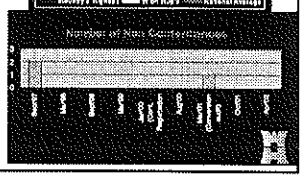


Achievements & Recognition

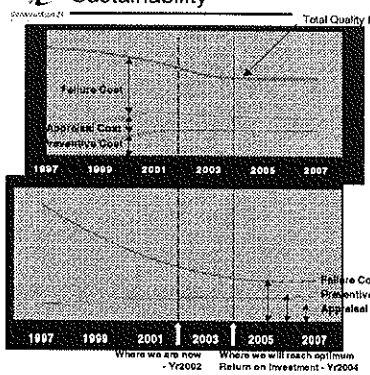
The implementation of the management tools have resulted in an improvement in the quality of works as noted by the high CONQUAS Scores achieved. This high quality has impacted positively on both the client and the end users.



The company has achieved zero nonconformities during the ISO 9000 audits over the last few years and is the first company to successfully convert over to the new ISO 9001 – 2000 standard under the BCA certification scheme.



Sustainability



- Return on investment will level out in Yr 2004.
- Company has set the cost as the benchmark for future investments.
- Company is embarking on R&D to move our initiative to the next level.

Thank You

hadden@wohhup.com

Developing a Corporate Export Culture for Expansion to Regional Markets

C21 Best Practice Awards (Merit) 2002

STRATEGY TRUST 5

Developing an External Wing

DP ARCHITECTS

MARCH 2002

C21 Best Practice Awards (Merit) 2002

HISTORY OF THE FIRM

- DP Architects established 1967
- Grew in tandem with independent Singapore
- All categories of buildings are in short supply
- Fast pace of national development spur firm's rapid growth

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INNOVATION AND CREATIVITY

- Specialization
- Marketing strategy
- Identify market niches
- Establish alliances
- Develop broad base track record

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SHOPPING CENTRES

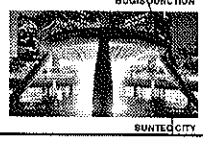

PEOPLE'S PARK COMPLEX


GOLDEN MILE COMPLEX


BUGIS JUNCTION


CENTURY SQUARE


FAR EAST SQUARE


SUNTEC CITY

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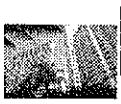
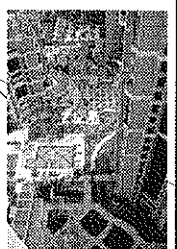
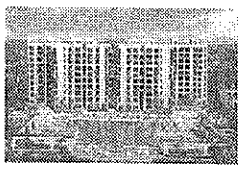
CONDOMINIUM HOUSING



RIDGEWOOD


PARC VISTA


THE BAYSHORE

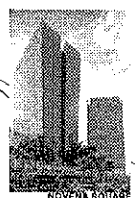

STERLING

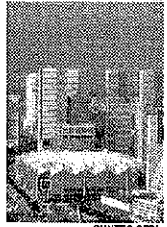
C21 Best Practice Awards (Merit) 2002

MAJOR PROJECTS

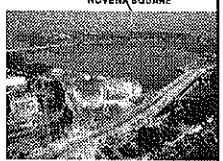

TAMPINES POLYTECHNIC


SAFTI MILITARY COLLEGE

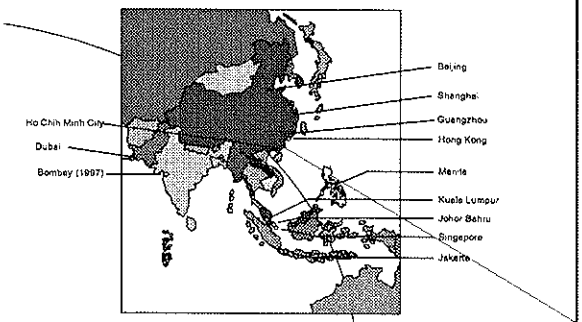

NOVENA SQUARE


SUNTEC CITY


PONTIAC MARINA

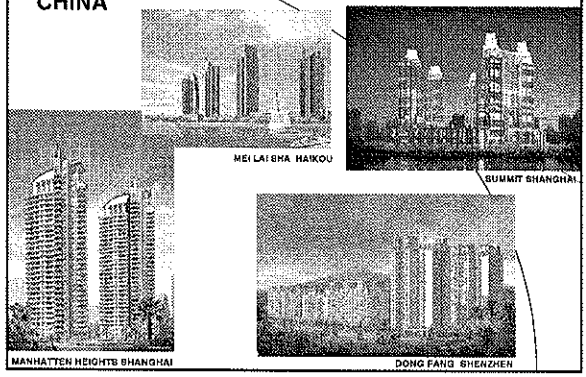

ESPLANADE – Theatres on the Bay

DPA's Overseas Projects



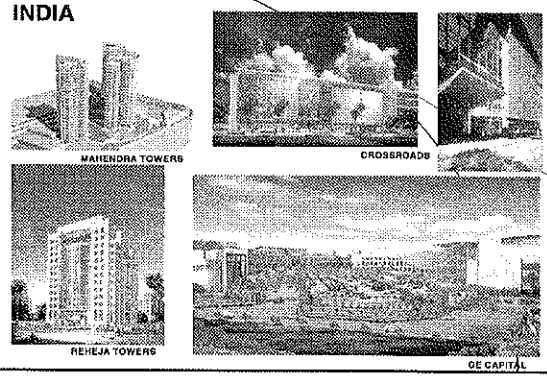
C21 Best Practice Awards (Merit) 2002

CHINA



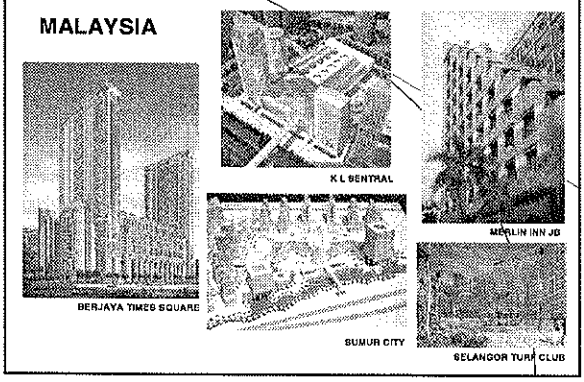
C21 Best Practice Awards (Merit) 2002

INDIA



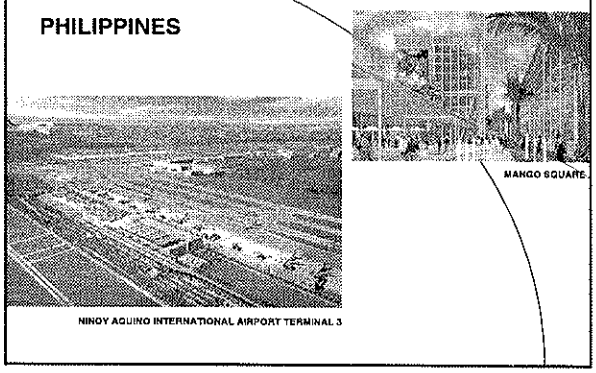
C21 Best Practice Awards (Merit) 2002

MALAYSIA



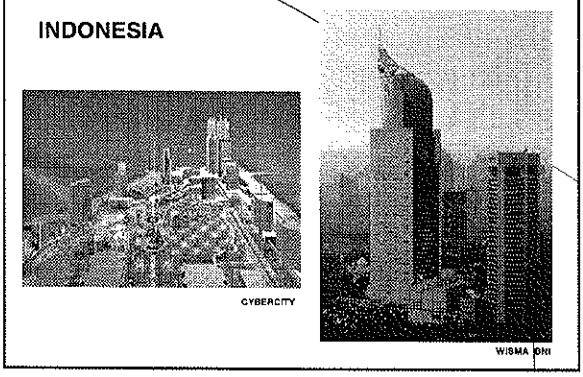
C21 Best Practice Awards (Merit) 2002

PHILIPPINES



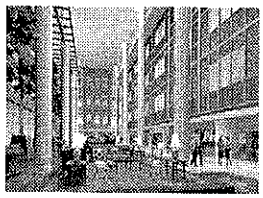
C21 Best Practice Awards (Merit) 2002

INDONESIA

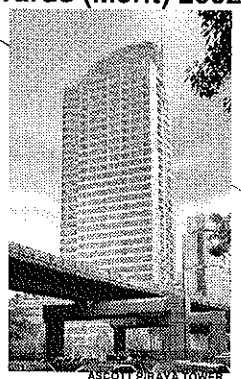


C21 Best Practice Awards (Merit) 2002

THAILAND



ASCOTT PIRAYA TOWER



ASCOTT PIRAYA TOWER

E

C21 Best Practice Awards (Merit) 2002

- IMPACT ON THE FIRM
  - Overseas projects enlarge our sphere of operation
  - Availability of many projects than locally available
  - Many more professionals and technicians have joined us
  - Our annual overseas income has increased
  - The fee earned last year was in excess of S$3 million
  - Anticipate greater future growth

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- ANNUAL OVERSEAS EARNINGS
  - 1997 $ 5.75 million
  - 1998 $ 3.75 million
  - 1999 $ 1.23 million
  - 2000 $ 1.67 million
  - 2001 $ 5.05 million
  - 1996 $ 5.95 million

C21 Best Practice Awards (Merit) 2002

CURRENT OVERSEAS PROJECTS

MALALYSIA	28
CHINA	20
HONG KONG	7
INDIA	11
PHILIPPINES	3
THAILAND	1
INDONESIA	8
Total	78

C21 Best Practice Awards (Merit) 2002

PERVASIVENESS

- Our expertise is highly sought after
- We have a good track record in a wide range of projects
- There are many repeat clients
- Requests from developers in new countries :-
  Bangladesh, Ho Chi Ming City, Myanmar, Korea, Taiwan, Japan
- Trend will continue

C21 Best Practice Awards (Merit) 2002

SUSTAINABILITY

- Overseas work is an integral part of firm's operation
- Have established alliances with overseas counterparts
- Have established working relationship with world class architects and consultants
- Ability to undertake any overseas project
- Have been requested by overseas clients to open firms in their countries with promise of more projects
- Overseas market is growing and is sustainable

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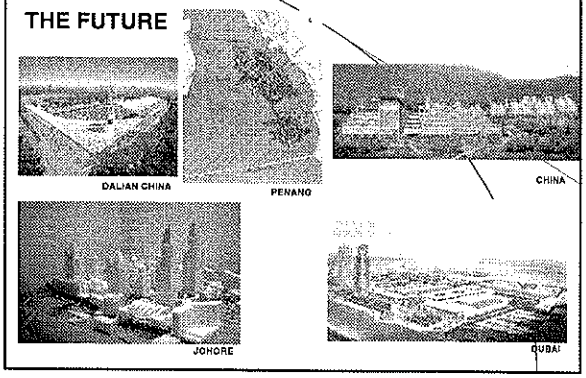
BEST OF ITS KIND

- Have done more projects in more countries than any Singapore firm
- Created strategic alliances for overseas projects
- Able to secure projects which are new to us
- Able to team up with world class architects

C21 Best Practice Awards (Merit) 2002

THE FUTURE



C21 Best Practice Awards (Merit) 2002

THANK YOU

Application of Precast & Prefabricated Solutions for Institutional Buildings

Seminar on
Best Practices for the Construction Industry 2002

Innovative Application of Precast/Prefabrication Technology and Promotion of Buildable Designs for Institutional Buildings

By Mr Kueh Lip Kuang
VP (C&S)
Airport Development Division

CPG Consultants Pte Ltd

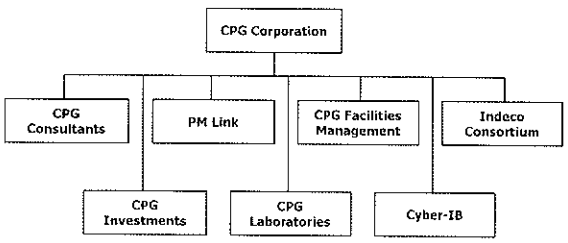
06 Sep 2002

Company Profile

CPG Corporation

- Formerly known as PWD Corporation
- Corporatised entity of the Singapore Public Works Department
- One of the leading development professionals in the Asian region
- Provides a full spectrum of infrastructure development services
- Contributed to the development and management of distinguished landmarks in Singapore since 1833

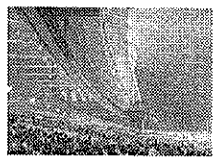
Company Profile



Company Profile

CPG Corporation

- Some of our notable projects:



Kranji Racecourse

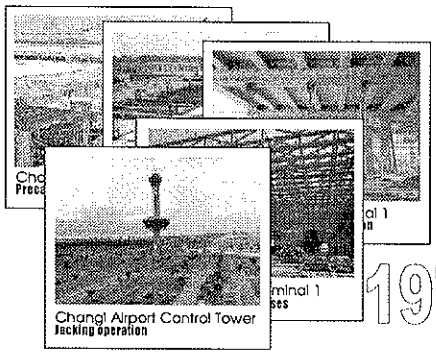
Creativity & Innovation

Creativity & Innovation

CPG Consultants

- leader in the region in designing and developing institutional buildings of diverse scale & nature
- pioneering precast/prefab technology for institutional buildings for more than 20 years
- achieving buildability & variety in design without compromising the identity & unique requirements of each project

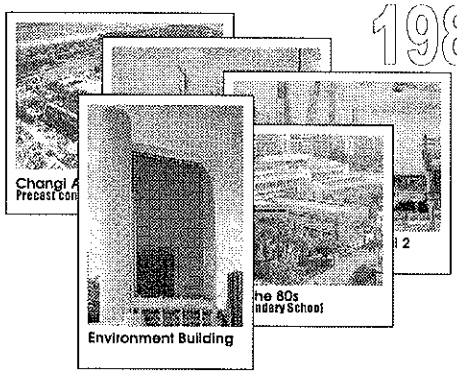
Creativity & Innovation



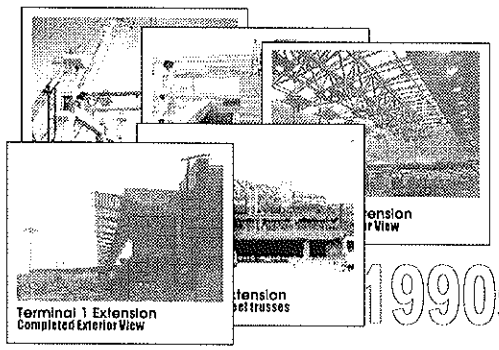
1970s

Creativity & Innovation

1980s

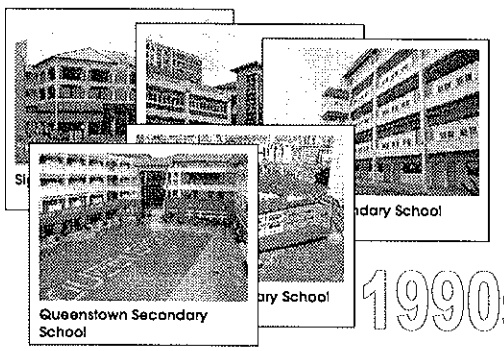


Creativity & Innovation



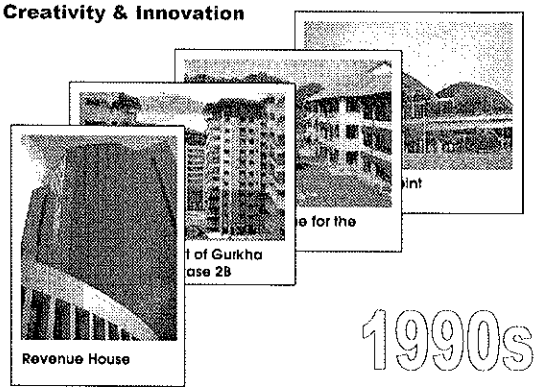
1990s

Creativity & Innovation



1990s

Creativity & Innovation



1990s

Creativity & Innovation

- Formed in-house Buildable Design Work Group in 1992
- Collaborating with CIDB/BCA on refinement of Buildable Design Appraisal System for its application to industry
- Systematic monitoring by senior management
- Intensive training programme for staff including overseas study trips

1990s

Effectiveness

Effectiveness

To achieve better buildability so as to improve productivity and reduce site labour without compromising aesthetic and functional requirements

Effectiveness

Buildability Score

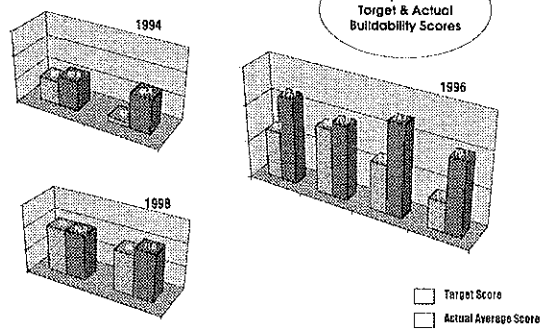
Buildable Design Work Group

- Establish prevailing BS for selected projects
- Recommend improvement areas and target BS

Senior Management Committee chaired by D(SSV) approve targets, monitor programs on regular basis

Effectiveness

Comparison of Target & Actual Buildability Scores



Impact & Significance

Impact on Industry

Positive Impact

- Contributing to overall construction buildability and productivity
- Upgrading of construction industry through mechanisation and application of precast/prefab technology
- Reducing usage of unskilled site labour
- Helping local contractors develop precast construction capability
- Generating demand for precast / prefab components due to large scale construction; hence more cost effective
- Facilitating standardised "off-the-shelf" precast components to be specified in designs/ drawings
- Contributing to neater and safer working environment
- Setting examples for private consultants

Impact on Industry

Addressing issues in C21 Report

- Improving labour efficiency and productivity through higher buildability
- Promoting industrialised method of construction leading to reduction site labour and amount of wet-work on site
- Bringing about cleaner and more orderly construction site
- Helping to make precast construction a cost-effective construction method due to large volume and better standardisation / modularization of building components
- Helping to change the image of construction industry from 3D industry to 3P industry

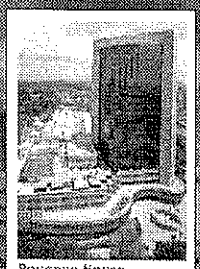
Pervasiveness

Pervasiveness

1977-1980
- Changi Airport Terminal 1
- Changi Airport Control Tower

1981-1990
- Changi Airport Terminal 2
- more than 40 schools
- Government HQ building

1991-2001
- more than 100 schools
- minor institutional buildings
- immigration checkpoints
- Terminal 2 Extension
- Terminal 1 Extension
- more government HQ buildings



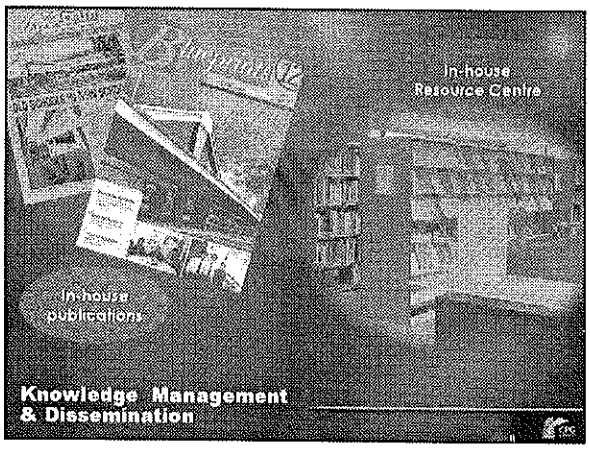
Revenue House

Pervasiveness

Staff Training

All levels
- all levels from professionals to drafting staff to site supervisors

Courses & Seminars
- precast design seminar & workshop in 1994
- overseas study trips to Finland, Germany and the Netherlands in 1995
- precast concrete design courses - CITI
- Buildable Design Appraisal workshop - CITI
- In-house technical sessions / briefings

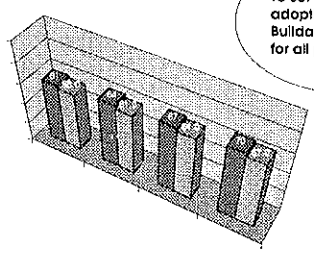


Knowledge Management & Dissemination

Pervasiveness

Future Plans

To set example by adopting higher Buildability Scores for all projects



Legislated Score
Target Score

Pervasiveness

Future Plans

Training

- Send more staff at all levels for relevant training
- More in-house learning seminars
- Engage renown experts to conduct specialized workshops & design reviews

Resource Centre

- Keep abreast with latest technology
- Post learning points from projects / best practice on Intranet

Pervasiveness

Benefits to External Parties

CAAS

- completion of terminal buildings within or ahead of time
- minimum disruption to operational efficiency during construction
- early revenue due to more aircraft parking stands, rental of shops etc.

MOE

- faster completion of schools
- alleviate acute need for schools under intensive schools building programme

Precasters

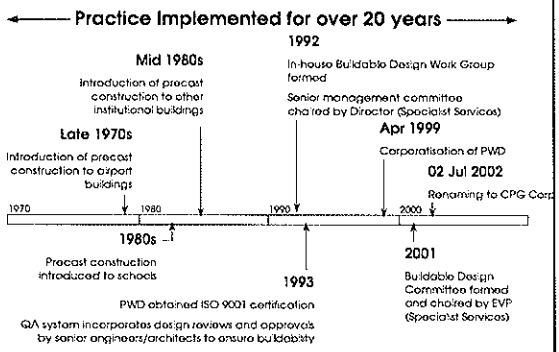
- economies of scale bringing about lower cost of precast components

Contractors

- development of precast construction capability
- less reliance on foreign labour

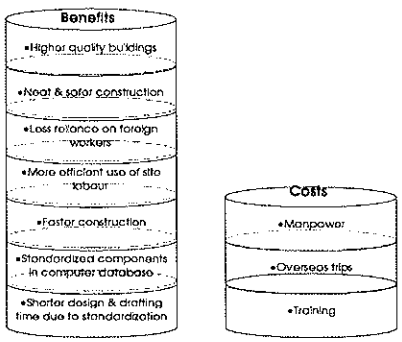
Sustainability

Sustainability



Sustainability

Costs / Benefits



Sustainability

Long Term Plans

- Adopt higher Buildability Score than legislated requirements for all projects
- Adopt learning as integral part of corporate culture;
- Conduct more in-house learning seminars
- Further develop the resource centre to keep contact with latest technology & innovation in buildable design & precast/prefab technology
- Post information on Intranet to be easily accessible by all staff
- Engage internationally renowned precast/prefab specialists to conduct in-house workshops
- Involve senior management to monitor buildability programmes

Best In Class

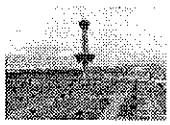
Best in Class

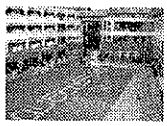
Comparison with Local / Overseas Organisations



Changi Airport Terminal 1 project in late 1970s set benchmark for the industry locally and regionally

Jacking up of pre-constructed 3-floor cabin of Changi Control Tower in late 1970s was most unique and outstanding locally and regionally

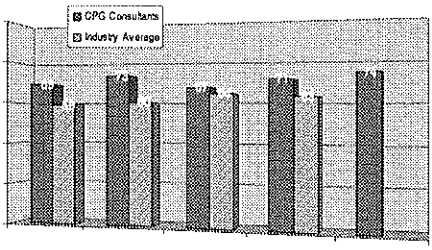




Practice implemented for School Projects in 1980s-1990s was the pioneer in this category of buildings locally and regionally

Best in Class

Comparison of **Average Buildability Score (for Institutional Category)** against industry average



Best in Class

Award Winning Projects

ISE Structural Achievement Award

- Changi Airport Terminal 2 Extension



Best in Class

Award Winning Projects

BCA/CIDB Best Buildable Design Award

- Tuas Checkpoint
- Revenue House
- Bukit Batok Home for the Aged
- Christalite Methodist Welfare Home
- Kranji Secondary School
- Changi Airport Terminal 2 Extension
- Admiralty Primary School
- Park View Primary School
- SengKang Primary School
- Siglap Secondary School
- Queenstown Secondary School
- North Spring Primary School
- Redevelopment of Gurkha Cantonment Phase 2B
- Changi Airport Terminal 1 Extension
- Poi Ching School
- Yusoff Ishak Secondary School
- West Wood Secondary School

Best in Class

SIA Design Award

- Senoko Fish Market
- MRT Engineering Laboratory at Kallang
- Kandang Kerbau Women's and Children's Hospital
- Tuas Checkpoint
- Changi Airport Terminal 2
- Fort Canning Centre
- Substation
- Jurong East Branch Library
- Environment Building
- Hon Sui Sen Memorial Library
- Civil Service Club

Award Winning Projects


Thank You

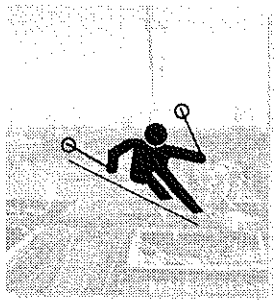
Integrated System for Order, Production and Logistics Management for the Ready-Mixed Concrete Industry

C21 Best Practice Awards (Merit) 2002

Multi-Channel Order Management, Production and Logistics System (MOPL)

RDC Holdings Pte Ltd

The Ready-Mixed Concrete Industry Outlook



- *Shrinking construction demand*
- *Intense competition among foreign and local players*
- *Foreign players buying up smaller players*
- *Deflated pricing*

RDC Holdings Pte Ltd

In the mind of a true industry leader ...

General Market Sentiment	Lateral thinking in RDC
• Downsizing	• Expansion
• M&A	• Partnership
• Price Leadership	• Productivity Leadership
• Competition Centric	• Collaborative Centric

RDC Holdings Pte Ltd

RMC Industry Revolution in the Making

Concrete OEM

What is it?

- *Adoption of 'Contract Manufacturing Concept' from the electronic industry.*
- *Aggregation of Production Domain to drive cost down and unearth productivity gain.*
- *Focus on Marketing and Sales function - leaner structure.*
- *Retain existing brand name.*
- *Centralized order fulfillment Maximise assets utilization.*

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COLLABORATION PARTNERS:

Concrete OEM

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Krygen Technologies

BuildNow

BREAKING NEW FRONTIERS

INDUSTRIAL INDEX

TMC

RDC.concrete

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RMC Industry Revolution in the Making

Concrete OEM

Key Success Factor

- ***Multi-Channel Order Management facility***
- ***Central scheduling of production***
- ***Central planning of delivery fulfillment***
- ***In short, we called it .....***

Multi-Channel Order Management, Production and Logistics System - *MOPL*

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Industry Practice

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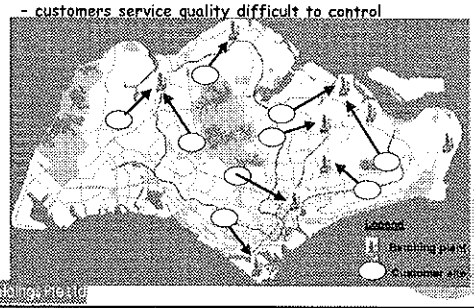
Decentralized Order Taking
- Customer calls directly to each plant to place order

Some drawbacks:
- difficult to optimize plant utilization
- unproductive man hours
- customers service quality difficult to control



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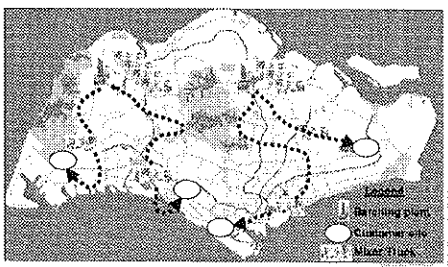
Decentralized Dispatching

Some drawbacks:
- difficult to optimize mixer trucks utilization
- delivery status are not monitored
- favoritism



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MOPL Operating Schema

The innovative way of Orders, Production and Logistics Fulfillment

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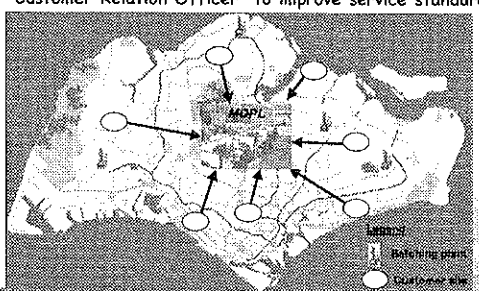
Call Centre: Central Order-Taker
- Centralized order-taking
- Receives all phone calls from customers (orders, enquiry's, complaints)
- "Customer Relation Officer" to improve service standard



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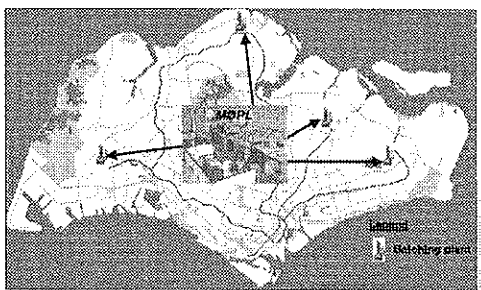
Call Centre: Central Order Scheduling
- Distribute orders to plants
- Load balancing to optimize plant utilization



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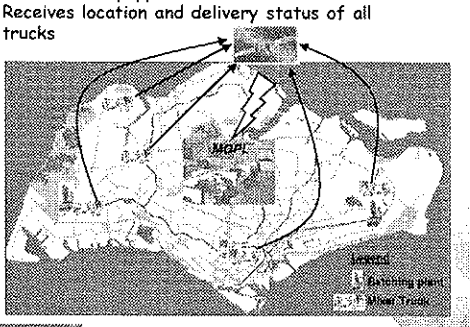
Call Centre - Central Truck Tracking

- GPS Truck Tracking System
- Each truck equipped with a in-vehicle unit
- Receives location and delivery status of all trucks



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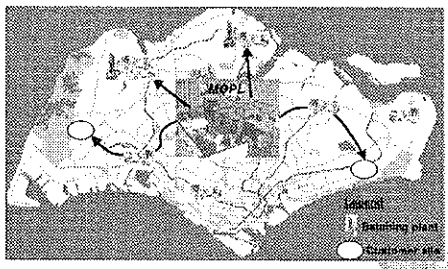
Call Centre: Central Dispatcher

- Dispatch orders to trucks and plants
- Redirect trucks to respective plants after unloading at customer site
- Manage truck productivity and drivers



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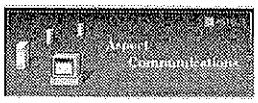
Technologies adopted for MOPL



· Computerized Call Distribution System

· Integrated ERP System for Ready-mixed Concrete Business

COMMAND Series™

GAP *· GPS/GSM Vehicle Tracking System*

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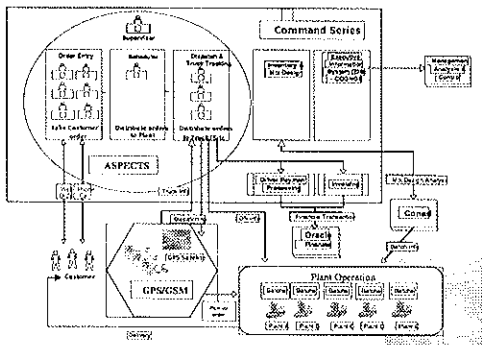
MOPL in a Nutshell



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The Revolution has begun ...

Can we export this concept?

Ideal solution for construction market facing high production cost.

These would be:

- •Hong Kong
- •Taiwan
- •Korea
- •Japan
- •Australia
- •USA

Scalability Potential in Concrete OEM Model

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Impact and Significance to the Industry

- **•Concrete OEM is serving 18% of market share with 12 plants**
- **•Simple Proportion of 70 plants for the whole industry.**
- **• Rationalization of approx. 30 plants.**

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Impact and Significance to the Industry

- **Less Truck**
- **Less Plants**
- **Less Environmental Impact**
- **Free up Land Space**
- **Technological Advancement**
- **Promote Professionalism**
- **Improve Customer Services**

MOPL - Another world class act from Singapore??

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Thank You

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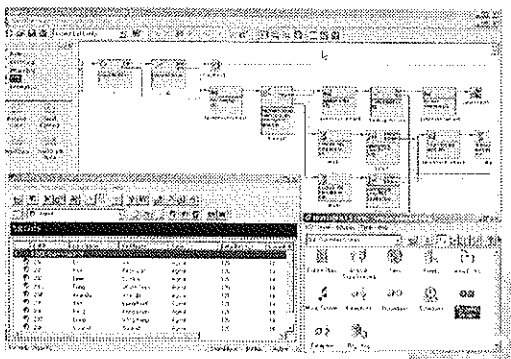

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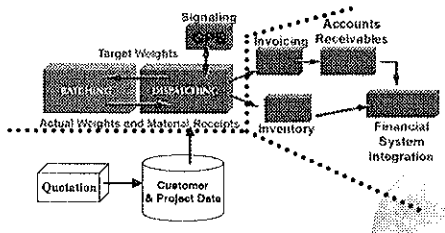
COMMAND series™



An Integrated ERP solution for the RMC business

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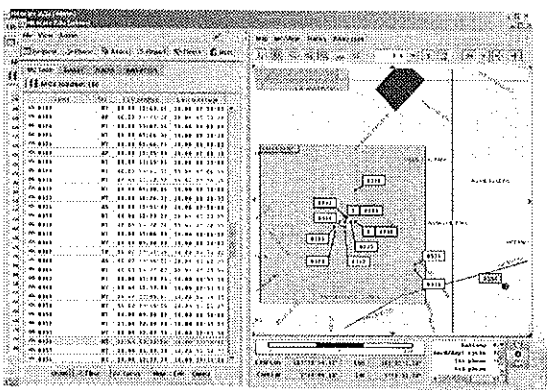

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