



Synchronous Lifting Case Study

**Bridge St Bridge
Christchurch**

Introduction

- The February 2011 earthquake in Christchurch – New Zealand, damaged and destroyed many buildings and much infrastructure.
- Bridge St bridge identified as being economically and technically viable for repair and remediation works.
- Bridge to be kept trafficable during works.

Pleasant Point Yacht Club - Before



Pleasant Point Yacht Club, Christchurch - prior to the earthquakes

Pleasant Point Yacht Club - After



Proximity to Bridge



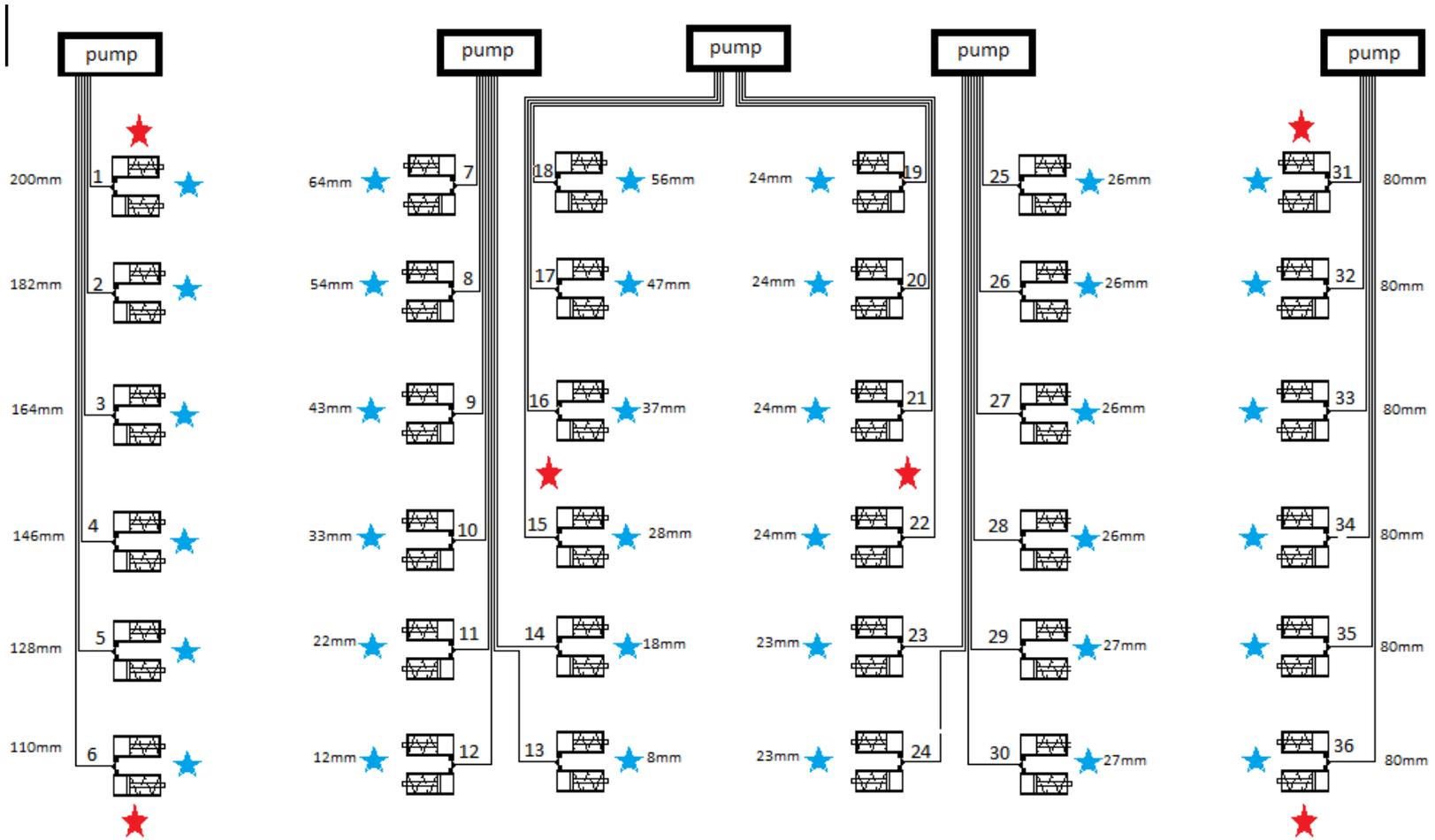
Population Catchment



Abutment Damage



Lift Plan – 36 Points



Manual Control – 26 Points



There's One on Every Job!!



Synchronous Control – 36 Points Up to 128 Points



Variable Displacement Planning for Re-packing

WEST ABUTMENT							
CYLINDER NUMBER 1			Stroke		56 mm		
TARGET	206 mm		Stroke Deadband		3 mm		
Lift No	Percent Complete	Stroke Total	Stroke Usable	Stroke Required	Target	LIFT STAGE	WARNINGS
1	25%	56	53	51.5	51.5	REPACK	
2	50%	56	53	51.5	103	REPACK	
3	75%	56	53	51.5	154.5	REPACK	
4	100%	56	53	51.5	206	CONTINUE	
5	100%	56	1.5	0	206	LIFT COMPLETE	

WEST PIER - WEST							
CYLINDER NUMBER 1			Stroke		25 mm		
TARGET	64 mm		Stroke Deadband		3 mm		
Lift No	Percent Complete	Stroke Total	Stroke Usable	Stroke Required	Target	LIFT STAGE	WARNINGS
1	25%	25	22	16	16	REPACK	
2	50%	25	22	16	32	REPACK	
3	75%	25	22	16	48	REPACK	
4	100%	25	22	16	64	CONTINUE	
5	100%	25	6	0	64	LIFT COMPLETE	

CYLINDER NUMBER 2							
CYLINDER NUMBER 2			Stroke		56 mm		
TARGET	187 mm		Stroke Deadband		3 mm		
Lift No	Percent Complete	Stroke Total	Stroke Usable	Stroke Required	Target	LIFT STAGE	WARNINGS
1	25%	56	53	46.75	46.75	REPACK	
2	50%	56	53	46.75	93.5	REPACK	
3	75%	56	53	46.75	140.25	REPACK	
4	100%	56	53	46.75	187	CONTINUE	
5	100%	56	6.25	0	187	LIFT COMPLETE	

CYLINDER NUMBER 2							
CYLINDER NUMBER 2			Stroke		25 mm		
TARGET	54 mm		Stroke Deadband		3 mm		
Lift No	Percent Complete	Stroke Total	Stroke Usable	Stroke Required	Target	LIFT STAGE	WARNINGS
1	25%	25	22	13.5	13.5	REPACK	
2	50%	25	22	13.5	27	REPACK	
3	75%	25	22	13.5	40.5	REPACK	
4	100%	25	22	13.5	54	CONTINUE	
5	100%	25	8.5	0	54	LIFT COMPLETE	

Packing Technique and Issues



Packing Technique and Issues

- Encoder Position
- Load Transfer for cylinder packing
- Settling of Packing and lift tolerance
- Safety – People under load
- Safety – Lifting in cramped position
- Time taken

Encoder Placement



- Space
- Rigidity of mount
- What is being measured
- Differential movement measurement
- Environment
- Access
- Protection

What a Sync System can do.

- Provide central control of many points
- High precision (0.5mm) location
- High precision weighing with load cells or pressure transducers.
- Provide load control – max and min load
- Pressure preload
- Tilting and uniform lifting functions
- Data logging of pressure and displacement

What a Sync System can't do

- Tell you what's moving
- Stop it from moving
- Give the same results with different set-ups
- Compensate for poor data (start position and target)

Conclusion

- Understand the capabilities of the system
- Include the system operator early in planning
- Some jobs can only be done with a Sync
- Some jobs are best done without a Sync
- The Bridge St bridge was successfully repaired and re-opened in early May 2015.

Media Release – May 2015

The South Brighton Bridge sustained significant damage in the February 2011 earthquake and subsequent aftershocks. Because Southshore is a tsunami evacuation zone, the area needs a swift and safe escape route for residents – the Bridge Street Bridge.

The liquefaction and land movements meant that the work involved rebuilding the bridge abutments on both ends with new piles, ground improvements and levelling, realigning, surfacing and repairing the existing bridge deck and services running through it.

The repair was originally anticipated to take a year, but as ground conditions and degree of damage was assessed more accurately onsite, the time had to be extended to allow for more extensive piling work in the estuarine environment.

As a result it was decided to build temporary abutments at each end of the bridge to enable two-way traffic and reduce the stress on the community from a long homeward detour.

The Fulton Hogan team held a community celebration for the reopening of the bridge which was attended by South Brighton school pupils, local City Councillor Glenn Livingstone, residents groups and members of the community attended alongside Fulton Hogan engineers and crew and SCIRT designers.

May 2015

