# A unique cement and fly ash supply system for the Changuinola I project in Panama

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### Changuinola I Hydro electrical project

- ) Large RCC dam (860,000 m<sup>3</sup>)
- 2) Headrace tunnel (4,2 km)
- 3) Main powerhouse (205 mW)
  - Mini hydro (9 mW)

4)

5) Project roads, bridges, etc.

### 260.000 tons of cement and fly ash required

- Quality of local pozzolans not suitable
- Only one road (in poor condition) to the rest of the country
- Round trip to closest cement plant by bulk trucks is 3 days!!!
- Small port available close to project

#### SUPPLY OF CEMENT AND FLY ASH BY SEA



Poor infrastructure



Port of Almirante







### Flow sheet seaborne cement and fly ash supply system



- Key factor is shipping distance ۲
- Shipping distance determines ship size ۲
- Ship size determines required storage facilities in loading and discharge port and required loading and discharge capacities.



Spreadsheet business model of complete supply system calculating full logistics and economics

- Basis is concrete placement schedule and from there the whole system is calculated backwards to cement and fly ash suppliers
- Calculates all logistical factors as well as operating and capital costs
- Calculation of many scenarios possible as well as different storage and equipment options



**Conventional Concrete Plant** With Adjacent Bulk Storage

**RCC** Plant With Adjacent Bulk Storage

### Cement and fly ash supply



Cement loading in Port Everglades

- Suitable fly ash available in USA
- Cement situation more complex
  - Shortage situation in Panama (high prices, quality issues)
  - Nationalisation of cement industry in Venezuela cutting off large supply base to the Caribbean
  - But: Economical crisis in 2008 creating oversupply situation of cement in Florida.



Cement plant just north of Miami with large finished product silos enabling direct deliveries to the ship.



Fly ash loading in Tampa



- Supply contracts for cement and fly ash contained special conditions in respect to logistics
  - Sufficient stock obligation use of general port for ship loading
  - Scheduling obligations
  - Receiving capabilities of ships



Fly ash supplier did not have sufficient buffer storage at plant and needed additional silo capacity in the port of Tampa



## Shipping

- 2 Self discharging vessels taken in time charter
  - One for the full concrete placement period (16 months)
  - One for the peak placement period (9 months)
- Vessel characteristics
  - Cargo capacity approx. 7.500 tons
  - Loading time 48 hours
  - Discharge time 30 hours
- Roundtrip time to Florida is 14 days (at reduced speed)
- Charter party agreement
  - Based on BIMCO uniform time charter
  - Additional conditions
  - Loading and discharge conditions (must match with supplier and receiver agreements and capabilities)
  - Vessel to comply with US regulations!
  - Various issues regarding trading in Caribbean











### Floating terminal near project site







- Barge Lavioletta (1961)
  - 23.000 tons cargo capacity
  - 5 holds
  - Draft 8,6 m
- Purchased in Canada, towed to Limon, Costa Rica and converted there into a floating terminal.
- Conversion work into a floating terminal
  - Repairs and modifications to vessel
  - Cement, fly ash, air, fuel, water and waste water pipeline systems
  - New gantry with pneumatic ship unloader (180 tph)
  - New generator set and electrical system
  - Installation of spud poles
- The Lavioletta can be fixed in position close to the shore by its spud poles and does not need any port facilities
- The floating pipeline allows for conveying of cement and fly ash to shore and supply of the barge with fuel, water and (emergency) power







## Cement and fly ash supply operations

























#### **Operations management**

- Scheduling of ships and terminal operations
- Coordination of all logistical activities (supply, port operations, shipping, terminal, road transport)
- Focus on cost savings



#### Operations management business model

	Inputs		Outputs
•	Concrete placement forecasts	•	Terminal operations scheduling
•	Trucks loaded at terminal	•	Ship scheduling
•	Silo and floating terminal hold levels	•	Stock situation
•	Silo levels at concrete plants	•	Internal invoicing
•	Terminal operating values	•	Cost overview and projections
•	Ships positions and tank levels	•	Cost per tonne calculation
•	Ship loading information	•	Cash flow projection
•	Payments	•	Day-to-day historical overview
		ĸ	ROW LLC

## Conclusion

The key feature of the unique cement and fly ash supply system for the Changuinola I project in Panama was the floating terminal Lavioletta.

- Provided the capability to have an overseas cement and fly ash supply
  - Resolved road infra structure limitation
  - Allowed more competitive sourcing of cement and fly ash
  - Allowed for more supply choice in respect to quality and types of material
- 260.000 tons of cement and fly ash handled
  - Required peak rate of 30.000 tons per month achieved
  - Maximum achieved daily throughput 1.650 tons (56 trucks)
  - Uninterrupted supply of cement and fly ash to the project

## THANK YOU FOR YOUR ATTENTION



