

# world water

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## Sustainable Development Goals

Integrated approach  
yields far-reaching  
results

# Is 2020 the tipping point for offsite manufacturing?

Manufacturing treatment facilities offsite can deliver multiple benefits for water and wastewater infrastructure projects. **Rich Matthews** of Siltbuster Ltd. explains why a more enterprise-thinking approach to capital delivery is necessary to achieve these benefits.

As the water industry comes under greater pressure to deliver more responsive and complex investment programs, many are reviewing how they manage and deliver them. This is particularly relevant with the increasing compliance and efficiency pressures being applied. In the United Kingdom (UK), the 2020-2025 investment cycle could prove to be a real opportunity for offsite manufacturing with all the benefits it brings, and a tipping point for adoption throughout the industry.

Offsite construction facilitates the ability to deliver modular-based solutions through a responsive engineered approach to meet the needs of today without compromising those of tomorrow. The application of modular build allows for environmental resilience in a climate that requires us to think differently in our approach to capital delivery activities.

There are a number of reasons why the water industry is ready for

offsite manufacture. Several sectors, including the wider construction industry, have advanced their skillsets in offsite manufacturing. This gives the water industry plenty to draw on; it can capitalize on this knowledge and skill, adopting the key progression lessons and taking advantage of supply chains, which have already been developed. This can be coupled with wider infrastructure investment initiatives to review infrastructure delivery models that fail not just clients and their suppliers, but also the operators and users of infrastructure systems and networks. Seeking a SMART delivery model – the use of standard, modular, agile, responsive treatment systems – is one example, which allow flexibility in program and are aligned to offsite manufacturing.

Offsite manufacturing is ideal for repeatable projects. Given the commonality of investment programs to be found across the

water industry, the opportunity for repeatability is evident – particularly considering the assets in terms of assemblies and subassemblies or modules.

Though the sector's projects are well-suited for the opportunities of offsite manufacturing, there needs to be a greater appetite to approach solutions differently. This means adapting procurement approaches and aligning more closely with the supply chain already serving other markets in this manner.

## Drawing on knowledge

Companies looking for reassurance where the offsite approach is working can find successful examples in the oil and gas market, where structures are built as “modules.” This allows site works and exposure to risks to be minimized, which factory-built modules can effectively deliver. This sector is particularly relevant to water and wastewater infrastructure. In both sectors sub-

assemblies are an underlying principle of asset-building programs – after all, an oil rig isn't built in-situ.

There are other sectors deploying offsite manufacturing to build treatment plants. For instance, food and beverage companies (where plant throughput is priority) are under considerable pressure to ensure their effluent treatment plants maintain compliance at all times. Similar to the wastewater sector, food and drink sites are often space-constrained and cannot afford downtime while the plant is maintained or upgraded. For a number of years these companies have relied on offsite manufacturing, deploying systems that use pre-assembled package plants and ancillaries to minimize downtime or as an effective contingency planning solution.

What can be learned from these sectors? The full benefits of adopting offsite manufacturing for treatment plants can be achieved when companies effectively implement



The Porlock Water Recycling Centre's existing membrane bioreactor facility was upgraded with a modular treatment solution provided by Siltbuster as part of the current capital program. The temporary works were delivered to site in February 2019 and remain in use in July 2020 as the MBR plant is being recommissioned. Photo credit: Siltbuster



Design for Manufacture and Assembly (DFMA). When using this approach, it is important to consider minimizing site activities, standardizing products and subassembly design, and implementing a production process to procurement.

#### Minimizing site activities

During a treatment plant project, the majority of problems arise from the activities completed onsite. The company's financial performance, health and safety, and even overall investment program can all be affected if things are to go wrong. However, if DFMA principles are implemented, the onsite activities (and risks) are focused on and minimized. This is because when manufacturing is completed offsite within a factory, it is much easier to manage the working environment, putting in place effective control measures and procedures. Minimizing site works by preassembling components, such as skid-mounted solutions or package plants, also brings the opportunity for other construction materials to be considered – though this requires conventional or traditional build philosophies to be challenged.

#### Standard products and subassembly design

Standardization is another element of DFMA, but to identify where it is warranted and best placed the DFMA hierarchy must be first considered.

Focusing standardization around parts and components allows for predictability in procurement but seeking to standardize a complete subassembly or asset could constrain the solution's ability to adapt to site specifics and require significantly more time to be invested.

A key aspect of subassembly design is working with defined battery limits and interfaces – information communication. Subassembly design also requires consideration of logistics such as overall size, weight, and installation based on the site constraints.

#### Production procurement

Essentially, the primary benefit of production-based delivery is that the factory-built assets (or subassemblies) can run concurrently in the construction program. Production programming means understanding lead times and supply chain interactions or dependencies and working smarter with the key links. As a result, contractual relationships need to be defined much earlier in the delivery process, using these key

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links to secure the knowledge and experience to fulfill the efficiency opportunities.

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#### Proven applications

There are extensive proven scenarios for the offsite build of treatment systems. However, when evaluating the suitability of offsite manufacturing for a specific situation it is important to consider whether the production is to be at the component level, subassembly, or a fully packaged plant. This will be affected by site-specific considerations (access and the available working area) or by process requirements (flow, load, and consent). Although, with the primary DFMA concern to minimize site activities, there is an opportunity to implement some offsite manufacturing on every site.

Working across municipal, industrial, and construction markets, the UK company Siltbuster team has seen offsite manufactured modular treatment solutions successfully work in a number of scenarios. These have ranged from supporting short-term compliance and capital maintenance programs through to providing complete design and build systems.

For example, in the UK, Siltbuster has provided the Wessex Water Engineering and Construction delivery team at Porlock Water Recycling Centre (WRC) with a modular treatment solution to be

used during the upgrade of the site's existing membrane bioreactor (MBR) plant as part of the current capital program. The solution not only enabled compliance to be maintained while the existing MBRs were upgraded, but it was also configured in such a way that Wessex Water had the option to deploy it elsewhere in the business once the project was completed. The modular assets were pre-built and factory tested, allowing for assembly onsite within 2 weeks for a complete wastewater works including primary and secondary treatment.

Modular solutions can range from a specific package plant through to a complete treatment stream being deployed with program constraints. This is when DFMA principles are proven. While deployment can often require extensive logistics planning, the savings in site assembly are evident where complete treatment systems can be installed and commissioned in a matter of weeks as opposed to months.

#### Further benefits

In addition to the benefits of speed and minimized disruptions onsite, the offsite manufacturing of effluent treatment plants also gives the UK water industry an opportunity to futureproof upgrades. For instance, having a treatment facility comprised of a series of modules means elements can be added to provide increased capacity or to deploy different treatment technologies as the demands of the catchment change. This futureproofing flexibility of modular- or phased-construction is an important consideration for the water industry, especially as it has such a long investment horizon during which so much could change politically, environmentally, and financially within the UK.

#### Conclusion

While the benefits are many, the scale of the cultural shift needed to adopt offsite manufacturing and the DFMA ideology should not be underestimated. DFMA adoption requires commitment

from all aspects of the project team and at every level within a water company. Its success is dependent on a willingness to challenge and adapt a proven concept with the wider construction industry and through the momentum gained of minimizing site activities and associated risk. This will deliver a more responsive investment program without compromising compliance.

The fact that offsite manufacturing fundamentally delivers so many benefits needed right now surely means its moment has come. It ensures project times and therefore budgets are met. It also minimizes site risk, which is a key health and safety benefit. Furthermore, by drawing on a systemized, production-style approach to plant manufacturing, it instills quality control in the delivery process. There are other sectors that can be learned from with an experienced, tried, and tested supply chain well-placed to present and deliver these solutions to the water industry. The political climate and scale and challenges of the investment program present the ideal opportunity for the water industry to draw on this experience, realize the benefits, and for DFMA to become a sought-after option for manufacturing.

#### Author's Note



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