Coppermills RGF
Digital Innovation & Offsite Build

Jonathan May
March 2021
Rapid Gravity Filters and Clean Backwash Tank (Precast)
## The Challenge…

<table>
<thead>
<tr>
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<th>Original Estimate</th>
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<tbody>
<tr>
<td>Direct Cost &amp; Risk</td>
<td>£20,992,559</td>
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<tr>
<td>Pre-Lims</td>
<td>£10,687,425</td>
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<tr>
<td>Risk</td>
<td>£2,811,812</td>
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<tr>
<td>Design &amp; PSC</td>
<td>£2,260,209</td>
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<tr>
<td>Fees &amp; Overhead</td>
<td>£5,649,788</td>
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<tr>
<td><strong>Affordable Cost</strong></td>
<td><strong>£42,049,368</strong></td>
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<td><strong>3 Years</strong></td>
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The Coppermills Digital-DfMA Journey
The Solutions – DFMA (Design for Manufacture & Assembly)

1. Pre-Fab New Workshop – Modular Building
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   – Modular Building
2. Pre-Fab 2000m² RGF base
   – Pre-fabricated reinforcement cages
The Solutions – DFMA
(Design for Manufacture & Assembly)

1. Pre-Fab New Workshop
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2. Pre-Fab 2000m² RGF base
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3. Pre-Cast RGF Structure & Backwash Tank
   – Dutchland post-tensioned pre-cast system
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4. Pre-Fab 12No. Distribution channels
   – Pre-fabricated from stainless steel
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1. Pre-Fab New Workshop
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3. Pre-Cast RGF Structure & Backwash Tank
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4. Pre-Fab 12No. Distribution channels
   – Pre-fabricated from stainless steel
5. Pre-Fab Inlet/Outlet pipework modules
   – Including all flowmeters, valves, actuators, walkways, lighting, pre-wiring and electrical distribution boards
The Digital Approach

2. Live 3D Model – updated throughout delivery from as-built scans & site markups.
5. AI Validation – to verify build & manage interfaces
6. BIM 360 Field – advanced applications for fast, quality controlled QA checks for handover
Coppermills Digital Aliens
Coppermills Digital Transformation

Tools

Training

Digital Natives
Coppermills Digital Aliens >>> Digital Residents

Digital Diary Demon
Glue Guru
‘Synchro’ Steve
Checksheet Champion
Pre-Cast Case Study
RGF Structure: Pre-Cast

In-Situ: 39 Weeks

DfMA: 18 Weeks

55% Reduction

Key

7 Indicates 1 Week

*Source: Senior General Foreman Estimate
Pre-Cast RGF Structure

In-Situ: 342 Concrete Loads*  
DfMA: 124 Pre-Cast Deliveries

64% Reduction in Vehicle Movements

Key
- Indicates 10 deliveries

*Source: Volumetric Concrete Calculation
RGF Structure: Pre-Cast

In-Situ: 65 Labourers*

DfMA: 5 Labourers

92% Reduction in Site Labour Force

*Source: Senior General Foreman Estimate
Pipe Modules Case Study
Pre-Fabricated Channels & Pipe Modules

6No “Plug in & Play” Modules – containing all valves, actuators, flowmeters, electrical wiring, backboards, lighting & walkways, each delivered in 2No Sections
Pre-Fabricated Channels & Pipe Modules

1. Interface Design Verification

2. 4D & Collaborative Planning
North Pipe Gallary and H-Flume Installation Simulation
## Pipe Modules: Direct Cost Comparison

<table>
<thead>
<tr>
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<th>Traditional</th>
<th>Outturn (DfMA)</th>
<th>Difference</th>
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<tbody>
<tr>
<td><strong>Mechanical Manufacture</strong></td>
<td>£370,000</td>
<td>£703,107</td>
<td>£333,107</td>
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<td><strong>Mechanical Installation</strong></td>
<td>£500,000</td>
<td>£232,492</td>
<td>£267,508</td>
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<td>Additional Split for Electrical Installation</td>
<td>N/A</td>
<td>£132,244</td>
<td>£132,244</td>
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<tr>
<td><strong>Lifting</strong></td>
<td>£80,000</td>
<td>£50,000</td>
<td>£30,000</td>
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<tr>
<td><strong>Total</strong></td>
<td>£950,000</td>
<td>£1,117,844</td>
<td>£194,843</td>
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Pipe Modules: Programme Comparison

On Site Mechanical: 12 Weeks

DfMA: 2 Weeks

On Site Electrical: 18 Weeks

90% Reduction

£1,080,000 Pre-Lim Saving

Key

7 Indicates 1 Week

*Source: Senior General Foreman Estimate
“There was no panic during the installation – when you’ve modelled the interfaces in 3D from scanned data, digitally rehearsed the installation, and tested fully in the factory, you simply know that it will go smoothly”

- Tom Fitzgerald, MEPS
Digital Approach to Operations Engagement
The Coppermills Journey

1. Agreed digital delivery philosophy early
2. Engaged supply chain partners & operations team early
3. Digitally facilitated collaborative approach throughout
4. The Right Team – embraced tools
5. DFMA Maximised
RGF Structure: Pre-Cast

- 90% Reduction in Height working:
  - Zero Wall & Roof Shuttering
  - Zero Wall Steel Fixing
  - Zero High-Level Support Steelwork
  - Pre-Fitted Handrail

- 40% Carbon Reduction

- Reduced Waste

- Zero Temporary Works

- Zero Site curing Time

- Zero Coring – Pre-Cast Orifices

- Zero Accidents
Thanks for your time.