2008 Council of Developing Industry Leaders

March 10th
NRMCA Board of Directors

Managing Returned Concrete

2008 Council of Developing Group
Technical Group Members

- Brannon McGiboney, Cemex, North Carolina
- Douglas Shaffer, Crider & Shockey, Inc., Virginia
- Michael Wagy, Glacier Northwest Inc., Washington
- Lisa Weaver, Ernst Concrete, Ohio
- Brad Zoelle, Systech, Inc., Illinois

Returned Concrete

- Reasons for returned concrete
- Average volume
- Cost vs. profit center
ORMCA Survey Results

What is the average volume of returned concrete at your concrete plants as a percentage of production on an annual basis (choose one):

1. 1 – 3%
2. 3 – 5%
3. 5 – 10%
4. Do not know

ORMCA Survey Results

Ranked Results

<table>
<thead>
<tr>
<th>Points</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>1. Wash out pits</td>
</tr>
<tr>
<td>38</td>
<td>2. Blocks or other products</td>
</tr>
<tr>
<td>26</td>
<td>3. Rebate with or without hydration control</td>
</tr>
<tr>
<td></td>
<td>admixtures</td>
</tr>
<tr>
<td>26</td>
<td>5. Crush hardened returned concrete and resell for use</td>
</tr>
<tr>
<td>13</td>
<td>4. Use of reclaimers and subsequently recycle solids and water</td>
</tr>
</tbody>
</table>
ORMCA Survey Results

Which of these options is most commonly used by your company to manage returned concrete (choose one)

1. Dispose to landfill
2. Sale for other uses
3. Give away for other uses (no net revenue)
4. Reuse in production

ORMCA Survey Results

The processes used by your company to manage returned concrete result in a net loss to the bottom line (choose one)

1. Yes
2. No
Economic Evaluation

- Wash out pits
- Supplementary Customers
- Alternative Uses
- Crushing
- Concrete block production
- Re-batching
- Reclaimers

Wash Out Pits

- Typical
- Clarified water
  - Batch water
  - Wash down trucks
  - Dust control
- Costs
  - Water treatment for discharge
  - Disposal of settled solids
  - System Management
Supplementary Customers

- Residential Construction
- Electrical Contractors for fill material
- Utility Contractors for thrust blocks
- Precast Manufacturing precast products
- Landscaping Companies water features Manufacturing or Mill Companies SOG
- Block Producers, Ecology blocks

Alternative Uses

- Road Base Material
- Bedding or fill material
- Landscaping
- Non Structural Concrete
- Ecology Blocks
- Architectural Blocks
- Retaining Walls
- Stepping Stones
Crushing Returned Concrete

Crushing
Crushing

- Owning vs. contract crushing
- Primary markets
  - Base material for parking lots & roads
- Crushed Concrete Aggregates (CCA)
  - NRMCA report findings
- Overall goal:
  - Mitigate costs
  - Convert costs to profits

Crushing – Market Specific Considerations

- Do you have a market for crushed concrete?
  - Proximity to quarry locations – price of VA
  - Local competition in crushed concrete
  - Market conditions
- Do you have space for crushed material?
  - Determine where there is real estate for crushed product
  - Should you consider a portable crusher
  - Will trucks need to be re-routed to dump returned
- What labor & equipment will you require?
  - Excavator, conveyer, hammer, loader, dedicated employees, etc.
- What is your average % of returned concrete?
  - Type of work and mix requirements comprise most of your business

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Crushing – Economic Evaluation

### Revenues
- Average Price per ton: $6.00

### Cost

<table>
<thead>
<tr>
<th>Cost</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Expenditures</td>
<td></td>
</tr>
<tr>
<td>Crusher</td>
<td>$400,000.00</td>
</tr>
<tr>
<td>Conveyor</td>
<td>$30,000.00</td>
</tr>
<tr>
<td>Used Excavator</td>
<td>$100,000.00</td>
</tr>
<tr>
<td>Hammer</td>
<td>$50,000.00</td>
</tr>
<tr>
<td>Depreciation (10 yrs)</td>
<td>$58,000.00</td>
</tr>
<tr>
<td>Employees</td>
<td></td>
</tr>
<tr>
<td>one prep</td>
<td>$18,000.00</td>
</tr>
<tr>
<td>one loading</td>
<td>$18,000.00</td>
</tr>
<tr>
<td>Maintenance Costs</td>
<td>$15,000.00</td>
</tr>
<tr>
<td>Fuel to run crusher</td>
<td>$20,000.00</td>
</tr>
<tr>
<td>Marketing</td>
<td>$-</td>
</tr>
<tr>
<td><strong>Annualized total Costs</strong></td>
<td><strong>$129,000.00</strong></td>
</tr>
</tbody>
</table>

Crushing – Economic Evaluation

### Breakeven Analysis

<table>
<thead>
<tr>
<th>Breakeven Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Cost</td>
</tr>
<tr>
<td>Price</td>
</tr>
<tr>
<td>Breakeven (tons)</td>
</tr>
<tr>
<td>Returned Concrete</td>
</tr>
<tr>
<td>Breakeven (tons)</td>
</tr>
<tr>
<td>Breakeven (vds concrete)</td>
</tr>
<tr>
<td>Minimum Yardage</td>
</tr>
<tr>
<td>% of returned that is crushed</td>
</tr>
<tr>
<td>Minimum Yardage Required</td>
</tr>
</tbody>
</table>
Crushing – Economic Evaluation

- Contract crushing evaluation
  - Minimums required (space limitations)
  - Cost $4 per ton
- Cost avoidance
  - Ex. Average haul cost $80 per load
- Green advantage
  - Green marketing
  - LEED credits
TRASS® System

Process of recycling

- Supply of raw materials (Crushed concrete)

  Supplying 4 m³ (≈ 50 tons) crushed concrete per batch

Raw materials

Receiving hopper

Pick up foreign object
Outline

- Fragmented concrete (> 40mm)
  - Roughly crushing by jaw crusher or impact crusher
- Crushed concrete (< 40mm)
  - Raw materials for TRASS (Recycling for high quality)
  - Products of TRASS
    - High quality recycled aggregate (5-20mm, 5-25mm, etc.)
  - By-products
    - Recycled for fine aggregate (< 5mm)
    - Under examination
  - By screw-grinding action (using Twin Corr) and sieving

Features of the system

1. Grinding by screw action

Raw materials (crushed concrete < 40mm) grind each other and surface mortar is removed without further crushing.

- Raw materials are roughly ground when passing through between the screws and the casing
- Surface mortar is removed by frequent contacts and attrition of densely packed raw materials
Reused Concrete with Chemicals

Hydration Control Admixture

- The admixture does not make the concrete new or fresh again.
- The admixture is a hydration stabilizer.
- The admixture stops the chemical reaction from occurring.
- When the effect of the admixture wears off, the concrete starts again where it ended the hydration process.
Guidelines For Hydration Control Admixture

The following is a list of guidelines to ensure that the admixture is used for optimum performance.

- Utilize admixture on residential projects, unless specifically approved by Technical Service Manager.
- Returned concrete must be like in aggregate size and geological origin.
- Returned concrete strength shall be equal to or greater than intended ticketed strength, and within 1000 psi.
- Contact Technical Manager if returned concrete is 2½ hours old or has a temperature in excess of 95 F.
- The Failsafe Rule: “IF IN DOUBT, DUMP IT OUT”

Cost For Hydration Control Admixture

- Avg. Cost Admixture per Yard $1.00 to 3.00
- Cost savings
  - Reduced wash out
  - Disposal costs
Process for Managing

**Revolved Concrete Reclamation Program**

Keeping in mind the promont solution by weighing each intervention.

1. Temperature of returned concrete: 83°F
2. Age of returned concrete: 24h
   - Age of concrete too great. Do not reuse.
3. Portland cement content (per cubic yards): 416 lb/yd³
4. Quantity of concrete returned: 2.88 yd³
5. Reused dosage rate for this load: DO NOT REUSE

Date: Friday, September 07, 2007
State: SGEC
Requested date: 12/18/99
Returned date: 12/12/07
Reason for Request: 12/17/99
Reason for Rejected:

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Reclaimer Rationale

Scenario

- Compare reclaimed aggregate value to cost of reclaimer operation.
- The assumption will be that it will take a net positive value to justify a reclaimer.
- Returned concrete average per truck will be based on 1 yd/day per truck.
- 3,000 lbs of reclaimed aggregate per cu/yd
- $8.00 / ton value of reclaimed aggregate
- 4 hrs / day to maintain reclaimer operation.
- Estimated average reclaimer purchase $100,000
Annual Reclaimer operation, net value

- Reclaimer operation cost = $23,800
- Return aggregate value w/ 7 truck fleet = $21,840
- Return aggregate value w/ 10 truck fleet = $31,200
- Return aggregate value w/ 15 truck fleet = $46,800

- Net value with 7 truck fleet = $-1,960
- Net value with 10 truck fleet = $9,360
- Net value with 15 truck fleet = $23,000

Reclaimer Conclusions

- Based on stand alone analysis a reclaimer will self justify in a fleet of 10 trucks or more.
- A more reasonable return on investment can be realized with a fleet of 15 trucks @ close to 4 years.
- If waste concrete removal is a high cost item in a plant’s daily activities, a reclaimer could be justified at a much lower number of trucks, depending on the costs.
- Environmental, governmental or local regulations may require the use of a reclaimer to help comply with other aesthetic or waste removal restrictions.
Concrete “Products”

Blocks
Blocks

- Capital expenditures
  - Mold 2’x2’x4’ - $500 each
  - Liners - $250 to $450 – 500 uses
  - Form release - $50 for 5 gallon bucket or alternative low cost

- Set up, pour, breakdown – 1 hour
- Load and ship – 10 blocks - $80/hr per truck (driver, maintenance)
- 15 minutes per truck to unload concrete to block.

- Revenues
  - Average block price -- $35.00

- No cost for returned concrete
Marketing Blocks

ERNST CONCRETE OFFERS

2 X 2 X 6
Concrete Blocks
Weight Approx. 3500 lbs.

Many applications
• Retaining Walls
• Storage Buildings
• Bin Storage
• Available at all Ernst locations

Quantity Discounts
Call Wendell for pricing and arrange pick up of blocks.
Free Loading
Ask About Delivery
Wendell 513-383-0069

Conclusions