

# **Application of Modern Plastic Piping Systems for Sustainable Water Quality**

Water Arabia 2015 12 March 2015

# Agenda



- Introduction to Georg Fischer Piping Systems
- Challenges for the Future
- Material Recommendations
- Applications with Plastic Piping Systems
- Value Added Services
- Project References
- Concerns with Plastic Piping Systems
- Conclusions



# Get to know GF Piping Systems

# Georg Fischer Corporation Internationally Recognised





![](_page_3_Picture_3.jpeg)

Georg Fischer Corporation

![](_page_4_Picture_1.jpeg)

![](_page_4_Picture_2.jpeg)

![](_page_5_Picture_0.jpeg)

# History

6 Company Profile | GF Piping Systems 2014

![](_page_6_Picture_0.jpeg)

## Industrial pioneers with a long history

	620	1802	Founded as small iron foundry in Schaffhausen by Johann Conrad Fischer.
		1827	Johann Conrad and his son Georg I establish plants in Hainfeld and Traisen in Austria.
Johann Conrad Fischer 1773–1854	Georg Fischer I 1804–1888	1864	Georg Fischer II takes over and renames the company after himself.
0			Start of industrial fittings production in malleable iron.
- A		1895	Georg Fischer III establishes plant in Singen.
Georg Fischer II 1834–1887	Georg Fischer III 1864–1925	1896	Family retreats with an IPO to the Zurich stock exchange.

![](_page_7_Picture_0.jpeg)

# We are driven by our tradition of innovation and passion

0. FISEHER SCHAFFHOUSE

## **PVC Solvent Cement Fittings 1957**

![](_page_8_Picture_1.jpeg)

+GF+

![](_page_9_Picture_0.jpeg)

# Present

#### GF Piping Systems We are dedicated to....

Valves

![](_page_10_Picture_1.jpeg)

...designing, manufacturing and marketing piping systems for the safe and secure conveyance of liquids and gases.

![](_page_10_Picture_3.jpeg)

Automation

Measurement & Control

**GF Piping Systems** 

![](_page_11_Picture_1.jpeg)

# Meeting individual application needs in your market segment

![](_page_11_Picture_3.jpeg)

![](_page_12_Picture_1.jpeg)

## From water extraction and treatment ...

Sea water extraction and desalination treatment

![](_page_12_Picture_4.jpeg)

**PE** Piping

![](_page_12_Picture_6.jpeg)

![](_page_12_Picture_7.jpeg)

Chlorine Analyzer System

> Actuated Ball Valve

![](_page_12_Picture_9.jpeg)

...and many more!

![](_page_13_Picture_1.jpeg)

## ... to waste water treatment and reuse...

![](_page_13_Picture_3.jpeg)

3-Way Ball Valve

![](_page_13_Picture_5.jpeg)

Pneumatic Diaphragm Valve

![](_page_13_Picture_7.jpeg)

2270 Ultrasonic Level Sensor & 2260 Ultrasonic Level Transmitter

...and many more!

## ... to water distribution...

![](_page_14_Picture_2.jpeg)

![](_page_14_Picture_3.jpeg)

ELGEF Branch Saddle System Topload

![](_page_14_Picture_5.jpeg)

ELGEF Plus Electrofusion Coupler

![](_page_14_Picture_7.jpeg)

...and many more!

![](_page_15_Picture_1.jpeg)

## In your water and gas utility network

![](_page_15_Picture_3.jpeg)

#### Our solutions In your industrial applications

![](_page_16_Picture_1.jpeg)

![](_page_16_Picture_2.jpeg)

Our solutions **In your building projects** 

![](_page_17_Picture_1.jpeg)

![](_page_17_Picture_2.jpeg)

# +GF+

# Successfully realized for you

![](_page_19_Picture_1.jpeg)

# Wherever you are positioned within the water cycle

![](_page_19_Picture_3.jpeg)

With environment-friendly piping systems

![](_page_20_Picture_1.jpeg)

# We keep your water flowing in...

![](_page_20_Picture_3.jpeg)

# Utility

![](_page_20_Picture_5.jpeg)

# For quality and efficiency of processes

We develop corrosion-free systems for your industrial applications.

# For safety and reliability in distribution

We provide leak-tight connections for your water and gas supply networks.

# For comfort and hygiene of installations

We create sustainable solutions for your building projects.

#### GF Piping Systems We have the right solution for you

![](_page_21_Picture_1.jpeg)

![](_page_21_Picture_2.jpeg)

## GF Piping Systems With more than 60 000 products we suit your every need

![](_page_22_Picture_1.jpeg)

#### Worldwide at home You can find us worldwide

![](_page_23_Picture_1.jpeg)

+GF+

More than 30 production sites guarantee our high standard worldwide

27 sales companies in charge of almost 200 countries Local presence in over 100 countries to meet specific requirements of each country

![](_page_24_Picture_0.jpeg)

# Water Quality Challenges ahead

![](_page_25_Picture_0.jpeg)

Biggest Challange

# \*Key Benefits of Plastics

![](_page_26_Picture_1.jpeg)

![](_page_26_Picture_2.jpeg)

#### Corrosion-free

- · Product lifetime over 50 years\*
- No incrustation thanks to smooth internal surface

![](_page_26_Picture_6.jpeg)

#### Chemical resistance

- · Good compatibility with chemicals
- Most economical solution for your requirements

![](_page_26_Picture_10.jpeg)

#### Low total cost of installation

- · Reduced pipe sizes
- Reduced welding times

#### Low material weight

- Low density no machinery required to carry material
- · Low anchor forces save installation costs

![](_page_26_Picture_17.jpeg)

#### Low thermal conductivity.

- Thermal insulation no additional wrapping costs
- No corresion due to less condensation and higher resistance results in cost savings.

![](_page_26_Picture_21.jpeg)

#### No electrical conductivity

- No corresion
- + No additional carthing required

![](_page_26_Picture_25.jpeg)

# **Benefits of Plastics**

![](_page_27_Picture_1.jpeg)

- + Low Carbon and Water Footprint
- + Material Recyclability
- + Reduced Environmental Impact
- + Global Quality Standards BS, ASTM, ISO, JIS....

![](_page_27_Figure_6.jpeg)

tel CO, and an inter-

- + Total System Capability Pipes, Fittings, Valves, Instrumentation, Jointing Machinery
- + No hot work permits

**Georg Fischer Piping Systems** 

## **Traditional Materials mean**

![](_page_28_Picture_2.jpeg)

![](_page_28_Picture_3.jpeg)

![](_page_29_Picture_0.jpeg)

# **Material Recommendations**

# **Over 20 Different Systems...**

![](_page_30_Picture_1.jpeg)

![](_page_30_Picture_2.jpeg)

**PE/ecoFIT** 

![](_page_30_Picture_4.jpeg)

PVC-U

![](_page_30_Picture_6.jpeg)

**PVC-C** 

![](_page_30_Picture_8.jpeg)

PROGREF Standard PROGREF Plus (PP)

![](_page_30_Picture_10.jpeg)

PROGREF Natural (PP)

![](_page_30_Picture_12.jpeg)

SYGEF Standard SYGEF Plus (PVDF)

![](_page_30_Picture_14.jpeg)

**Mechanical Fittings** 

![](_page_30_Picture_16.jpeg)

**CONTAIN-IT Plus** 

![](_page_30_Picture_18.jpeg)

**Automation** 

![](_page_30_Picture_20.jpeg)

**Duramax Corrugated Pipes** 

	ecoFIT	Carbon Steel	GRP
Expansion Bellows	Not Needed	Needed	Needed
Thrust Blocks	Not Needed	Needed	Needed
Ductility	+	-	-
Corrosion Resistance	+	-	+
Life Expectancy	+	-	-
Zero Leak Rate	+	-	-
Toxicity	+	-	-
Chemically Resistant	+	-	+
Freeze Resistant	+	-	-
Weight	+	-	+
Ease of Jointing	+	-	-
Training	+	-	-
Flexible range of Components	+	-	-
Strength	+	+	+
Hydrostatic Pressure	+	-	-
Impact Resistance when buried	+	-	-
UV Resistance	+	-	-
Smooth Bore	+	-	-
Surge Pressure	+	-	-
Ground Bedding for buried pipe	-	-	-
Production History	+	+	+
Global Approvals	+	-	-

![](_page_31_Picture_1.jpeg)

## ecoFIT vs Carbon steel vs GRP

+ = Good - = Negative aspect

### Which Material is Suitable for my application?

![](_page_32_Picture_1.jpeg)

- Determined by the following parameters:
  - ✓ 1. Working Pressure
  - ✓ 2. Working Temperature
  - ✓ 3. Type of Fluid or Gas, Chemical concentration and mixture.
  - ✓ 4. Expected Life of the System

➢ Once these parameters are known you can refer to the chemical resistance service from GF.

➢ For design and installation, the comprehensive *Planning Fundamentals* technical manual will provide you with all the important data for the planning, product selection, installation and commissioning of pressure pipelines in industrial applications.

 $\succ$  CAD data is available via a CD or online, to help with designing.

# **Typical Chemicals**

![](_page_33_Picture_1.jpeg)

<ul> <li>Chlorine Water</li> </ul>	$CI_2 H_2 O$	PVC-U, PVC-C
<ul> <li>Bromine</li> </ul>	Br <sub>2</sub>	PVDF, PFA
<ul> <li>Sulphuric Acid</li> </ul>	$H_2SO_4$	PVC-U,PVC-C, PE100, PP,PFD, PFA
<ul> <li>Hydrofluoric Acid</li> </ul>	HCI	PVC-U, PVC-C, PE100, PP, PVDF, PFA
<ul> <li>Caustic Soda</li> </ul>	CaOH <sub>2</sub>	PVC-U, PVC-C, PE100, PP
<ul> <li>Sodium Hypochlorite</li> </ul>	NaOCI <sub>2</sub>	PVC-U
<ul> <li>Sodium Chloride</li> </ul>	NaCl	PVC-U, PVC-C, ABS, PE100, PP
<ul> <li>Hydrogen Peroxide</li> </ul>	$H_2O_2$	PVC-U, PE100, PP
<ul> <li>Iron Chloride</li> </ul>	FeCl <sub>3</sub>	PVC-U, PVC-C, ABS, PE100, PP, PVDF, PFA
<ul> <li>Phosphoric Acid</li> </ul>	H <sub>3</sub> PO <sub>4</sub>	PVC-U, PVC-C, PE100, PP, PVDF, PFA
<ul> <li>Acetic Acid</li> </ul>	CH₃-COCH	PVC-U, PVC-C, PE100, PP, PVDF, PFA
<ul> <li>Hydrofluoric Acid</li> </ul>	HF	PVC-U, PE100, PP, PVDF

# Systems & Materials

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System	Operating Temperature	Dimension
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PVD-D		HA . 6400 14 24 inch
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# **Applications in Plastics**



#### **Applications for Water Treatment**



**Industrial Reclaim System** 

## **Municipal Water Treatment**





#### **Drinking Water Process**

- » Raw Water Pumps
- » Sedimentation
- » Sand filter
- » Iron Exchangers
- >> Ultrafiltration
- » Reverse Osmosis
- » Mixing / Blending
- » Neutralization
- » Chemical Distribution
- » Dosing / Mixing
- » CIP / Sterilization
- » Sludge Dewatering



#### Waste Water Treatment

- » Sand & Grease Trap
- » Primary Clarifier
- » Activated Sludge
- » Secondary Clarifier
- » Sludge Dewatering



#### **Reuse of Waste Water**

Reuse Systems normally consist of a waste water treatment with generally several drinking water process steps following

- » Neutralization
- » Chemical Distribution
- » Dosing / Mixing
- » Anaerobic Stage
- » Biogas Flare & CHP

#### **Application: Sea Water Intake**







#### **Application: Sea Water Intake**







## **Application : Pumping Stations**





### **Application: Cooling**











## **Application : Cooling**







## **Application: Chemical Conveyance**









## **Application: Chemicals Conveyance**







## **Application : Containment**





#### **CONTAIN IT PLUS**

#### CONTAIN IT

#### DOUBLE SEE





#### **Application: Water Treatment**









#### **Application: Membrane Technology**



### **Application : Multi Media Filtration**



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## **Application : Ultrafiltration**





# Application: Water & Gas Distribution +GF+









#### **Application: Fire Mains**









#### **Application: Safety Showers**











## **Application: Marine**



## Oasis of the Seas

+GF+ Material 350 000 iFIT fittings 150 000 metres PB pipes 8 200 PP-H ball valves

> Key Data: 362 m long Height 65m above sea level 3 800 cabins 5 400 guests 2 165 crew

#### **Application:** Aviation





#### **Application: Hotel Refurbishment**





## **Application : Compressed Air**



- ecoAIR
- INSTAFLEX
- SANIPEX MT









## **Value Added Services**

#### **Value Added Services**



We Offer Value Added Services for our customers

- Project- / On-site Support
- (Re-) Engineering
- Pipe System Design (2D and 3D)
- Application Advice (ie. chemicals)
- Customizing
- Prefabrication
- Machining
- Training



#### **Product Innovation**











QR-Code –Technical information online via Smartphone



## **Applications: Customising**







#### Customising









## Jointing Technology



	1	PE100	PVC-U	PVC-C	PROGEF (PP)	PROGEF (PP-n)	SYGEF (PVDF)	Contain- IT Plus	COOL- FIT ABS
<u>Solvent</u> <u>Cementing</u>	1								
Butt fusion	1								
Socket Fusion	1								
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# **Project References** (Past)

#### **Municipal Drinking Water** United Arab Emirates







Project Name	Fujairah II Water Production Plant (UAE)
Type of Object	Hybrid plant : RO Desalination / MED
Basic Data	150 000M <sup>3</sup> /day Water production Sea Water Reverse osmosis
Place of installation, Country	Fujairah: United Arab Emirates
Owner, Country	Abu Dhabi Water & Electricity Authority
Date of Installation	2009
GF Piping Material	HDPE, PVCU, PVDF, Sygef PFA

#### **Municipal Waste Water** UAE - Dubai





Project Name	Al Awir sewage treatment plant
Type of Object	DAF – Dissolved Air Flotation Unit
Basic Data	PVC-U Pipes, Fittings and Valves (manually operated and automatically ones) for dosing of HCI, $H_2SO_4$ , NaOH and Flocculated from esti´mated 43 nm to 4- Breite.
Place of installation, Country	Al Awir, Dubai
Owner, Country	Dubai Municipality
Date of Installation	2010
GF Piping Material	PVC-U, PVC-C

#### **Atlantis on Palm Jumeirah, Dubai (UAE)**





Project Name	Atlantis Hotel, Palm Jumeriah
Type of Object	Hotel. Resort
Place of installation, Country	Dubai: United Arab Emirates
Owner, Country	Private
Date of Installation	2006- 2008
GF Piping Material	Polybutylene – Instalfex up to d225mm for Hot and cold water services

#### **Emirates Palace Hotel, Abu Dhabi (UAE)**





	Mashail
Project Name	Emirates Palace Hotel
Type of Object	Hotel. Resort
Place of installation, Country	Abu Dhabi: United Arab Emirates
Owner, Country	Private
Date of Installation	2004
GF Piping Material	Polybutylene – Instalfex up to d225mm for Hot and cold water services. Polyethylene for LPG Gas Services







#### Municipal Waste Water Al Yassat Island Dubai, UAE







Project Name	Al Yassat Island Private Palace
Type of Object	Desalination Plant
Place of installation, Country	Dubai: United Arab Emirates
Owner, Country	Private
Date of Installation	2009
GF Piping Material	UPVC pipes and fittings, Automated valves ball and butterfly. Euro 140k

#### Municipal Waste Water EMAL Abu Dhabi, UAE







Project Name	EMAL – PHASE II
Type of Object	SWRD Desalination plant
Basic Data	150 000M <sup>3</sup> /day Water production Sea Water Reverse osmosis
Place of installation, Country	Abu Dhabi: United Arab Emirates
Owner, Country	UAE Government
Date of Installation	2013
GF Piping Material	PP-H, PVDF, Automated valves & manual valves

#### Municipal Waste Water Oman Khazzan Project, (Sultanate of Oman)







Project Name	Oman Khazzan Project
Type of Object	Raw water treatment plant 6000 m3/day (process and drinking water)
Place of installation, Country	Abu Dhabi: United Arab Emirates
Owner, Country	BP / Omani Government
Date of Installation	2014
GF Piping Material	UPVC sch80 & valves


# **Project References** (**Present**)

## Abu Dhabi Airport - Midfield Terminal Building (MTB)

+GF+

- One of the Largest Projects in UAE: Est 2.9 Billion\$
- Client : ADAC
- Main Contractor: TAV,CCC & Arabtec JV
- Application: UT/BT/IS
- Products: PPR, ELGEF, GFO machines, WAGA, UPVC/CPVC
- GF Part: 850 K Euro supplied up to now and Est.1.5 M Euro To come
- Completion: 2017





## New Doha International Airport, Qatar, Doha



- Polyethylene PE100 (Project Value Euro 1.4 million)
  - Airport opened 30<sup>th</sup> April 2014
  - Project started 2004
  - Built on reclaimed land
  - GF project supplier since 2008
  - Fire Main, Water Supply, Irrigation, Sewage,
  - 221 km PE pipes.
  - 31,788 Joints (BF and EF)
  - 28 Joint Failures due to welder
  - 0.088% Failure rate





## Oil Terminal 2 Phase II Top Side Facility, Port of Fujairah, Fujairah, UAE



- Port of Fujairah is the only multi-purpose port on the Eastern seaboard of the UAE
- Full operations started in 1983
- Our PE piping for UG Firemain application at Port of Fujairah:
  - In 2004 OT1 Phase I
  - In 2009 OT1 Phase II
  - In 2012 OT2 Phase I
  - Now OT2 Phase II is ongoing



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## Water Treatment projects in Praslin and Mahe, Seychelles

- First project for GF Dubai in Seychelles – (Project Value Euro 278K)
  - Direct supply to the contractor, Tornado with more margin
  - Products included: PE, PVC, PP, BF machines, manual and actuated valves
  - Tornado had used GF products in their previous projects and convinced of the high quality
  - PE piping selected for sea water due to corrosion resistant and long lasting

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## Fish Farm Project - Phase l in Jebel Ali, Dubai - UAE

- Fish Farm for Salmon & Sea Bream Fish – (Project Value Euro 100K)
  - Crown prince of Dubai is the client for this project
  - Products Involved: PE & PVC fittings, PVC ball valve, check valve and diaphragm valves
  - Phase II and III are imminent and are larger than Phase I
  - Installation is being carried out by our agent's welding team trained by GF







## Sabah Al Salem University City Kuwait



6 million sqm 15 colleges

Part of 2025 masterplan 39000 students

Delivered: Instaflex, PE, Fuseal, PVDF, PVC Duct ~5MEURO (30% of total package)





## GF supports Petroleum Research in Saudi Arabia

### Euro 1.3 million of ELGEF, PRIMOFIT and WAGA Supplied

- Project: KAPSARC King Abdullah Petroleum & Research Centre.
- Application: Potable water, Fire Main, Drainage, Chilled Water
- Client: Aramco Saudi Arabia
- Consultant: Aramco Saudi Arabia
- Contractor(s): SK Saudi (South Korean), Drake & Skull (KSA)





### GF Dubai, UAE "Includes First Branch Saddle in KSA"









## PE100 References – Saudi Arabia

#### **Potable Water Distribution**

- Nationwide approved for use up to 250mm (225mm) (MOWE, NWC. Local WA)
- Khamis Mushait / Abha Authority ≤ 250mm
- Jizan using PE ≤ 400mm Qassim Authorty a project of 560 mm 13 km
- 2nd Industrial City, Riyadh, Jeddah & Qassim upto 315mm

#### Chilled Water:

- Royal Commission Yanbu (Technical Institute) ≤ 355mm
- King Abdullah Pet. & Resc. Centre (KAPSARC/Aramco)
- King Fahd National Library ≤ 450mm

#### Fire Fighting:

- National Guard (King Abdulaziz Medical City) Sites Jeddah, Riyadh, Hassa, Madina.
- King Saud University. / KAPSARC
- Ministry of Defence (Base of air military forces (Riyadh, Jeddah).
- Jabal Sayed Bareq Mining Project up to 560 mm

#### LPG

• Princess Noura University for Women – + Several Colleges Riyadh / Qassim



# **Concerns with Plastic Pipe Systems**

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## Problem

## Application

- Design
- Installation
- Jointing at Site
- Commissioning
- Operation and Maintenance

## Solution

• Training and Education



**GULF PLASTICS PIPE ACADEMY** 

# **Gulf Plastics Pipe Academy**

## www.gulfplasticspipes.org





# Conclusions

# Worldwide at home Whole Life Costing

The whole-life cost of a building can be defined as:

## "The cost of acquiring, operating and maintaining a building over its whole life through to disposal"

It is estimated that up to 80% of a building's whole-life cost can be attributed to running, maintenance and refurbishment costs. Consequently, there are spikes in expenditure at 10 years and every five years after that.

The initial choice of materials and the way that they are protected obviously plays an important role within the maintenance and refurbishment costs of a building over its lifetime. They therefore have a very large influence on the whole-life cost profile of the project.





#### Smoothing the expenditure

Life cycle expenditure tends to inherently produce "spiky" profiles with large peaks at 10, 15, 20, 25 years





## **Impact and Ownership of Quality**

Value Chain	Months	%
Raw Material Manufacturer	1	0.2%
Pipe + Fitting Manufacturer	3	0.5%
Contractor	14	2.3%
Pipeline Owner	600	97.1%
<ul> <li>Raw Material M</li> <li>Pipe + Fitting M</li> <li>Contractor</li> <li>Pipeline Owner</li> </ul>	anufacturer anufacturer	

### Worldwide at home **Present Traditional Solution**





### Metal

- welding
- labour
- price stability ?
- on-site theft

### Corrosion

- external
- internal
- encrustation



### **Post-Insulation**

- irregular shapes
- large dimensions
- not vapour tight
- soft surface rips

Worldwide at home
Remember!



### Old Habits + Old Technology =

### **Predictable Consequences**

### **Old Habits + New Technology =**

### **Dramatically Altered Consequences**

Al Gore 2006 'An Inconvenient Truth"

## Your complete solution provider







# **More Information**

## **New** Web-Site – www.gfps.com





Water Cycle

#### News

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## **New Information on Fitting Bag**



## **New QR Codes**









**New** Apps





**Pipe Engineering App** 



**FlowCalc App** 



## **New** Apps



9900 Transmitter App

## **New Social Networks**



Facebook/GeorgFischerCorporation

Twitter/georgfischer

LinkedIn/GeorgFischer

Xing/GeorgFischer

youTube/GeorgFischerCorp

## **New CAD Library**



Sf Plana Vysholid

## CAD Library

+GF-

- 3D/2D Drawings
- >30 different formats
- Complete GF Product Range
- cad.georgfischer.com.



The comprehensive GAB library is GF Plang Systems' must frequently used planning look. The database comprises over 25,008 provings and technical data on piges, fittings, measurement and control technicalogy, and manual and actuated values.





### Multiple Systems

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Features

#### 12447

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#### Year benefits





# **Connection to Other Materials**

## **MULTI/JOINT<sup>®</sup>** range of fittings:





## The problems of connecting pipes:



- Different outside diameters
- Rough or damaged pipe ends
- Different pipe materials

For example DN100:

Cast iron: 116-124mm

Ductile iron: PVC: 108/110mm 114,3/125mm Asbest Cement: 120-132mm Steel: 104 -114,3mm

Total range: 104-132mm

110/125mm

PE:

The MULTI/JOINT<sup>®</sup> DN100 covers all DN100 pipes!



# +GF+ The World cannot function without... View



#### .... Piping System's inside



# Thank you on behalf of

**GF Piping Systems Mashail**