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

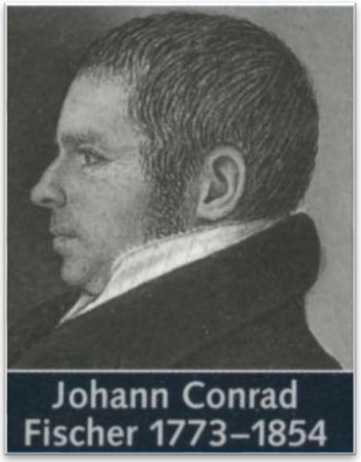
Get to know GF Piping Systems

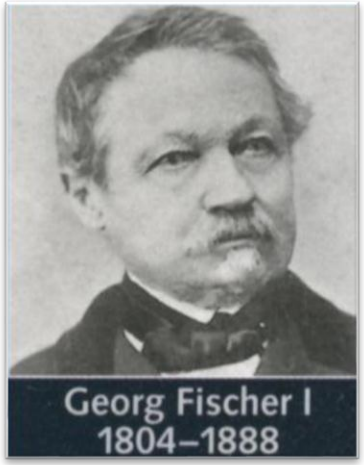
Internationally Recognised

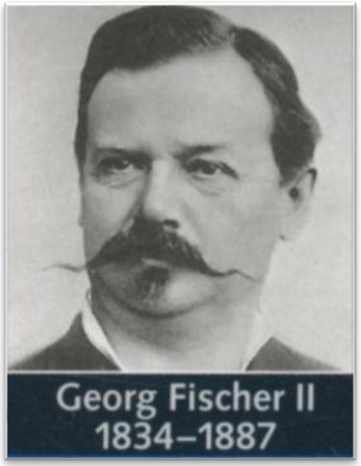
Local Partner

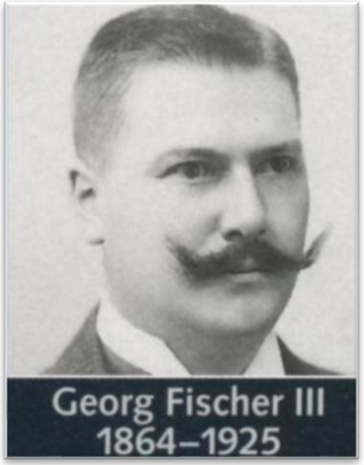
History

Industrial pioneers with a long history


Johann Conrad Fischer 1773–1854


Georg Fischer I 1804–1888


Georg Fischer II 1834–1887


Georg Fischer III 1864–1925

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.

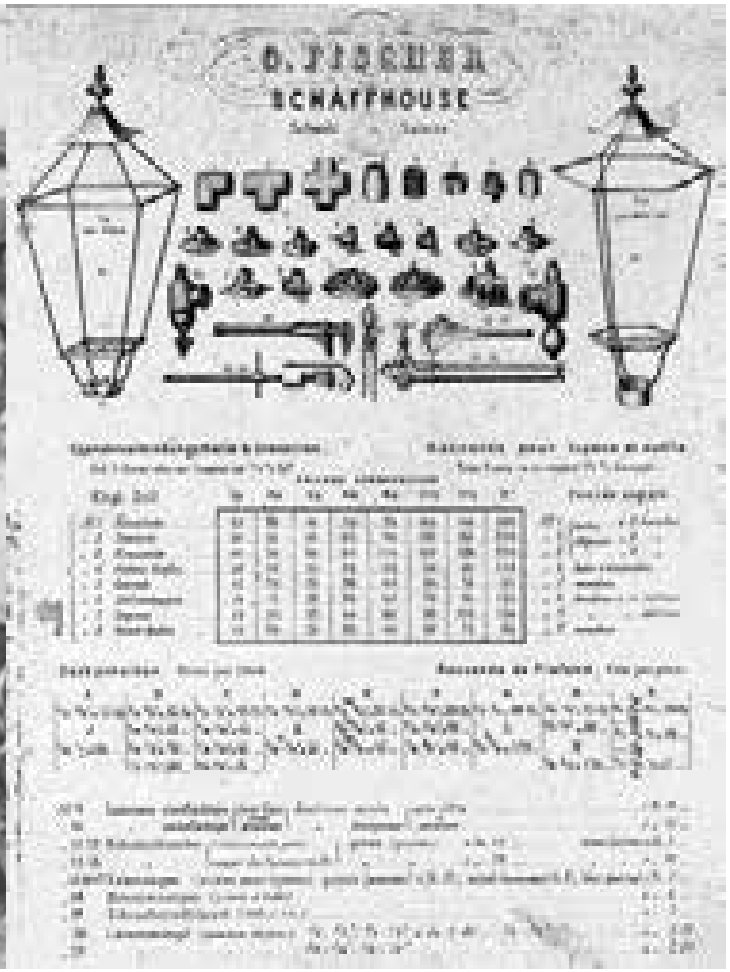
1864 Georg Fischer II takes over and renames the company after himself.

Start of industrial fittings production in malleable iron.

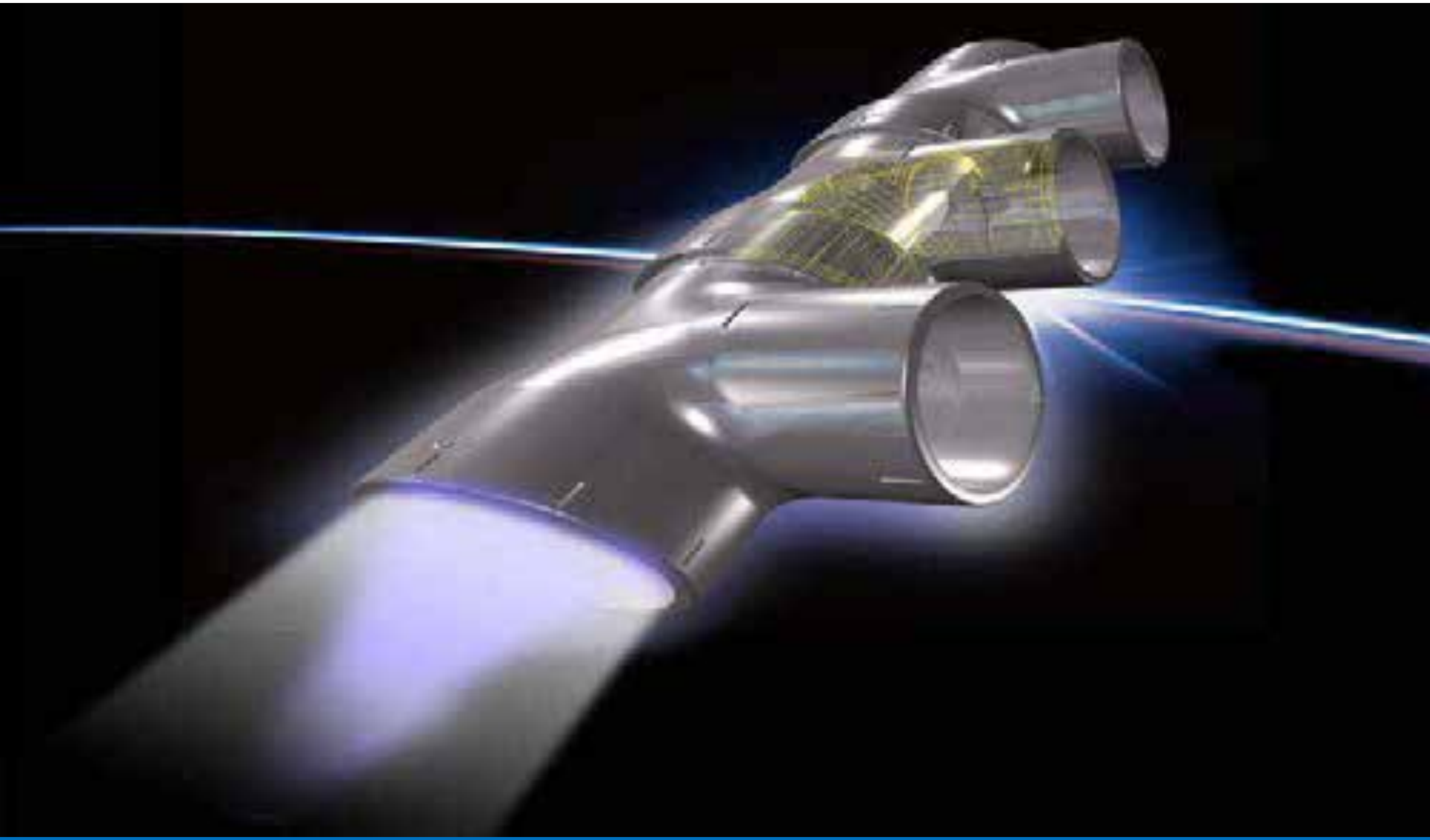
1895 Georg Fischer III establishes plant in Singen.

1896 Family retreats with an IPO to the Zurich stock exchange.

We are driven by our tradition of innovation and passion



PVC Solvent Cement Fittings 1957



Present

We are dedicated to…

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

Pipes

Fittings

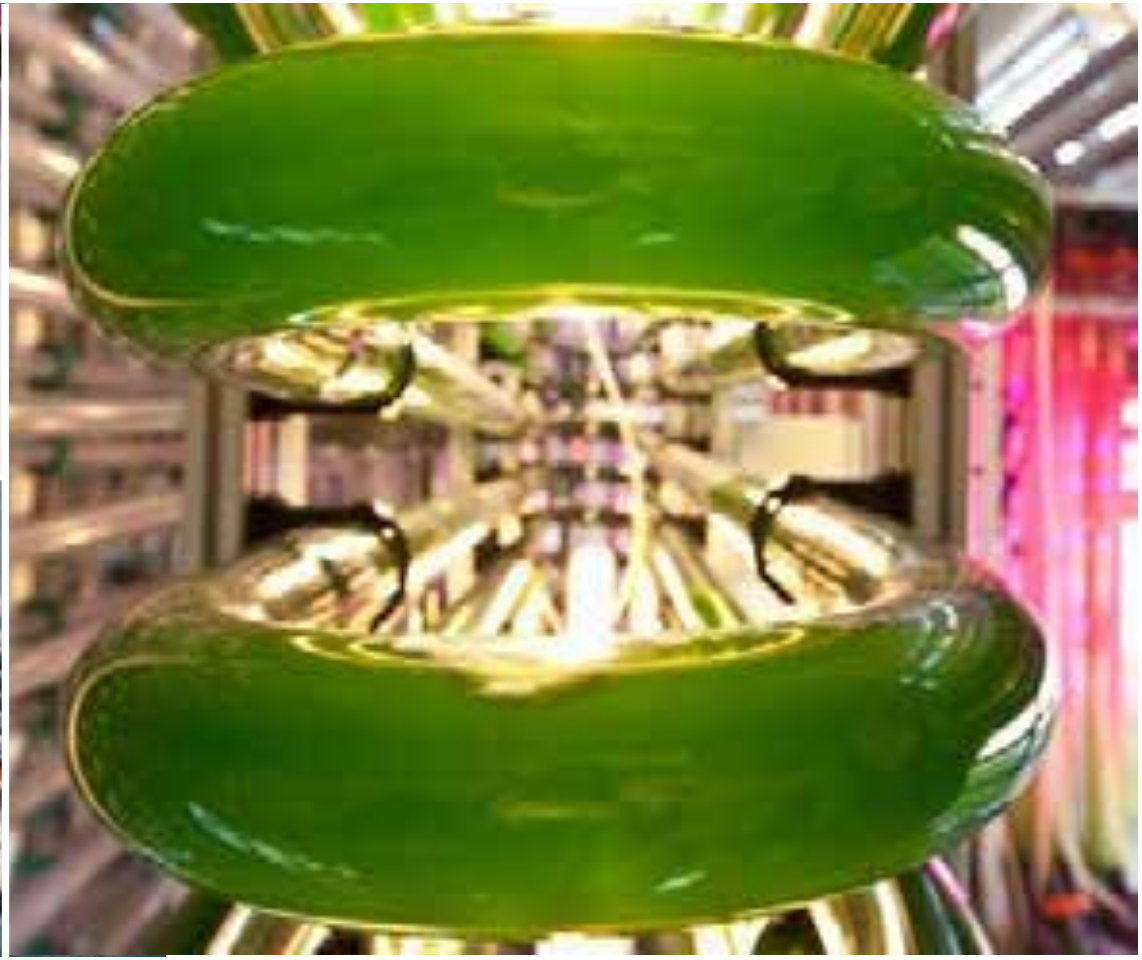
Jointing Technologies

Valves

Automation

Measurement & Control

Meeting individual application needs in your market segment



From water extraction and treatment …

Sea water extraction and desalination treatment

Chlorine Analyzer System

PE Piping

Actuated Ball Valve

…and many more!

… to waste water treatment and reuse…

Waste water treatment facility

3-Way Ball Valve

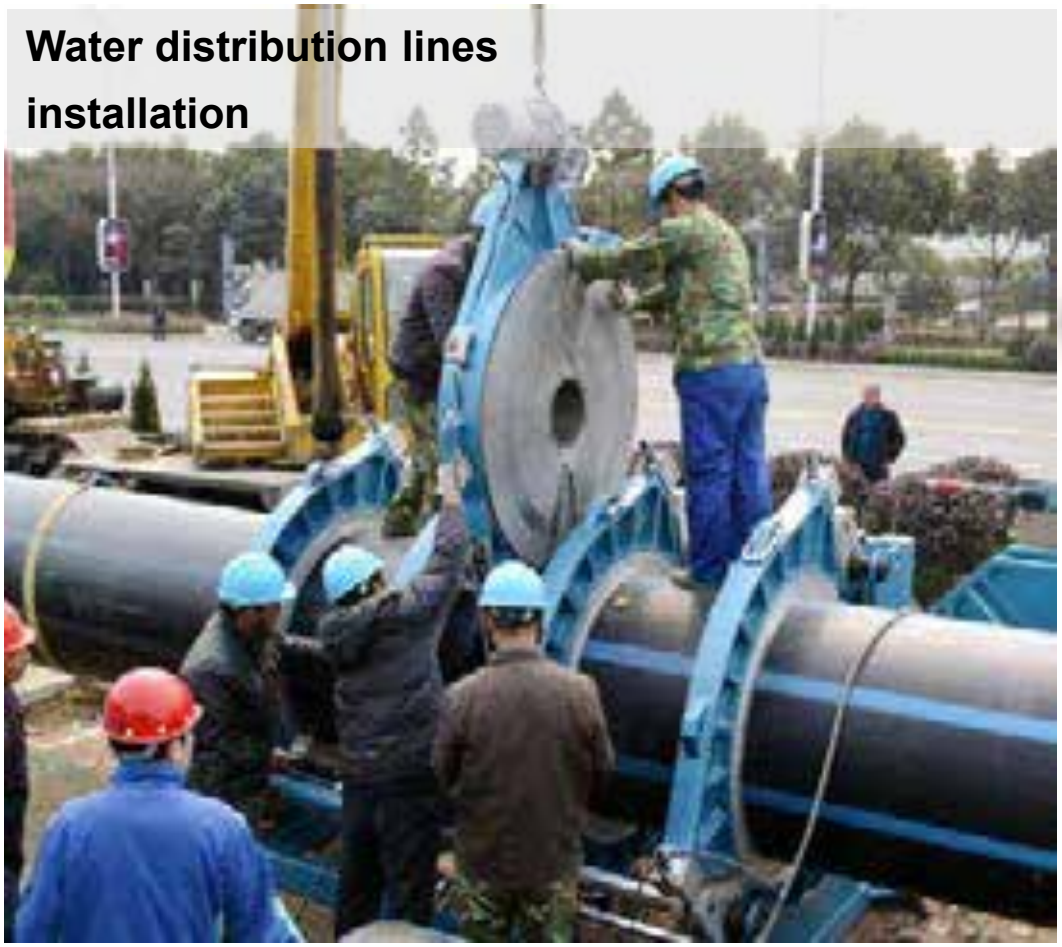
Pneumatic Diaphragm Valve

2270 Ultrasonic Level Sensor &
2260 Ultrasonic Level Transmitter

…and many more!

… to water distribution…

Water distribution lines installation



ELGEF Branch Saddle System Topload

ELGEF Plus Electrofusion Coupler

…and many more!

In your water and gas utility network

Our solutions

In your industrial applications

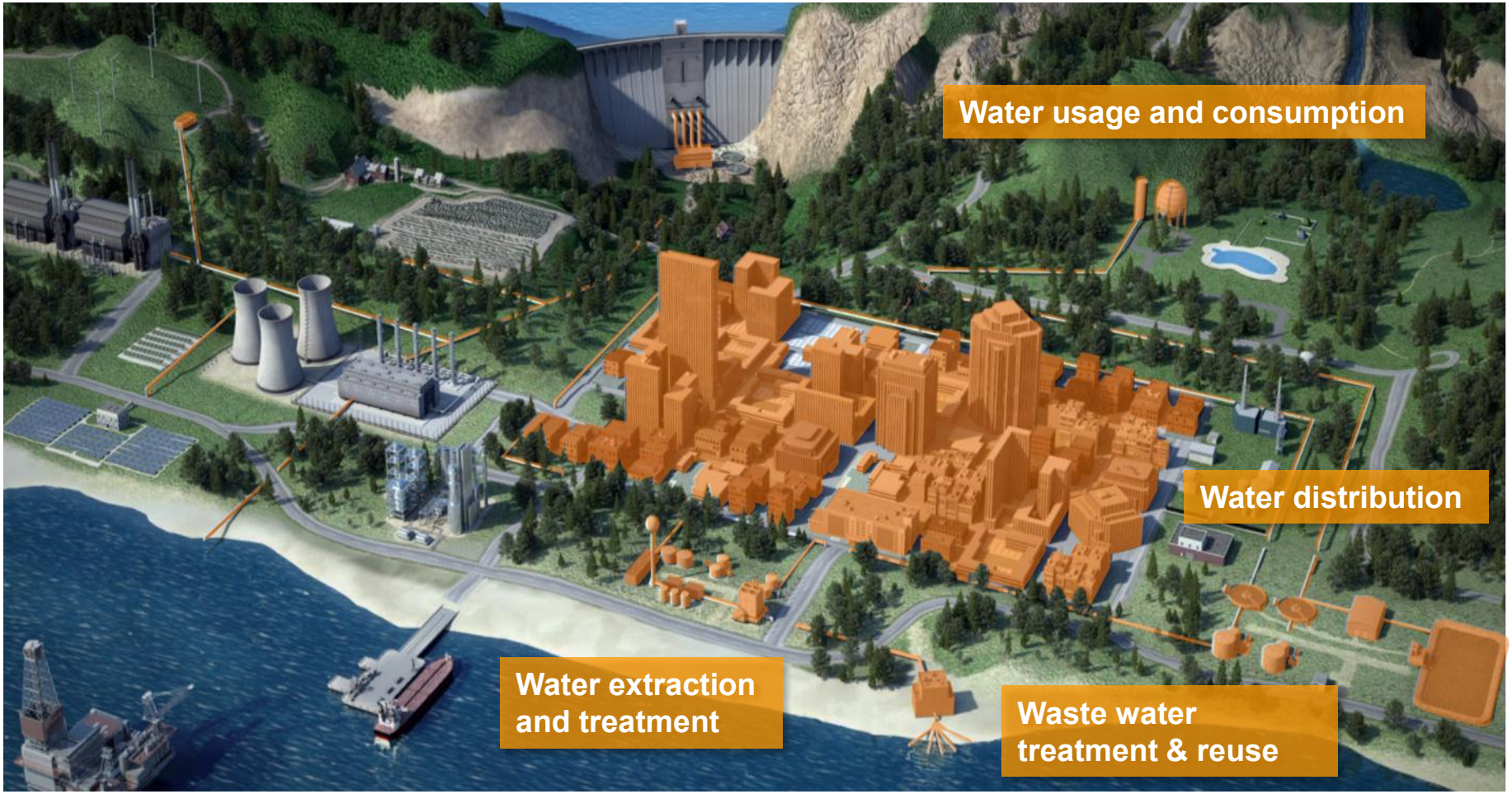
Our solutions

In your building projects


+GF+
Successfully realized
for you

From source to point of use

Wherever you are positioned within the water cycle



With environment-friendly piping systems

We keep your water flowing in…

For quality and efficiency of processes

We develop corrosion-free systems for your industrial applications.

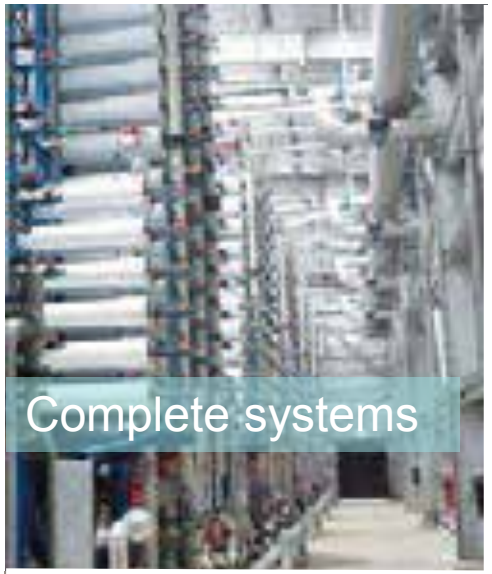
For safety and reliability in distribution

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.

We have the right solution for you



With more than 60 000 products we suit your every need

Worldwide at home

You can find us worldwide

Water Quality

Challenges ahead

Biggest Challange

Corrosion

+Key Benefits of Plastics

+GF+

Mashail

Corrosion-free
- Product lifetime over 50 years*
- No incrustation thanks to smooth internal surface

Chemical resistance
- Good compatibility with chemicals
- Most economical solution for your requirements

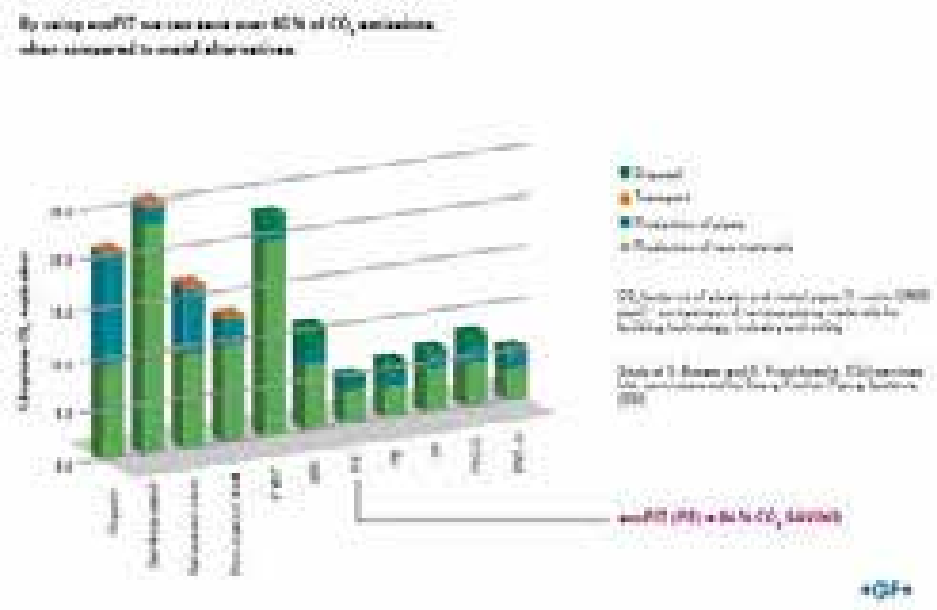
Low total cost of installation
- Reduced pipe sizes
- Reduced welding times

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

Low thermal conductivity
- Thermal insulation – no additional wrapping costs
- No corrosion due to less condensation and higher resistance results in cost savings

No electrical conductivity
- No corrosion
- No additional earthing required

Benefits of Plastics



+ Low Carbon and Water Footprint

+ Material Recyclability

+ Reduced Environmental Impact

+ Global Quality Standards
  BS, ASTM, ISO, JIS….

+ Total System Capability
  Pipes, Fittings, Valves, Instrumentation, Jointing Machinery

+ No hot work permits

Traditional Materials mean

Material Recommendations

Over 20 Different Systems…

+GF+

Mashail

>60,000 Products

PE/ecoFIT

PVC-U

PVC-C

PROGREF Standard
PROGREF Plus (PP)

PROGREF Natural (PP)

SYGEF Standard
SYGEF Plus (PVDF)

Mechanical Fittings

CONTAIN-IT Plus

Automation

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	+	-	-

ecoFIT vs Carbon steel vs GRP

+ = Good
- = Negative aspect

Which Material is Suitable for my application?

- 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.

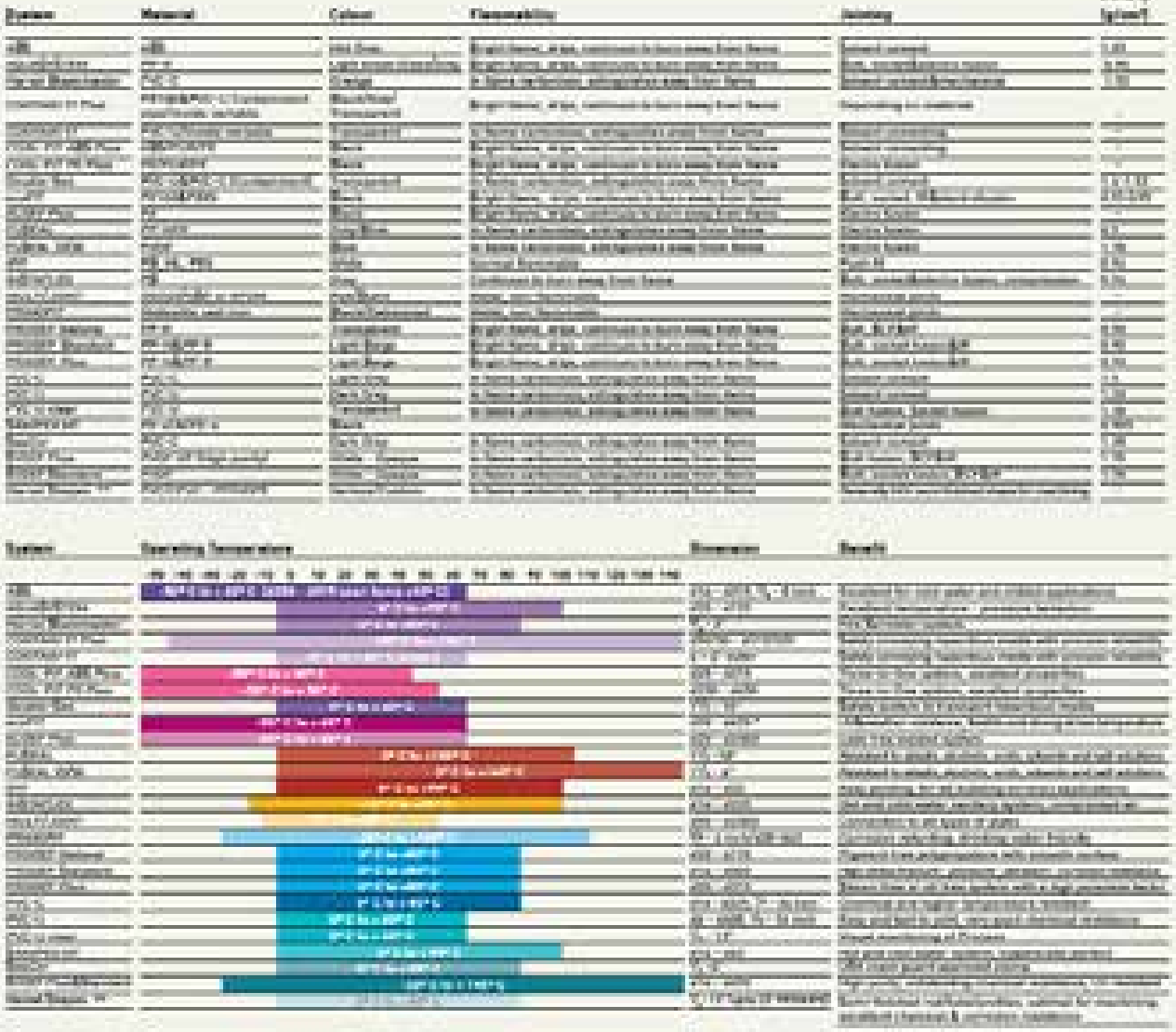
- For design and installation, the comprehensive *Planning Fundamentals* technical manual will provide you with all the important data for the planning, product selection, installation and commissioning of pressure pipelines in industrial applications.

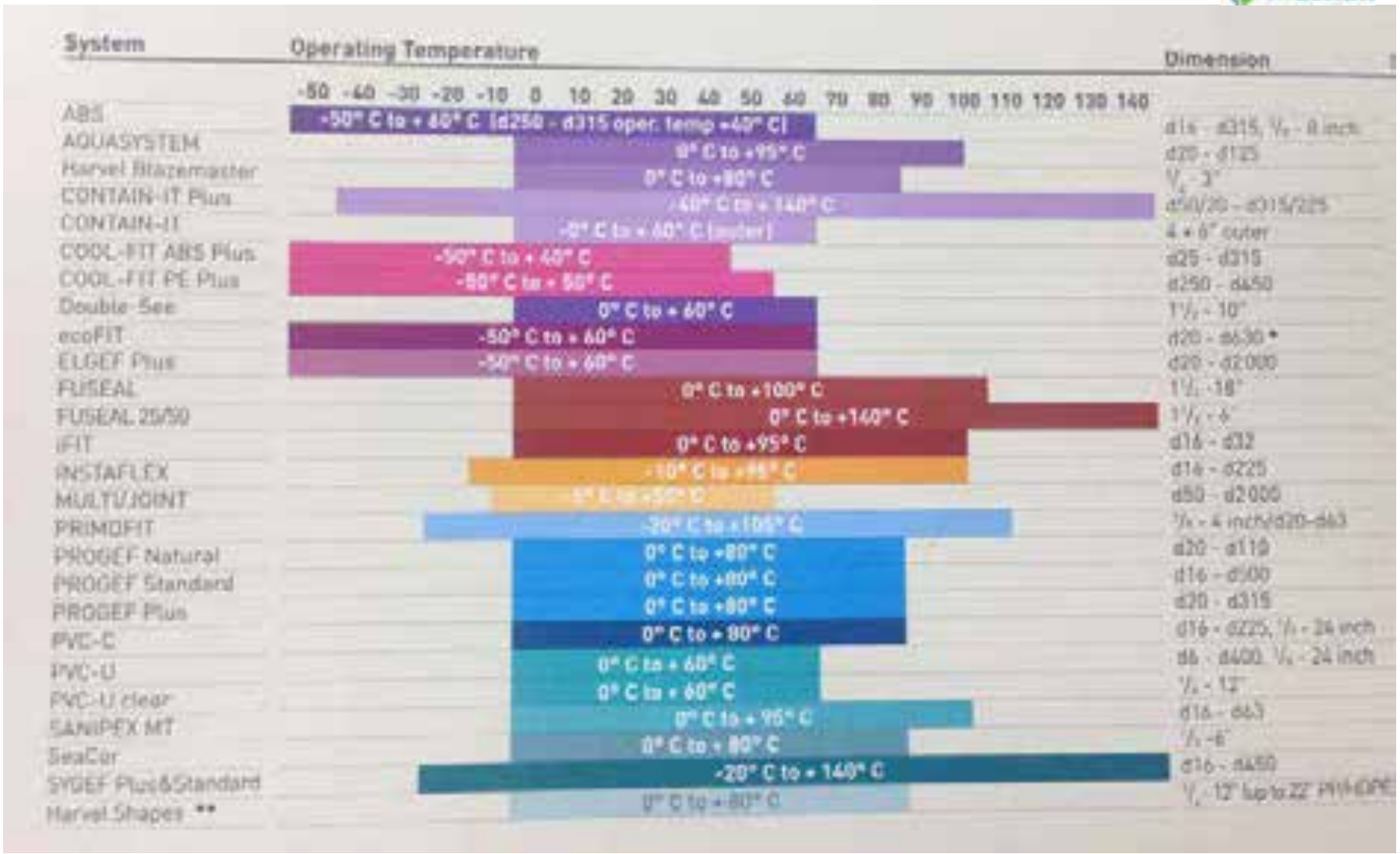
- CAD data is available via a CD or online, to help with designing.

Typical Chemicals

▪ Chlorine Water	$Cl_2\,H_2O$	PVC-U, PVC-C
▪ Bromine	Br_2	PVDF, PFA
▪ Sulphuric Acid	H_2SO_4	PVC-U,PVC-C, PE100, PP,PFD, PFA
▪ Hydrofluoric Acid	HCl	PVC-U, PVC-C, PE100, PP, PVDF, PFA
▪ Caustic Soda	$CaOH_2$	PVC-U, PVC-C, PE100, PP
▪ Sodium Hypochlorite	$NaOCl_2$	PVC-U
▪ Sodium Chloride	NaCl	PVC-U, PVC-C, ABS, PE100, PP
▪ Hydrogen Peroxide	H_2O_2	PVC-U, PE100, PP
▪ Iron Chloride	$FeCl_3$	PVC-U, PVC-C, ABS, PE100, PP, PVDF, PFA
▪ Phosphoric Acid	H_3PO_4	PVC-U, PVC-C, PE100, PP, PVDF, PFA
▪ Acetic Acid	CH_3-COCH	PVC-U, PVC-C, PE100, PP, PVDF, PFA
▪ Hydrofluoric Acid	HF	PVC-U, PE100, PP, PVDF

Systems & Materials




System
Operating Temperature
Dimension
-50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140
ABS
AQUASYSTEM
Harvel Blazemaster
CONTAIN-IT Plus
CONTAIN-IT
COOL-FIT ABS Plus
COOL-FIT PE Plus
Double-See
ecoFIT
ELGEF Plus
FUSEAL
FUSEAL 25/50
iFIT
INSTAFLEX
MULTIJOINT
PRIMOFIT
PROGEF Natural
PROGEF Standard
PROGEF Plus
PVC-C
PVC-U
PVC-U clear
SANIPEX MT
SeaCor
SYGEF Plus&Standard
Harvel Shapes **
-50° C to + 60° C (d250 - d315 oper. temp +40° C)
0° C to +95° C
0° C to +80° C
-40° C to + 140° C
-0° C to + 60° C (outer)
-50° C to + 40° C
-50° C to + 60° C
0° C to + 60° C
-50° C to + 60° C
-50° C to + 60° C
0° C to +100° C
0° C to +140° C
0° C to +95° C
-10° C to +95° C
-20° C to +105° C
0° C to +80° C
0° C to +80° C
0° C to +80° C
0° C to + 80° C
0° C to + 60° C
0° C to + 60° C
0° C to + 95° C
0° C to + 80° C
-20° C to + 140° C
0° C to +80° C
d16 - d315, ½ - 8 inch
d20 - d125
½ - 3"
d40/20 - d315/225
4 + 6" outer
d25 - d315
d250 - d450
1½ - 10"
d20 - d630 *
d20 - d2000
1½ -18"
1½ - 6"
d16 - d32
d16 - d225
d50 - d2000
½ - 4 inch/d20-d63
d20 - d110
d16 - d500
d20 - d315
d16 - d225, ½ - 24 inch
d6 - d400, ¼ - 24 inch
½ - 12"
d16 - d63
½ -6"
d16 - d450
½ - 12" up to 22" PN16/PE

Applications in Plastics

Applications for Water Treatment

Municipal Drinking Water	Municipal Waste Water	Municipal Reclaim System
		
Fresh Water Treatment	**Waste Water Treatment**	**Reuse of Waste Water**
		
Industrial Process Water	Industrial Waste Water	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

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

Reuse of Waste Water

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

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

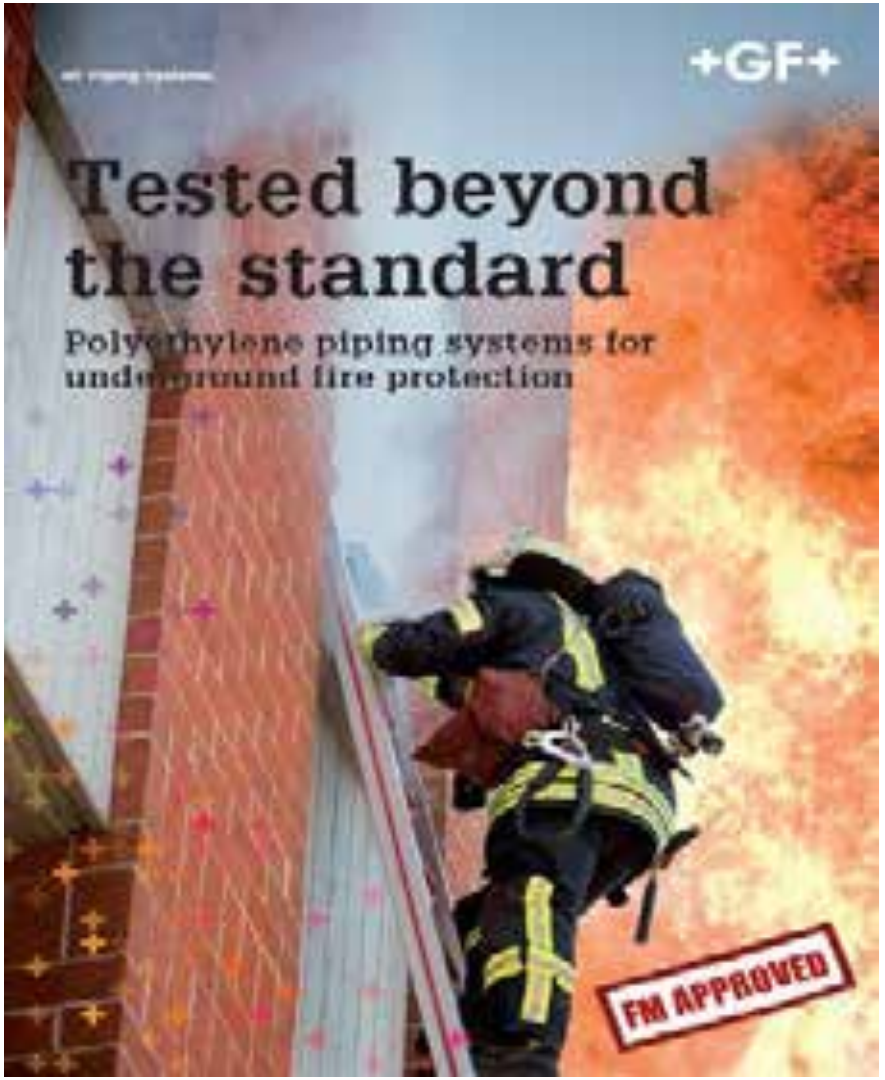
Application: Membrane Technology

Application : Multi Media Filtration

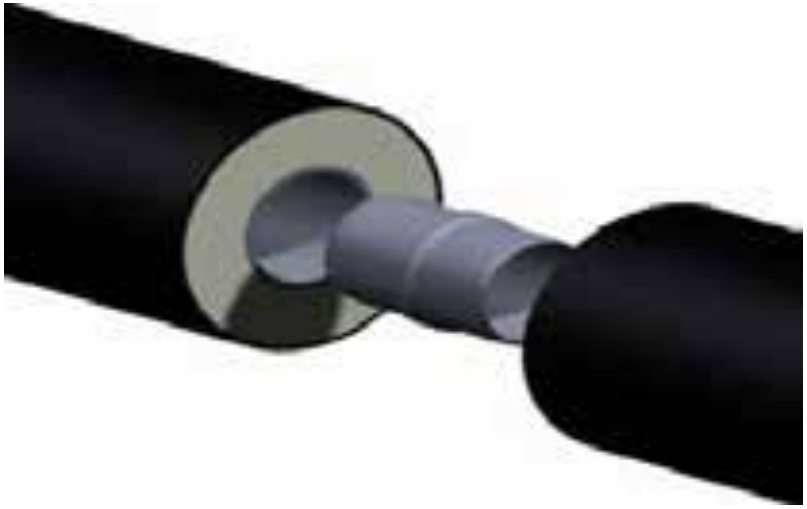
Application : Ultrafiltration

Application: Water & Gas Distribution

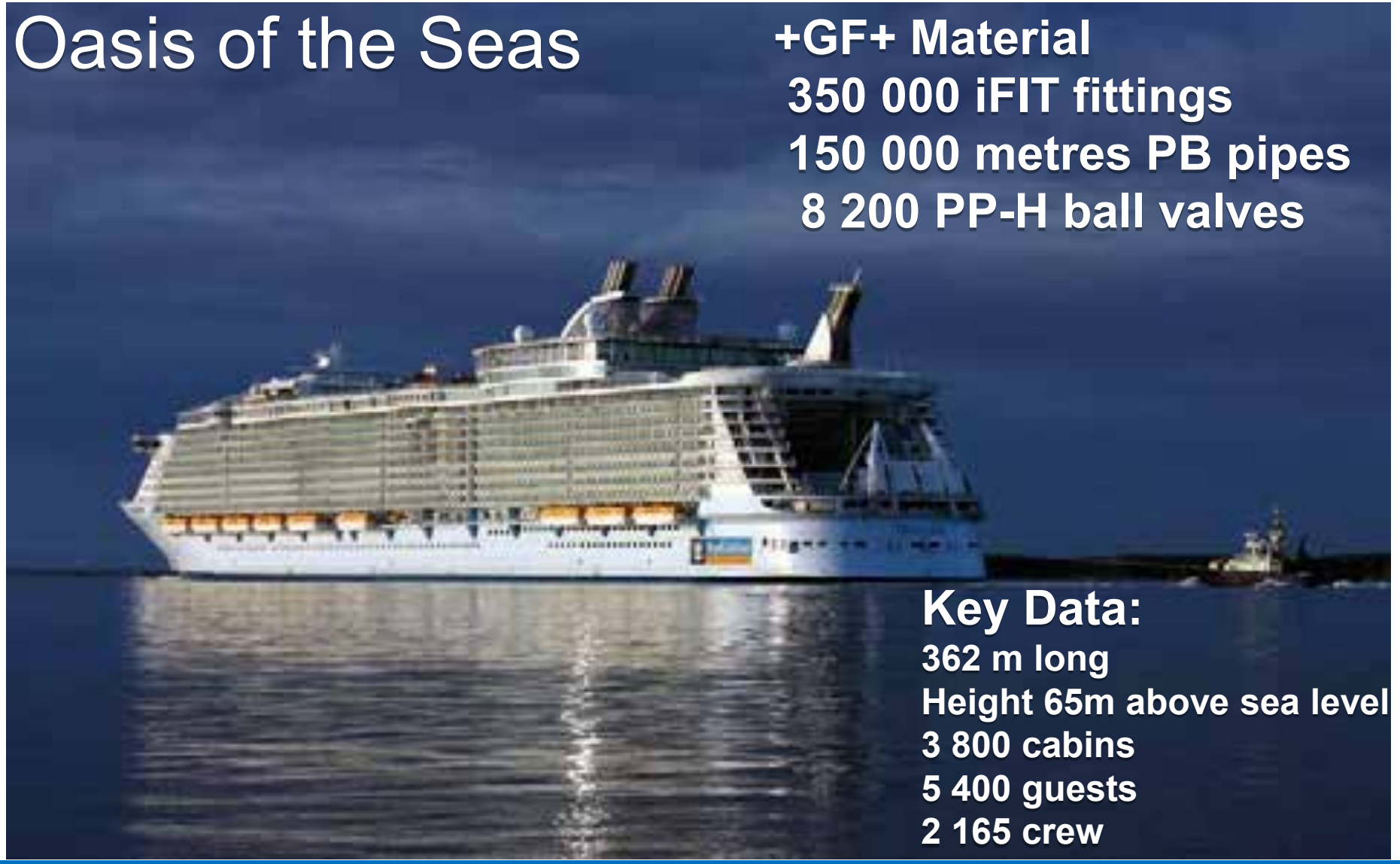
Application: Fire Mains



Application: Safety Showers



Application: Marine



Application: Aviation

Georg Fischer DEKA supplies pipes installed in the Airbus A380.
(Ducting for AC d123mm x 0.5mm)

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

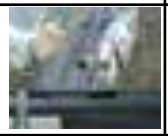
Product Innovation

QR-Code –Technical information online via Smartphone

Applications: Customising

Customising

Jointing Technology

	PE100	PVC-U	PVC-C	PROGEF (PP)	PROGEF (PP-n)	SYGEF (PVDF)	Contain-IT Plus	COOL-FIT ABS
Solvent Cementing 		■	■				■	■
Butt fusion 	■			■	■	■	■	
Socket Fusion 	■			■		■	■	
Electro Fusion 	■						■	
IR Fusion 	■			■		■	■	
BCF Fusion 					■	■		
Mechanical Joints 							■	

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^3/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 HCl, 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)

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 000M³/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)

- **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 30th 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

- GF piping for fire protection (Project Value Euro 175K)
  - 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 Fire-main 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

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

Fish Farm Project - Phase 1 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“

GF Dubai, UAE

„Includes First Cassini 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

Concerns / Issues

Problem

Application

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

Solution

- Training and Education

Gulf Plastics Pipe Academy

www.gulfplasticspipes.org

Conclusions

Whole Life Costing

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

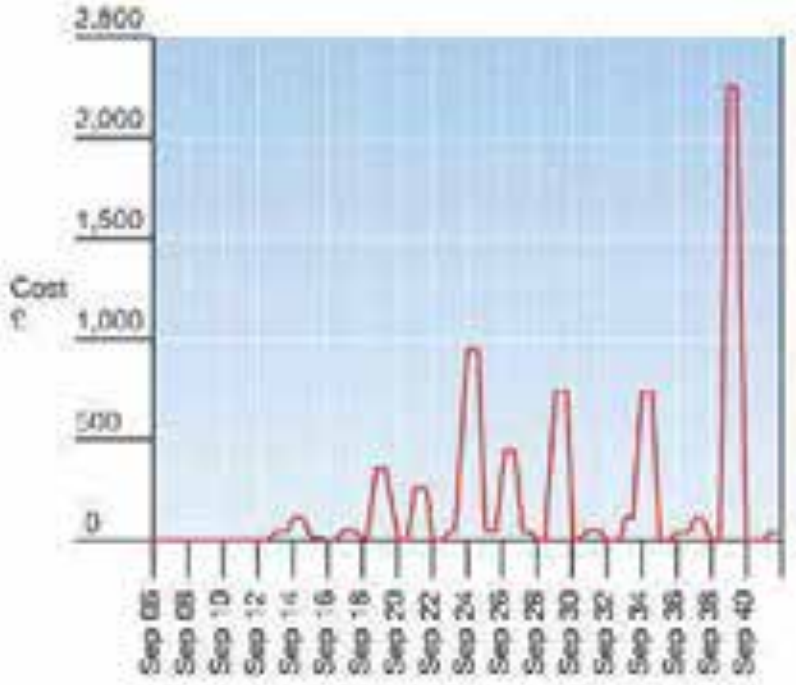
"The cost of acquiring, operating and maintaining a building over its whole life through to disposal"

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.

Design	Build	Operate	Dispose	Total
£ 3%	£ 17%	Run/Maintain £ - 40% Repair £ - 30% Periodic Replacement/Refurbish £ - 10%	£ ?%	100% Cost of Ownership
1 Year	2 Year	25 Years	1 Year	Total

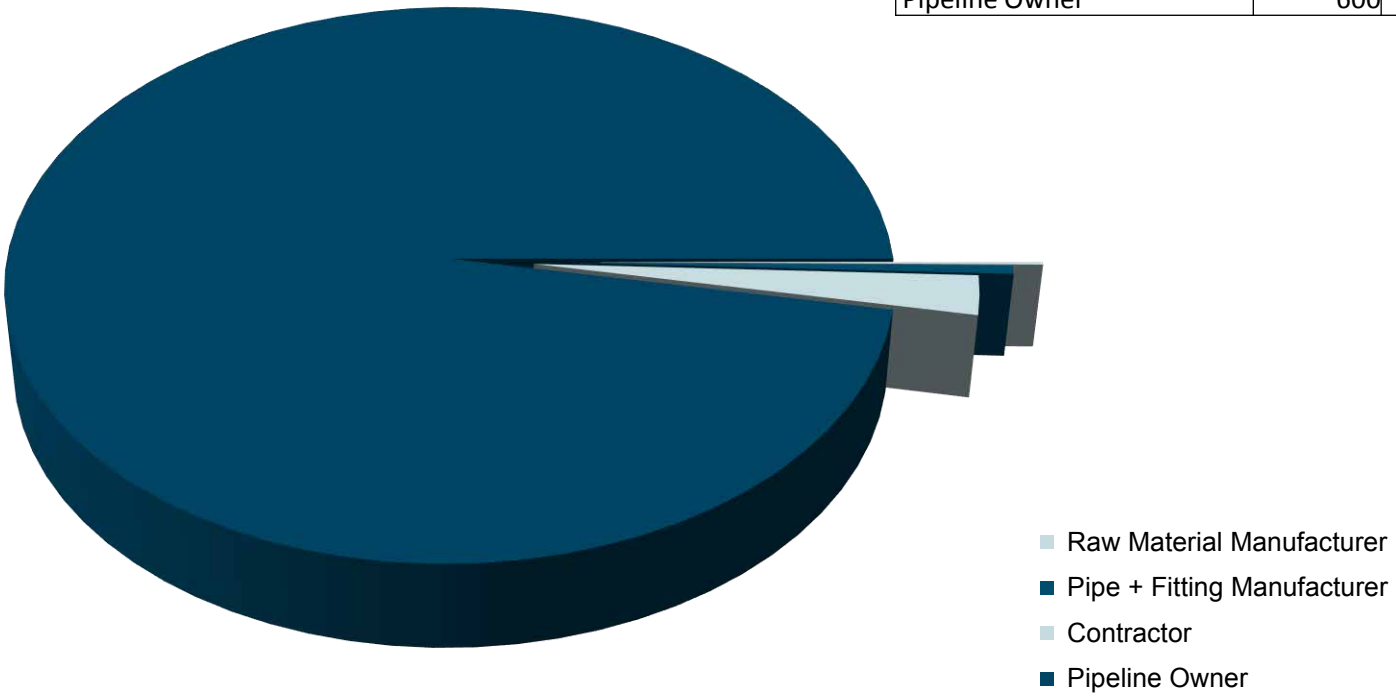
Information supplied by Turner and Townsend, Construction and Management Consultants



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%



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

Remember!

Old Habits + Old Technology =

Predictable Consequences

Old Habits + New Technology =

Dramatically Altered Consequences

Al Gore 2006

'An Inconvenient Truth"

Your complete solution provider

Your Complete Solution Provider

Local training & certification

Local project- and after sales-service

Support with projects and applications

Jointing technology (cement, welded, electrofusion)

Support tools during design stage (CAD)

Customized solutions

Pipes

Double Containment

Fittings

Automation, Measurement & Control

Valves

More Information

New Web-Site – www.gfps.com

New Information on Fitting Bag

Manufacturer

Trade name

Product symbol

Dimension

Batch-No.

Traceability

EAN-code

Manual Fusion data

QR-Code

NEW!

Fusion barcode

New QR Codes

New Apps

Pipe Engineering App

FlowCalc App

New Apps

9900 Transmitter App

New Social Networks

Facebook/GeorgFischerCorporation

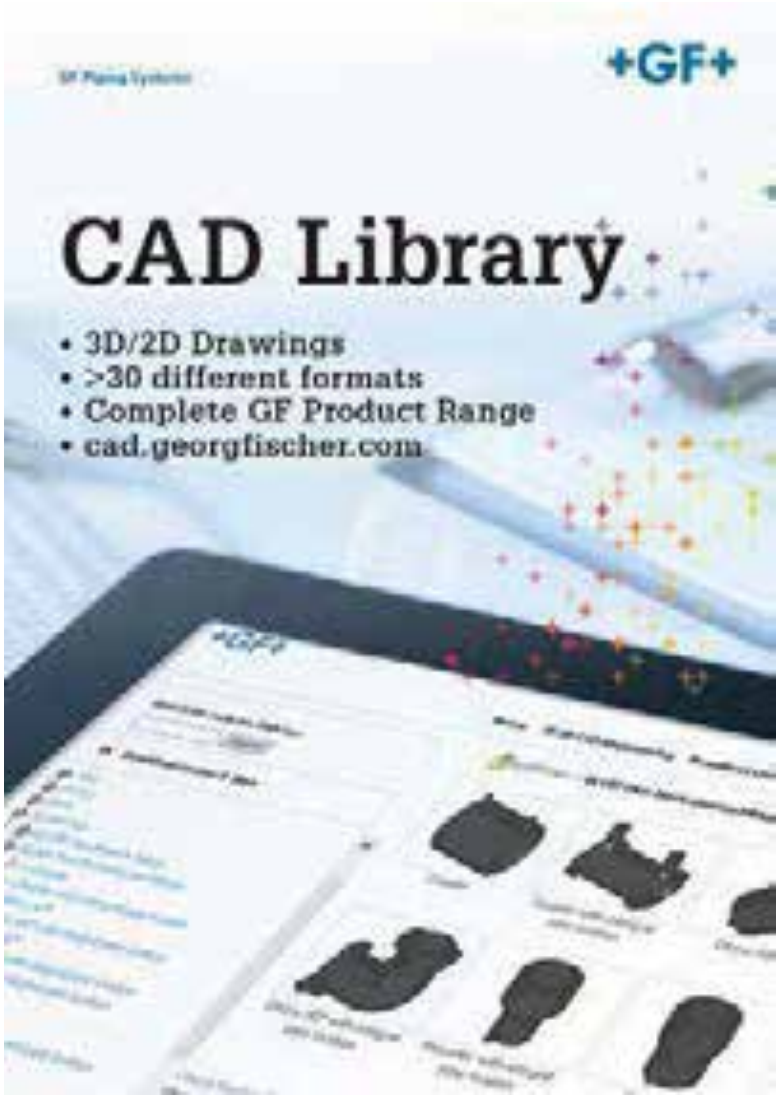
Twitter/georgfischer

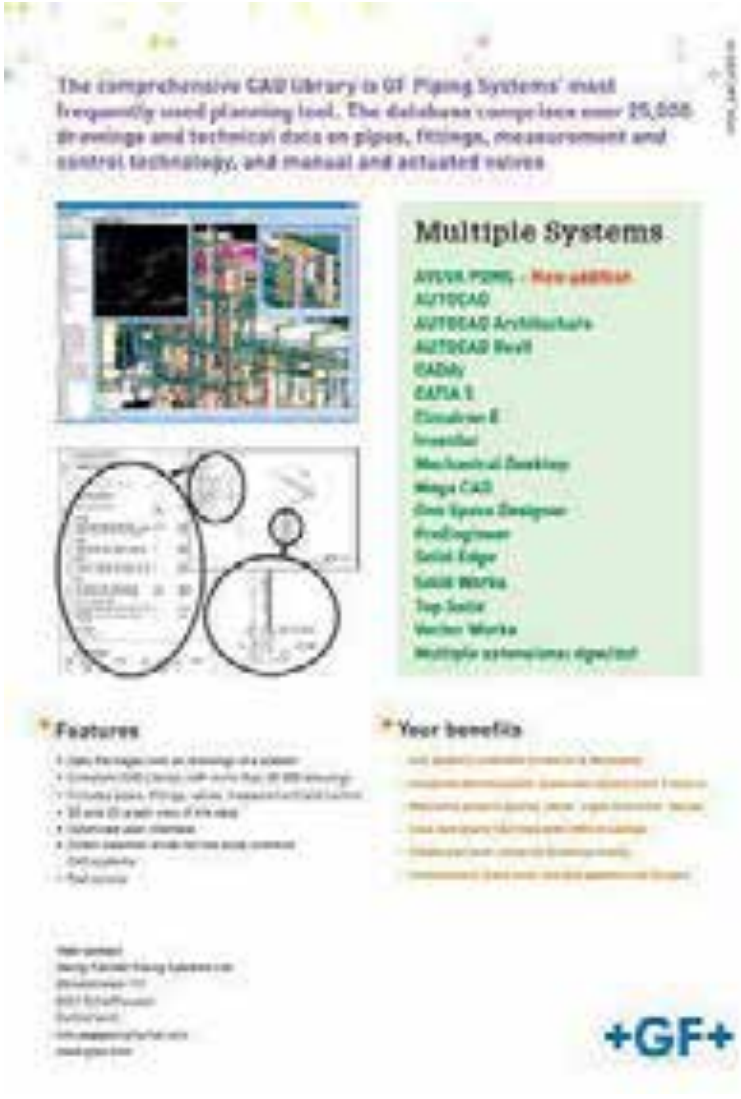
LinkedIn/GeorgFischer

Xing/GeorgFischer

youTube/GeorgFischerCorp

New CAD Library





Connection to Other Materials

MULTI/JOINT® 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: 118mm

PVC: 108/110mm 114,3/125mm

PE: 110/125mm

Asbest Cement: 120-132mm

Steel: 104 - 114,3mm

Total range: 104-132mm

The MULTI/JOINT® DN100 covers all DN100 pipes!

The World cannot function without…

…. Piping System's inside


Thank you on behalf of
GF Piping Systems
Mashail