

# EM Application for Concrete

# Effect of EM

- Powerful surface activity.
- Increase compressive strength 30-50 % more than ordinals.
- suppression of carbonation (neutralization).

# Study on compressive strength

- With 10 % EM ceramics shows 20 % more than control.
- With 5 % EM 1 shows 20 % more than control.
- With 5 % EM 3 shows 10 % more than control.
- With 5 % EM-X shows 20 % more than control.

(5% air content. )

From “Some properties of concrete mixed with effective microorganisms and the on-site investigation of the completed structures”, N. Sato, T. Higa, M. Shoya, and S. Sugita, )

# suppression of carbonation (neutralization)

- With 10% EM ceramics reduces 70 % than control.
- With 5% EM 1 reduces 70 % than control.
- With 5% EM 3 reduces 60 % than control.
- With 5% EM-X reduces 70 % than control.

(5% air content. )

From “Some properties of concrete mixed with effective microorganisms and the on-site investigation of the completed structures”, N. Sato, T. Higa, M. Shoya, and S. Sugita, )

## Other Benefits

- EM controls harmful chemicals, microbes, fungi, mites for human through biological process.
- EM controls oxidation activity by wild microbes, therefore, controls oxidation of iron and concrete.
- EM controls termite activity by biological process.

# On-site inspection

- 16 concrete buildings under 2-10 years age were inspected in Japan and Thailand.
- 10 % stronger than same age concrete, and more tightness.
- Less drying-shrinkage crack.

From “Some properties of concrete mixed with effective microorganisms and the on-site investigation of the completed structures”, N. Sato, T. Higa, M. Shoya, and S. Sugita, )

# Basic Treatment for House Building

- Ground (soil) treatment.
- Concrete treatment.
- Paint treatment.
- Adhesive (glue) treatment.
- Wood treatment.
- Ceramic (brick) treatment.

# Cost of EM

For 1 cubic meter of Fresh Concrete.....

- EM1 and 3: 8L (with 150-160 L of water)
- EM-X: 8L
- EM-X Ceramics: 2 – 100 kg

For 1 square meter of ground....

- EM1 and 3: 500 mL
- EM-X Ceramics: 500 g
- EM treated wood charcoal: 100-150 kg



# Same application to....

- Swimming pools
- Car parks
- Private concrete roads
- Ships
- Log Houses
- Animal Sheds

# Actual Work Photo

- Private house in Naha City, Japan (2002)



# Ground Treatment

- Spray EM1, 3 and EM-X Ceramics powder.



# Concrete Treatment

- Mix EM1,3 and EM-X, EM-X Ceramics powder with fresh concrete.
- Mixing period is around 1 minute.



# Setting the Concrete





# Results of on-site check

- Compressive strength is 21 N/mm<sup>2</sup>.
- Slump is 18 ± 2.5 cm
- Air content is 4.5 ± 1.5 %

All of the above cleared the Japanese Industry Standard. (JIS)



# Examples of EM-made Buildings



Tropical Plants Resources Research Institute



Kagawa Child Center

# Thanks all

For more information, see the  
attached papers.....

(APNAN Data Base No. 511, 1165, 1168, 1169, 1188)