GREATEST ENGINES MADE ANYWHERE

Environmental Module: Process Design & Improvement
Worldwide Manufacturing

GLOBAL ENGINE Manufacturing Alliance

North America

Capacity

1st Module
Sept. 2005
420 k

2nd Module
Oct. 2006
420 k

840 k Total

Customer

Korea

Capacity

1st Module
March 2004
300 k

2nd Module
Oct. 2006
300 k

Customer

HMC

Japan

Capacity

Sept 2005
340 k

Customer

MMC
LEADERSHIP ENVIRONMENTAL POLICY COMMITMENT STATEMENT

We, the leaders of Global Engine Manufacturing Alliance (GEMA) are committed to environmental stewardship – an approach to the earth and its resources that requires us to engage in careful and responsible management of our activities, products, services and impact on our surrounding community. We, GEMA employees and partners, will work as a team to successfully integrate environmental considerations into our business metrics of Safety, Quality, Delivery, Cost, Morale and Environment.

Just as there is interdependency and balance in our natural world, there is interdependency and balance needed within the cycle of 4-stroke engine. The GEMA team will run like an engine, and produce an efficient environmental program that embodies the key aspects of GEMA’s 4-S.T.R.O.K.E. environmental policy, which will be,

- For Setting and reviewing environmental goals and targets
- For Tackling plant waste streams
- For Responsibility through continual improvement
- For Obeying relevant environmental regulations
- For Knowledge of processes to implement pollution prevention
- For Everybody!

We believe that in order to achieve our environmental goals, our environmental policy must be supported by seven environmental principles:

1. **Environmental Management**: We pledge to integrate an effective environmental management system that will serve as a model for future plants.
2. **Employee training and awareness**: We pledge to train our employees to enhance environmental awareness in order to move towards an environmental mindset in all employees.
3. **Environmental Compliance**: We pledge to achieve compliance with all relevant environmental regulations and other environmental requirements.
4. **Community outreach and education/Environmental Justice**: We pledge to build a relationship and trust with our surrounding community through transparency and involvement.
5. **Sustainable business and practices**: We pledge to consider the environmental impacts in the total life-cycle of our product. We will work towards using our resources – materials, time, energy – in a sustainable manner.
6. **Environmental Accounting**: We will work to develop a system that can characterize and quantify our achievements and savings in our environmental program. We will set environmental metrics and work to meet them.
7. **Pollution Prevention**: We pledge to engage in waste minimization techniques in our business practices.

Bruce Coventry
President

Bruce Baumbach
Plant Manager

Mark Dunning
Sr. Manager, Human Resources

Hirohsa Shintoku
Sr. Manager, Manufacturing Engineering
How do you become a GREEN & Sustainable plant?

• Develop commitment
• Benchmark the best
• Analyze the cost vs. benefits of all ideas
• Build sustainable processes
• **Waterless Urinals**
  – Operational Costs (cost of cartridges)
  – Not enough volume use
  – Lack needed amount of dilution for sewer water

• **Wind Energy**
  – High capital cost (tower, monitoring instrumentation)
  – Cost for stand-by power
  – Low wind power class (Dundee – wind class of 2)

• **Geo-thermal heating**
  – Not analyzed

• **Re-use of treated industrial waste for process water and irrigation**
  – Brief discussion to see if GEMA could own their own ultra filter. However, the decision was made to use the village of Dundee to treat our material.
• Capturing rainwater from the roof for irrigation, flushing toilets, watering plants, etc.
  – The initial design package for the site was extremely limited as it relates to irrigation. If the pond had been utilized for irrigation, the design would have been different resulting in a detention pond.

• Solar Panel
  – This was not considered. Ruled out quickly due to slow payback for a premium investment.

• Occupancy Sensor Studies
  – This was not pursued because the installation cost of motion sensors outweighs the savings and did not yield the payback the corporation requires. Also, this is partially redundant because we have a computerized lighting system.

• Green Roof (next)
  – This was considered but required costly structural support and was cost inhibitive.
• What is a process?

• What does process have to do with waste generation?
The 7 Wastes

- Waste of Motion
- Waste of Over Production
- Waste of Inventory
- Waste of Transportation
- Waste of Over Processing
- Waste of Waiting
- Waste of Product Defects
- SOLID WASTE!!
Various GEMA Waste Streams
• Most companies still send their trash to the landfill.....
Disposal Methods - Hierarchy

• Reduce: amount of toxicity of trash
• Re-use: containers, repair broken items
• Recovery
  – Recycling
  – Composting
  – Energy Recovery
• Disposal

Source: http://www.epa.gov/msw/reduce.htm

Note: Article – 3 R Handout
Common waste streams in Engine Plant

– Coolant
– Used Oil
– Scrap Metal
– Used Absorbents
– Filter Paper
– Medical Waste
– Aerosol Cans
– Metal and Plastic Drums
– Solvents, other chemical wastes
– Paper
How GEMA reached zero waste to landfill?

- Developing a cost benefit analysis
- Plant audit BEFORE full production commenced
- Developing a waste stream map
- Getting the resources
- Selling “the product” & getting buy-in
- Implementation (putting in the process)
- Feedback
- Creating the baseline
- Establishing metrics ($)
- Reviewing the process
- Continuous Improvement