
Challenges – Jorge Quijano


Opportunities – Anders Jensen


Expansions – Bill Hanson


Land dredging – Carlos Reyes


Environment – Daniel Muschett


Disposal – Hortensia Broce

Challenging The Industry

"Over the past 100 years, the Panama Canal has presented many challenges to the dredging industry, but the $5.25Bn expansion programme is presenting new challenges – and will see some of the most up-to-date dredging equipment in the world taking them on"

Photo: iStockphoto


Right equipment – Hugo De Vlieger


Time for change – Gerard van Raalte


Investment – Polite Laborie


Case studies – Lindsay Murray


Jousting – Doug Clarke


Partnering – Heinz Glindemann

That was **Jorge Quijano**'s opening to a unique event, the first joint international seminar on sustainable dredging and maritime construction organised by the **Central Dredging Association** (CEDA) and the **Western Dredging Association** (WEDA), sponsored and hosted by the **Panama Canal Authority** (ACP) and held in Panama on 2 March.

ACP's executive VP of engineering and programme management, Jorge Quijano welcomed over 110 delegates to the conference, which was themed *Connecting the World through Dredging* and held in ACP's Ascanio Arosemena Complex. And he had dramatic news: as delegates assembled, the *request for proposals* was launched to dredge the canal's Atlantic entrance of approximately 15M m^3 (with 800,000m^3 of dry excavation) and deepen it to 15.5m. That will allow the expanded canal to transit post-2014 Panamax-size vessels – including boxships up to 12,600teu – through the new locks. It will be awarded to the lowest qualified bidder with proposals to be submitted on 15 July 2009 and completion slated for Q2 2013.

"Throughout the life of the expansion programme, we will have some of the world's most powerful dredging equipment in Panama," Quijano stated. "And you will see continuous updating of ACP's dredging division's own skills."

He pointed out that the deadline for submission of bids for the estimated $2.7Bn new lock complexes contract – all with three chambers and water-saving basins – was next day (*see page 16*). The result's expected by early July – and work's slated to begin in 2010.

Vital Link

The two presidents, CEDA's **Anders Jensen** and WEDA's **Bill Hanson**, introduced the conference, Anders describing the canal as "a vital link in world trade" and an example that high quality projects were still going ahead. "We should not despair in these bad times, but look for opportunities," he pointed out.

"The centre of the maritime universe over the next few years," was Bill's description of Panama and he pointed out that the canal expansion was complemented by major port expansion (*see page 34*) and was also having an impact on ports throughout the US (*see page 42*). Congratulating the ACP on doing "a great job running the canal", Bill added: "People need to understand it all starts with dredging, that's how goods get on the shelves."

With US Army Corps of Engineers' (USACE) dredging technical support programme manager **Doug Clarke** in the chair, ACP's drilling & blasting chief **Carlos Reyes** got us under way with *Fresh Water Dredging in the Canal Expansion*, his first of two papers.

Describing the overall programme that will include more than 53M m^3 of dredging, including 20M m^3 in Gatún Lake and 9M m^3 in the Gaillard Cut, to almost double the Canal's capacity (*see page 28*), Carlos took us through the four phases, from dry excavations – "we call it land dredging" – drilling & blasting (D&B) and dredging to the final configuration.

"Transits never stop during the work," he said. "We use the windows between transits for D&B."

Working With Nature

Environmental Aspects of the Expansion was the title of ACP's **Daniel Muschett**'s paper – a theme that would recur throughout the conference.

Work began in 2003 with the report submitted and approved three years later – "four-tier organisation, stringent regulations and a nine-point due diligence programme monitored according to the *Equator Principles*," were the key factors he said. "We held many public meetings, have a free telephone line and email for public comment, a website and much more. Maintaining impartiality, objectivity and transparency in the eyes of all project stakeholders is critical."

Major facets include:

- Erosion and sedimentation controls, especially in the Gaillard Cut which is being widened as well as deepened
- Water quality monitoring, along with turbidity control of some parts of the dredging programme
- Working conditions, including safety, health issues, air quality and noise
- Remediation, which calls for over 1,000ha of reforestation in three national parks
- Wildlife rescue plan that's already removed hundreds of animals from affected areas.

"Up to now, compliance has been between 96% and 100% – those not in compliance must show an active correction plan to be carried out in a given timeframe," Daniel added. "We also carried out archaeological surveys over the past three years in the new locks area. We're working with the Canal Museum and the Smithsonian Tropical Research Institute and have procedures in place for any findings."

As said earlier, the expansion will see over 53M m^3 of material dredged – plus at least another 66M m^3 of dry excavation – and the *Selection of Excavation Material Disposal Sites* was ACP's **Hortensia Broce**'s subject.

Studies on both the Pacific and Atlantic sides of the canal led to the selection of 23 sites in total, both terrestrial and marine, with extensive beneficial reuse including building dams and especially remediation of 'site T6.'

"It's an old shooting range and the good thing about this site is that it's clear of forest and had so much ordnance it could be considered land reclamation," Hortensia told delegates. "We had no experience of clearing ordnance – we do now!"

Dredging And Blasting

With CEDA Environment Commission chairman **Polite Laboyrie** in the chair, session two began with Dredging International's Central America area manager **Hugo De Vlieger** giving an overview of the $177.5M Pacific entrance dredging contract DI won in April 2008 (*see page 32*).

"Before starting, and it's a good thing we did, we hedged the dollar/€uro rate and fuel costs," he said, stating the contract was scheduled to run over eight phases during its four-year term. And of the 23 disposal sites mentioned by Hortensia, DI can use five of them, three at sea and two on land.

"Choosing the right equipment is the key to this project," Hugo added.

This brought Carlos Reyes back to the podium to look at *Underwater Rock Blasting for Dredging* – "It's a challenge, it's very hard material," he said, pointing out that any drill pattern must identify and cope with varying types of rock. "The difficulty's predicting the size

of the resulting fragments," he added.

But using records of D&B operations throughout the canal, he's come up with a new all-Panamanian (and copyright protected) formula – $B^{1.28} = [5.2x10^2\ \delta\ (\sqrt[3]{W})^{1.28}]/0.7\sigma$ – that combined with other parameters should see much greater consistency in rock fragmentation. "Every drilling pattern can be localised throughout the canal," he concluded. "We now have a record of every block blasted over the past couple of years."

Final session of the morning was down to Hydronamic's **Gerard van Raalte** with lessons on *Environmental Control of Dredging Projects*.

"Contracts change dramatically," he said. "Of the 500 tenders we looked at in 2000, 15% had environmental restrictions; in 2008 it was over 50%, half of them with very stringent conditions – it's really challenging."

He had two major points: all projects are different and 'cutting & pasting' wads of environmental conditions from one project and imposing them on another won't work.

As he explained: "In Saudia Arabia we were asked to dredge against Danish environmental standards! Does that make any sense? In Mejillones the local authorities were asking one thing while the World Bank [financing the project] were asking another – can any contractor work with that?"

As for Melbourne (*see* ***DPCs passim***), he pointed out that of the A$1Bn price tag, environmental studies and monitoring cost 50%. "In 2005 we carried out a A$10M trial dredging because people in Melbourne didn't believe all those experts from around the world..."

Monitoring sensors could also cause problems, in one case because fish saw them as desirable homes – "they cut off the light and bingo, the sensors registered high turbidity. We eventually managed to convince the client it was not our fault."

Concluding, he stated: "We believe it's time for a change in thinking – building with nature, not fighting nature. There's a lot of research going on at present to show people that dredging and nature are not enemies. And the results will be available to all."

Sustainable Infrastructure

Gerard moved to the chair for the post-lunch session three, swapping the podium with Polite, who wore his Rijkswaterstaat hat for a view of *Dredging for Climate Change and Transport in the Netherlands*.

"About two-thirds of Holland is prone to flooding and the value of the industries on that land is over a trillion €uros, so it's worth investing to keep the areas dry," Polite explained, outlining the country's 30M m^3 annual salt and freshwater maintenance dredging needs, beach replenishment, the *Room for the Rivers* programme to allow for climate change and the infrastructure improvements to allow safe navigation.

DPC sponsored the reception

"Environmental imperatives are now driving more dredging," he added, "especially contaminated sediment in rivers – about 35M m^3 in all."

In closing, Polite called for more balance between the economy and the environment – and balanced regulations. "Imposing restrictions increases costs," he said. "Dredging is a tool for sustainable development that has impacts, but these can be mitigated to a certain extent – you need to take local conditions into account."

CEDA president Anders Jensen followed in his role as environmental manager for the planned €6Bn Femarnbelt Link between Denmark and Germany – the environmental impact assessment (EIA) is likely to cost €30M alone. Entitled *Large Infrastructure Projects and the Environment*, Anders' presentation looked at the lessons learned from the existing fixed links across the Danish straits:

1). *Great Belt Link* – between the Danish islands of Zealand and Funen, built in the 1980s with the EIA costing €3M, monitoring another €3M and optimisation €10M

2). *Øresund Link* – to Sweden, built 1995-2000, with the EIA costing €5M, monitoring another €30M and optimisation €130M.

"Technical challenges for the Femarnbelt Link include 4m waves and 30m water depth – it's a record-breaking project because of its sheer size," he commented. "But the environmental considerations and the cost – 10 times that of the Great Belt Link for the EIA – have risen hugely."

Lessons from the Great Belt Link applied to the Øresund Link meant "there was no measurable impact at the time of opening and the number of marine mammals actually increased." Despite that, environmentalists' demands for Femarnbelt had more than doubled, the scope including the welfare of bats and birds as well as marine flora and fauna.

Construction is due to start in 2013 – as Anders pointed out, he'll have his work cut out to ensure that happens.

WEDA president Bill Hanson concluded the session with *Important Dredge Cost Drivers*, especially beneficial reuse of material in the US: "It's good for the environment, but boy, what a cost!" he said, stating that those costs needed to be explained to project owners who in turn needed to involve dredging contractors early on. As for regulators: "They don't care how much it costs. In my 30-years experience, despite seeing bad science, I've yet to see even one regulation removed."

Bill pointed to five main cost drivers: soils, depth, geometry, weather and traffic – "Weather can be critical, especially offshore, and as for traffic, nowhere is more difficult than the Panama Canal." Concluding, he called for more risk sharing and recognition of each party's needs and expectations – "We need to spend time understanding each other's problems," he stated.

Final Session

The Many Faces of Dredged Material and Sediment was the title, Hortensia was in the chair and Cefas' **Lindsay Murray** based her presentation on PIANC's recently published *Report 104—Dredged Material As A Resource*. And since she chaired the working group that produced it, the talk spanned many years research experience.

"It started in 1992 when PIANC published its first report on beneficial reuse," Lindsay said. "It's still a useful document, but times have changed..."

Among those changes is the concept of putting clean sediment back into waterways – "a useful option, though some confuse it with disposal."

Other options include engineering uses in flood and coastal protection, plus environmental enhancement

– "we've a lot of experience in using fine-grained material for wetlands improvement, for example."

Drawing on over 30 case studies from around the world, Lindsay detailed many successes, as well as constraints. "We came to the conclusion that you need an economic driver. In Japan, sea dispersal was being discouraged, hence 90% of dredged material was used beneficially. We think there's a real need to promote the benefits," she concluded, "as well as the risks."

With Doug Clarke at the podium and a paper entitled *Compliance Monitoring of Turbidity: Jousting with Windmills?* delegates looked forward to controversy – and Doug didn't disappoint.

"I've never seen a fish go belly-up next to a dredge – have you?" he challenged. "So does that mean we've been working with false data?"

Arguing that present turbidity monitoring is based on false assumptions, is non-adaptive and has no demonstrable link to protection of the environment, he questioned regulations that seemed to crop up time and again with no seeming validity, such as '29NTU at 100m down-current.'

"I've asked 'why 29NTU?' Why not 28 or 30? Nobody knows. We've adopted such measures purely from expediency and it's not the way we should be doing things."

Site-specific calibration of instruments prior to dredging was "absolutely critical," he stated. "In order to have a benchmark against which to measure the risks of concentration and duration of the dose to fauna and flora."

Using sea grass as an example, he pointed to the different regulations adopted by US coastal states: "Without site-specific pre-calibration, you might just as well pull numbers out of the air – they're just as believable."

Doug concluded by calling for an adaptive compliance monitoring design that would take new insights into account, but he went on to add: "I'm a little pessimistic about breaking the circle of compliance monitoring in the US, but this is at least a chance to bring it before an international audience."

Hamburg Port Authority's **Heinz Glindemann** brought the conference to a close with a study of *Win-Win Solutions Between Sediment Management and Natural Development in the Tidal River Elbe*.

"We convinced environmentalists that the port was their partner, that we had sufficient experience to help recreate natural wetlands that were disappearing," Heinz explained, referring to the progress made through the 1996-2008 development of Hamburg's dredged material management programme.

Factors to deal with include the Elbe's hydrodynamic changes throughout its tidal range – "sediment can be pumped all the way from the Elbe's mouth to Hamburg, including dredged sediment." Hence the development of sediment traps and other measures.

"We also made a study of polluted sediment we were *not* responsible for," Heinz concluded – and he's now on a crusade attacking NGOs like Greenpeace for not rooting out polluters elsewhere in the European Union!

Finally...

Thanking the sponsors, Anders closed the conference: "These kind of events, this time across the oceans, can only take place when organised by associations such as CEDA, WEDA and of course the ACP. It's been an excellent day with excellent presentations."

Which just left the reception sponsored by *DPC*. If you've never had grilled giant prawns wrapped in pancetta with a Chilean sauvignon blanc, it's time you visited Panama!

Presentations are available to conference participants and CEDA corporate members at www.cedaconferences.org/panama2009 and will be made public from 1 July

CEDA's Anna Csiti at the canal's Pacific entrance

Quotes

♦ "After that, I'll start jumping up and down!" – **Doug Clarke** on methods of ensuring delegates returned to their seats on time

♦ "The regulations are tough and our environmental friends make sure we stick to them with spot checks" – **Carlos Reyes** on material placement

♦ "Unlike the original Canal builders, we *did* have extensive environmental conditions to comply with!" – **Hortensia Broce** discussing material disposal options

♦ "It's cheaper and doesn't affect navigation in the canal" – ACP project management division chief **John Langman** answering a question as to why there was more dry than wet excavation

♦ "We'll only boom once a day – the nearby neighbourhood contains my house!" – **Hugo De Vlieger** on Pacific entrance drilling & blasting

♦ "I have to live with Marc Verhaert of Jan De Nul who complains about fragment size and consistency" – **Carlos Reyes** on the problems of predicting drill & blasting results

♦ "If you want us to work nice and clean, it's going to cost more than doing it quick and dirty – not every client can accept that!" – **Gerard van Raalte**

♦ "Yes, there are *lots* of regulations. Perhaps that's why not many consultants are here, they're writing new ones" – **Polite Laboyrie** on environmental conditions for Rotterdam's Maasvlakte II project

♦ "It's actually the highest point in Denmark!" – **Anders Jensen** showing a photo of the Great Belt Link's 250m-high pylon

♦ "Isn't it great, to go to a dredging conference and have presentations about dredging" – **Bill Hanson** on the preponderance of academic environmental presentations in other recent conferences

♦ "In the US, a bird island was built with dredged material that attracted terns, but it also happened to be on the migration route of endangered young salmon smolts – the terns' favourite food!" – **Lindsay Murray** on the care needed selecting beneficial reuse options

♦ "Apologies to Cervantes, but this is how I feel after many years jousting with regulators in the US" – **Doug Clarke** on how the title of his paper came about

♦ "I'm amazed you're all still awake – it's been a long day!" – **Heinz Glindemann** wrapping up the conference.