ECOSMART CONCRETE

By

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Unibeton Ready Mix

What is EcoSmart concrete

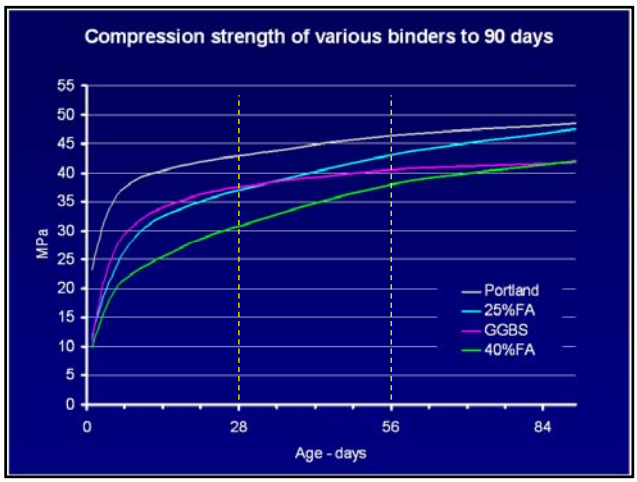
- Concrete with reduced CO^2 emission by using cement replacement
- Traditionally, the approach of EcoSmart is to use Fly Ash (from coal buring) to replace cement
- It is also possible to use other replacement (GGBS, silica fume) to reduce cement content
- Use of high strength concrete is also possible to reduce cement use

CONTENT

- Interest of EcoSmart concrete from a concrete producer point of view:
  - Advantage to use of Fly Ash vs GGBS
  - Problematic in handling Fly Ash
- Demonstration projects
  - Ferrari experience
  - Saadiyat Island Bridge
  - Other projects

READY MIX CONCRETE

- A concrete producer is selling strength and durability with other requirements:
  - Service
  - Cost (material + handling + storage)
  - Additional properties
    - Heat of hydration
    - Pumpability



FACTS

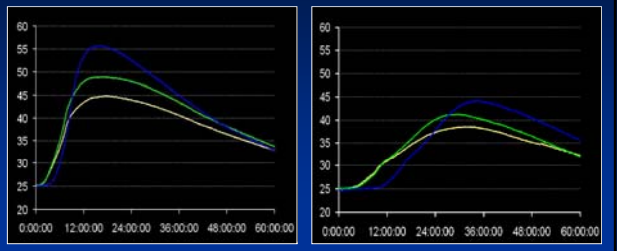
- FA (and GGBS) are not winning on the strength issue (better at 56 days)
- Why use it if not specified?
- Sometime it is needed for durability issue
- What to use?
  - Specification
  - Producer habit
  - Performance vs cost

Why Fly Ash

- Lots of GGBS is specified: not much choice
- When choice is possible, producer will go for “business as usual”
- What was Unibeton motivation to look into FA
  - Possible shortage of GGBS
  - Possible increase in GGBS price
  - Lower dosage of FA

Heat of Hydration tests on various binders

(350kg, 425kg and 500kg)



Portland group **GGBS group 65%**

Heat of Hydration tests on various binders
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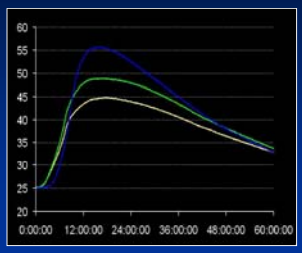

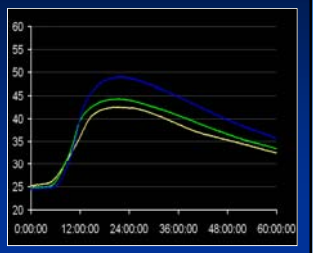

Portland group | Fly Ash group 25%

Heat of Hydration tests on various binders
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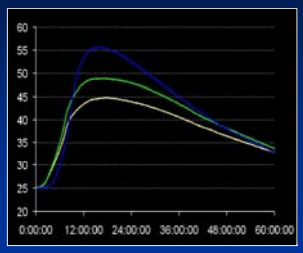

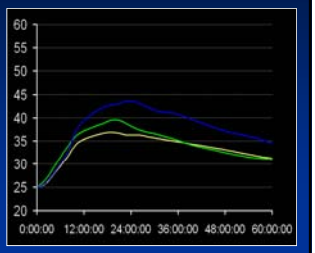

Portland group | Fly Ash group 40%

Heat of Hydration tests on various binders
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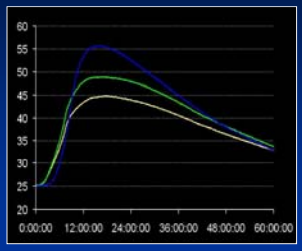

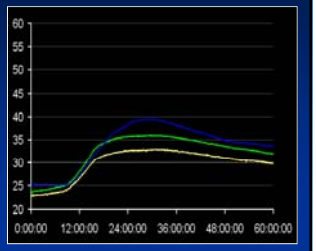

Portland group | Fly Ash group 55%

Heat of Hydration tests on various binders
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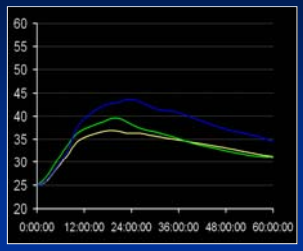
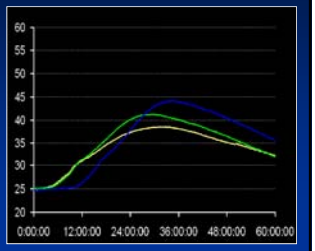
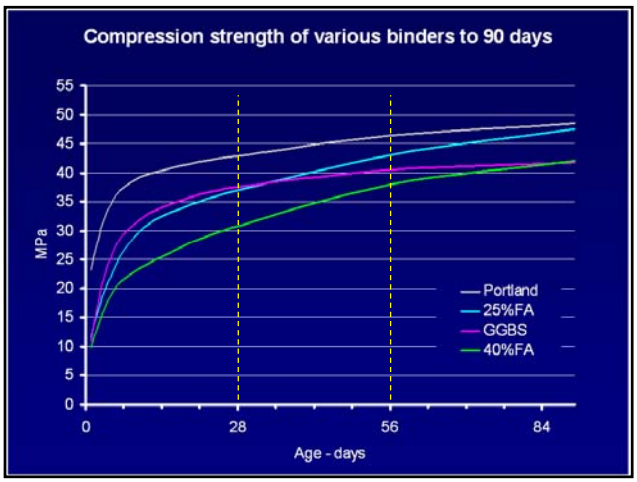




Fly Ash group 40% | GGBS group 65%

FACTS

- 40% FA seems equivalent to 65% GGBS in term of lowering the heat of hydration
- 65% GGBS is also more difficult to pump
- Since cost of FA is now less than GGBS, there seems to be all beneficial
- But…



FACTS

- The use of EcoSmart concrete requires
  - a cheep source of Fly Ash
  - a change in specification
  - a change in mentality

Demonstration projects

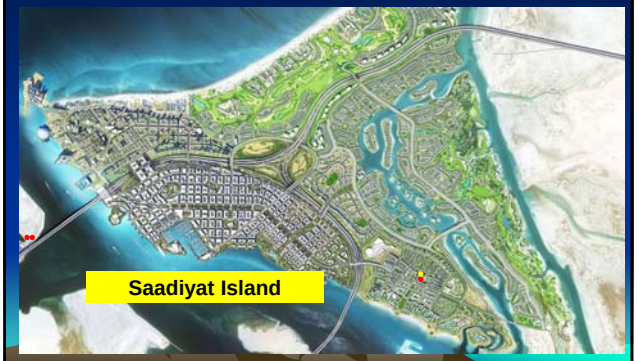
- The decision to change from GGBS to FA need careful analysis
- Specification plays a big part in the possibility
- Consultant attitude is as important
- Luckily, there is some open minded person who are ready to listen or at least to try

Ferrari experience

Ferrari Experience

- Driving forces:
  - Supply of raw material
  - Cost
  - Durability requirement
  - Heat of hydration
  - Approximately 40 000 m^3 produced
- Main problems:
  - Supply of Fly Ash

Saadiyat Infrastructure



Saadiyat Bridge

- Driving forces
  - Workability of approved mixtures (65% GGBS)
  - Early strength requirement
  - Pumpability requirement
- Main problems
  - Specification
  - Supply of Fly Ash

Landmark Tower

- Driving forces
  - 80N concrete to be pump to high floor
- Main problems
  - Cost increase

Conclusion

- More concrete can be Green if good (meaning easy to handle and cheep) fly ash would be available

Thank you!