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Terry G. Spragg & Associates
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Dear Terry,

You mentioned that some people have expressed concerns over the control and stability of large towed objects. These concerns are legitimate since without proper design or precautions, problems can be experienced. The fact that during our exhaustive model and prototype tests no such problems occurred might not satisfy the critical observer in the absence of an explanation on why the SpraggBag™ system is different and immune to such behaviors.

I suspect much of this concern stems from the unfortunate experiences associated with the now-defunct Nordic Water Supply technologies. In that case, the flexible portion of the fabric barge had to transition into a rigid bow. As you may recall in our early development, we quickly dispensed with that option. By contrast, the SpraggBag system transfers the towing force directly into the prismatic portion of the lead bag and then these forces transfer from one bag to the next via the interconnection skirt. By doing this we insert no loads on the bow and stern of each bag and the role of these specially shaped panels is only to resist the hydrostatic pressure of the freshwater cargo and provide a reasonably streamlined bow and stern for the series of interconnected bags.

Because each bag is only filled to 90% capacity, there is ample opportunity for each portion of the bag to flex independently under the action of short-crested waves. As we consistently witnessed in our testing program, smaller high-frequency waves tend to be reflected off the bags. By contrast, medium-frequency waves would pass through the bag without causing any gross motions. Finally, low-frequency waves, i.e. wave lengths greater than the beam of the bag, would pass through and induce motions of the bag consistent with the orbital velocities of these long-period excitations.

In this respect, the bags are no different than towing any very large object in long-period waves. In high sea conditions, problems can occur because of the vastly different behaviors of the train of bags and the relatively small tugboat. These problems can manifest themselves in excessive towline tension or the failure of the towline termination point.

Again, in the engineering of the SpraggBag system, this latter issue has been mediated. However, a towline must be selected that is sufficiently long and has sufficient elasticity or catenary to allow for the relative tow/towboat motions. That said, normal precautions should apply when it comes to avoiding maritime operation during storm conditions.

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I am intrigued with the idea of SpraggBag operations in a consistent, favorable ocean current. As you recall, none of our very-positive engineering and economic analyses enjoyed the boost that would be realized when the transit is assisted by such conditions.

While this situation would have a very favorable impact on towed operations involving long trains of SpraggBags and high-powered tugs, the fair-current scenario combined with society's interests in minimizing its carbon footprint brings with it some very intriguing possibilities. For example, and depending on the current velocities, the use of solar-powered propulsion might become a realistic alternative. Looking at a single 25-megaliter SpraggBag, we have approximately 2,000 sq. m. of exposed surface area. Even based on modest PV performance rates, that could yield over 100kW of power. That would translate into in excess of 150 horsepower of electric propulsion.

It should interest you to know that I have recently been working on mobile fish-farming operations – self-propelled ocean cages in particular. I have engineered electric propulsion systems that yield over 170 pounds of thrust per horsepower. That is approximately five times the thrust-per-horsepower ratio of ocean-going tugs. I am conducting sea trials of this system later this month in Culebra, PR.

This zero-carbon approach would be competitive even in a conventional delivery scenario. However, in a favorable current, the option of one solar-enhanced SpraggBag towing a modest train of passive units offers a stunning opportunity. Indeed, depending on the intensity and predictability of the current, the self-propulsion requirement might be modest; only what is needed to keep the transits along a prescribed route. I'd enjoy exploring these concepts further if the details of a route and delivery requirements can be specified.

You also mentioned that some people have had questions about the SpraggBag technology's ability to contain such massive amounts of water. I'm not sure how to respond except to say that our initial analyses were exhaustive, our material testing program was rigorous, our model tests verified the sea-keeping predictions, the prototype inflation tests proved the adequacy of the fabrications, and the pilot-scale demonstration tows revealed the feasibility of the entire system.

Suffice to say, the basic questions about the SpraggBag mode of water delivery have been answered. What remains is customizing the components and the operations to the particulars of the route.

I hope these comments are useful in explaining the key differences between the SpraggBag system and some of the inferior approaches to water transport that may have given rise to skepticism. Please let me know is there is any way I can help in conveying the merits of the SpraggBag technology.

Sincerely,

Cliff Goudey
Research Engineer