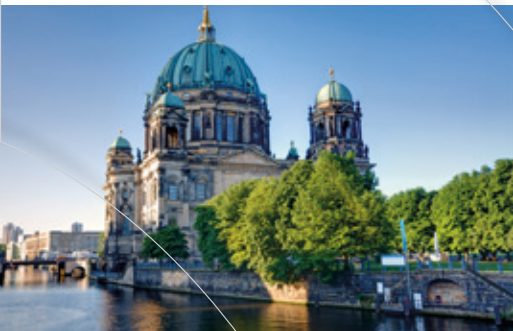


# DUCTILE IRON PIPE SYSTEMS

Information of the European Association for Ductile Iron Pipe Systems · EADIPS®

55



# Topics and Authors

4 Brief des Herausgebers / Letter from the editor

6 Schnellübersicht / Abstracts

## EADIPS FGR News

12 **Annual report 2020/21 and perspective in 2022**

Manfred Künze, Christoph Aigner and Christoph Bennerscheidt

17 Social Media and Newsletter

## Technical articles "Solid reason" for soil and water protection

18 **The best water – a solid reason**

Christoph Dietiker

24 **Maximum security – a solid reason**

Daniela Usenbenz

30 **The resources cycle – a solid reason**

Steffen Ertelt and Friedrich Greiser

38 **#reduceplastic – a solid reason**

Kai Sengwitz

46 **Cooler cities – a solid reason**

Christoph Aigner and Christoph Bennerscheidt

52 **Regionality – a solid reason**

Christof Mairinger

58 **Short distances – a solid reason**

Andreas Wollnik

64 **Partners with vision – a solid reason**

Stefan Neuhorn and Christoph Dietiker

## Application example

- 70 **The position of the ductile iron pipe in the material mix**  
Michael Schneider and Jürgen Rammelsberg
  
- 76 Members of EADIPS FGR
- 77 Solid reason for soil and water protection
- 77 Solid reason – partners
- 78 Imprint

# Brief des Herausgebers

Liebe Leserinnen und Leser,

es gab schon immer gute technische Gründe für den Einsatz von duktilen Guss-Rohrsystemen in Trinkwasser- oder Abwassernetzen, als Beschneiungs- oder als Kraftwerksleitungen. Anfang 2020 hat uns dann die Corona-Pandemie den Nutzen von Produktionsstätten in Europa mit robusten Lieferketten vor Augen geführt. Zusätzlich haben die Auswirkungen des Klimawandels und die damit verbundenen Notwendigkeiten zur Reduzierung der Treibhausgase sowie zur Entwicklung von Anpassungsmaßnahmen an unterschiedlichen Stellen den Handlungsdruck erhöht. So hat die Europäische Kommission mit dem European Green Deal den Übergang zu einer modernen, ressourceneffizienten und wettbewerbsfähigen Wirtschaft formuliert, die bis 2050 keine Netto-Treibhausgase mehr ausstößt, ihr Wachstum von der Ressourcennutzung abkoppelt und niemanden, weder Mensch noch Region, im Stich lässt. Dies berücksichtigt aber nur unzureichend, dass die Einhaltung der in Europa geltenden Sozial-, Arbeitsschutz und Umwelt-Standards auch bei einer Produktion in Drittländern Anwendung finden muss, wenn entsprechend hergestellte Produkte nach Europa importiert werden.

Dies haben die Mitglieder der EADIPS FGR zum Anlass genommen, die Summe der technischen Gründe und weitergehende Argumente in acht guten Gründen zusammenzufassen und für Kommunen, Netzbetreiber, Planer und ausführende Firmen greifbarer zu machen.

Die Initiative „Der beste Grund – ein guter Grund“ für Wasser- und Bodenschutz startete im September 2020. Darüber hinaus wurde an einer Güterrichtlinie gearbeitet, die es Netzbetreibern europaweit ermöglichen wird, für die Lieferung von duktilen Guss-Rohrsystemen in Ausschreibungen Anforderungen an die Einhaltung von Sozial- und Arbeitsschutzstandards sowie an den Umweltschutz zu berücksichtigen.

In dieser Ausgabe 55 des Jahreshalts GUSS-ROHRSYSTEME finden Sie Beiträge der EADIPS-Mitglieder zu den acht guten Gründen „Das beste Wasser“, „Höchste Sicherheit“, „Kreislauf der Ressourcen“, „#reduceplastic“, „Coolere Städte“, „Regionale Produktion“, „Kurze Wege“ und „Partner mit Weitblick“. In Ergänzung dazu stellen wie gewohnt Vorstand und Geschäftsführung den Jahresbericht vor. Der Beitrag über die Stellung des duktilen Gussrohres im Materialmix eines großen deutschen Netzbetreibers ist ein erfolgreiches Anwendungsbeispiel für einige gute Gründe.

Werfen Sie zusammen mit uns einen Blick über die reine Technik von duktilen Guss-Rohrsystemen hinaus, um gemeinsam die besten Lösungen für unseren besten Grund zu finden.



Es grüßt Sie herzlich



Ihr  
Christoph Bennerscheidt

# Letter from the editor

Dear Readers,

there have always been good technical reasons for using ductile iron pipe systems in drinking water or sewage networks, as snowmaking or as power plant pipelines. Then, in the early 2020s, the Corona pandemic made us realise the benefit of having manufacturing sites in Europe with robust supply chains. In addition, the effects of climate change and the associated need to reduce greenhouse gases and develop adaptation measures have increased the pressure for action in various places. With the European Green Deal, for instance, the European Commission has articulated the transition to a modern, resource-efficient and competitive economy that emits no net greenhouse gases by 2050, decouples its growth from resource use and leaves no one, neither people nor region, in the cold. However, this only insufficiently takes into account that compliance with the social, work protection and environmental standards applicable in Europe must also be applied to production in third countries if products manufactured accordingly are imported into Europe.

The members of the EADIPS FGR have taken this as an opportunity to summarise the sum of the technical reasons and further arguments in eight solid reasons and to make them more tangible for municipalities, network operators, planners and contractors.

The initiative “The best ground – a solid reason” for water and soil protection started in September 2020. Moreover, work was done on a quality directive that will enable network operators across Europe to take into account requirements for compliance with social and work protection standards as well as environmental protection in tenders for the supply of ductile iron pipe systems.

In this issue 55 of the annual journal CAST IRON PIPE SYSTEMS you will find contributions from the EADIPS FGR members on the eight solid reasons “The best water”, “Maximum security”, “The resources cycle”, “#reduce-plastic”, “Cooler cities”, “Regional manufacturing”, “Short distances” and “Partners with vision”. In addition, as usual, the board of directors and management present the annual report. The article on the position of ductile iron pipe in the material mix of a large German network operator is a successful application example for some solid reasons.

Together with us, take a look beyond the pure technology of ductile iron pipe systems to find the best solutions for our best ground.

Warmest greetings



Yours  
Christoph Bennerscheidt

# Abstracts

## Jahresbericht 2020/21 und Ausblick 2022

Manfred Künze, Christoph Aigner und Christoph Bennerscheidt

In den vergangenen zwei Jahren beherrschten die Schlagworte Klimawandel, European Green Deal mit Übergang zu einer modernen, ressourceneffizienten und wettbewerbsfähigen Wirtschaft sowie das Lieferkettengesetz unseren Alltag; Begleitet wurden und werden sie noch von der weltweiten Covid 19-Pandemie, die uns zeigt, wie störanfällig unsere Welt ist. Die Mitglieder der EADIPS FGR haben auf die anspruchsvollen Herausforderungen in der Zukunft u.a. mit der in 2020 gestarteten Initiative „Der beste Grund – ein guter Grund“, bzw. „The best ground – a solid reason“ reagiert und die Vorteile von duktilen Guss-Rohrsystemen zum Anfassen dargestellt.

In Kooperation mit der GET steht nun auch der Entwurf der RAL-Güterichtlinie kurz vor der Fertigstellung. Damit künftig Städte und Gemeinden sowie Netzbetreiber ein Instrument an der Hand haben, mit dem sie qualitativ hochwertige Produkte, die unter Einhaltung hoher Arbeitsschutz- und Umweltstandards produziert wurden, ausschreiben können, kann die kurz vor der Fertigstellung stehende RAL-Güterichtlinie Duktile Guss-Rohrsysteme genutzt werden.

Mit Bekanntmachung des European Green Deals im Dezember 2019 steigt auch der Druck, den eingeschlagenen Weg zur Reduzierung der CO<sub>2</sub>-Emissionen fortzusetzen, um 2040 CO<sub>2</sub>-neutral zu produzieren. Die Begleitung nationaler und internationaler Regelwerksarbeit, die Gemeinschaftsvorhaben Digitalisierung und Ressourceneffizienz waren auch in 2020/2021 wichtiger Bestandteil der Verbandsaktivitäten. Zur Anpassung an die Auswirkungen des Klimawandels startete am 1. Oktober 2021 das mit BMBF-Fördergeldern unterstützte Projekt BoRSis – Boden-Rohr-System als innovatives Element der klimaangepassten Stadtentwässerung“, mit dem die Schwammstadt-Lösung unter Nutzung von duktilen Gussrohren entwickelt wird.

## Annual report 2020/21 and the perspective in 2022

Manfred Künze, Christoph Aigner and Christoph Bennerscheidt

In the past two years, the keywords climate change, the European Green Deal with its transition to a modern, resource-efficient and competitive economy, and the Supply Chain Act have dominated our daily lives; they were and still are accompanied by the global Covid 19 pandemic, which shows us how fragile our world is. The members of EADIPS FGR have responded to the demanding challenges of the future with, among other things, the initiative launched in 2020, “Der beste Grund – ein guter Grund” respectively “The best ground – a solid reason”, and have presented the advantages of ductile iron pipe systems one can touch.

In cooperation with the GET, the draft of the RAL quality guideline is now also close to completion. So that in future cities and municipalities as well as network operators have an instrument at hand with which they can invite tenders for high-quality products that have been produced in compliance with high occupational health and safety and environmental standards, the RAL Quality Guideline Ductile Iron Pipe Systems, which is about to be finalised, can be used.

With the announcement of the European Green Deal in December 2019, the pressure is also increasing to continue on the path we have taken to reduce CO<sub>2</sub> emissions in order to produce in a CO<sub>2</sub>-neutral manner by 2040. Accompanying national and international works on rules and regulations, the joint projects on digitalisation and resource efficiency were also an important part of the association's activities in 2020/2021. To adapt to the effects of climate change, the BMBF-funded project “BoRSis – soil-pipe system as an innovative element of climate-adapted urban drainage” started on 1 October 2021, developing the sponge city solution using ductile iron pipes.

## Das beste Wasser – ein guter Grund

Christoph Dietiker

Gerade weil Trinkwasser das meistkontrollierte Lebensmittel ist, kann man es ohne Bedenken direkt aus dem Wasserhahn trinken. Der Kauf von Wasser in Plastikflaschen ist daher obsolet, belastet die Umwelt, wie man an den Müllstrudeln in den Ozeanen beobachten kann. In der Schweiz und in Liechtenstein wird dieser Gedanke konsequent verfolgt, indem in Restaurants, öffentlichen Trinkbrunnen, bei Großevents etc. auf den Verkauf von teurem Wasser in abgefüllten Flaschen verzichtet und das deutlich preisgünstigere Leitungswasser ausgedient wird. Ein Teil des eingesparten Geldes wird gemeinnützigen Zwecken gespendet.

Für den Fall, dass man seine tägliche Trinkwasser-Ration mit sich führen will, gibt es die originelle wiederverschließbare Glasflasche, ebenfalls mit dem Ziel, den Einsatz von Plastikflaschen zu minimieren. Diese Flasche dient als Werbeträger und ist vollständig kreislauffähig, ebenso wie die duktilen Guss-Rohrsysteme, mit denen das Trinkwasser vom Wasserwerk zum Verbraucher transportiert wird. Es sind also zwei anorganische Werkstoffe, die den Transport und den Verbrauch von Trinkwasser extrem nachhaltig machen.

## Höchste Sicherheit – ein guter Grund

Daniela Usenbenz

Für uns Mitteleuropäer ist es selbstverständlich, dass wir jederzeit mit hoher Sicherheit hygienisch einwandfreies Trinkwasser aus unserem Wasserhahn zapfen können. Kaum jemand macht sich jedoch klar, welcher technische und administrative Aufwand dafür erforderlich ist. Die Hersteller von Rohren, Formstücken und Armaturen arbeiten mit den Wasserversorgern seit Jahrzehnten zusammen, um die gewünschten Eigenschaften der Systemkomponenten in Normen und Spezifikationen festzuschreiben. Bei Rohren und Formstücken ist das vergleichsweise einfach, bei Armaturen müssen bewegliche Teile aus verschiedenen Werkstoffen mit demselben Ziel zusammenspielen: höchste Sicherheit im Betrieb und störungsfreier Betrieb über Jahrzehnte! Es braucht eine über Jahrzehnte gewachsene Erfahrung und Know-how, um diese Sicherheitsanforderungen erfüllen zu können.

## The best water – a solid reason

Christoph Dietiker

It is precisely because drinking water is the most strictly controlled commodity for human consumption that we are able to drink it direct from our taps without concern. The purchase of water in plastic bottles is therefore obsolete and a burden on the environment, as can be seen from the volumes of plastic waste in our oceans. This approach is resolutely pursued in Switzerland and Liechtenstein in that expensive bottled water is no longer sold in restaurants, public drinking fountains, major events etc.; instead the considerably cheaper tap water is served. Part of the money saved is donated for charitable purposes.

In cases where people want to carry their daily ration of drinking water with them, there is the original resealable glass bottle, also targeted at minimising the use of plastic bottles. These bottles can act as promotional items and are completely recyclable, in just the same way as the ductile cast iron pipe systems which transport the drinking water from the waterworks to the consumer. Thus there are two inorganic materials which are making the transport and consumption of drinking water extremely sustainable.

## Maximum security – a solid reason

Daniela Usenbenz

For those of us in Central Europe it is taken for granted that, with a high degree of certainty, we can draw clean, hygienic drinking water from our taps at all times. However, scarcely anybody is aware of the technical and administrative effort which this involves. Manufacturers of pipes, valves and fittings have been working together with the water suppliers for decades in order to enshrine the desired properties of the system components in standards and specifications. With pipes and fittings, this is comparatively simple, but with valves the moving parts in different materials must work together with the same objective: maximum reliability in service and problem-free operation over decades! It takes the experience and know how accumulated over decades in order to be able to meet these security requirements.

## Kreislauf der Ressourcen – ein guter Grund

Steffen Ertelt und Friedrich Greiser

Der „European Green Deal“ rückt die ressourcenschonende Kreislaufwirtschaft ins Zentrum der Betrachtungen, um die CO<sub>2</sub>-Emissionen in absehbarer Zeit so weit zu senken, dass das 1,5 °C-Ziel noch erreicht werden kann. Duktile Guss-Rohrsysteme verfolgen diesen Ansatz schon seit Jahrzehnten: der Rohstoff, aus dem sie hergestellt werden, ist weitestgehend Schrott, bereitgestellt durch ein etabliertes Schrott-Sammel- und Handelssystem. Je nach vorhandenen Schmelzaggregaten können fast 100 % des Einsatzstoffes aus Guss- und Stahlschrott bestehen. Durch den Schmelzprozess werden Verunreinigungen eliminiert, das fertige Gussprodukt ist immer wieder neuwertig, es findet keine Qualitätsminderung beim Recycling statt. Der Beitrag macht zudem deutlich, wie durch ständige Optimierungsschritte auch der Einsatz von Primärenergie verringert und die in der Gießerei anfallende Restwärme sinnvoll und effizient genutzt werden kann. Die Minderung der CO<sub>2</sub>-Emissionen ist beträchtlich.

## #reduceplastic – ein guter Grund

Kai Sengwitz

Im täglichen Leben nimmt Plastik einen prominenten Platz ein. Mit dem weltweiten Anwachsen der Müllberge wird jedoch immer mehr das Risiko für Natur und Umwelt sichtbar. Am Ende des Anwendungsweges von Gegenständen aus Kunststoff steht die Verbrennung, euphemistisch als thermische Verwertung bezeichnet – es gibt keinen Kreislauf wie bei Metallen. Am Anfang steht das Rohöl, das aus den Lagerstätten gefördert wird, und am Ende stehen Millionen Tonnen an CO<sub>2</sub>, die in der Erdatmosphäre endgelagert werden mit den bekannten Folgen. Anders bei den Metallen: eine etablierte Schrottwirtschaft sorgt für den ständigen Kreislauf, z. B. von Stahl- und Eisenschrott, aus dem Rohre, Formstücke und Armaturen aus duktilem Gusseisen ohne Qualitätsverluste immer wieder neu hergestellt werden können. Mit den modernen Umhüllungen und Auskleidungen haben diese Systeme Nutzungsdauern von 100 Jahren und mehr, was der Forderung an Nachhaltigkeit gerecht wird. Ebenso sind die Schadensraten dieser Systeme geringer als bei den „modernen“ Kunststoffrohrsystemen. Es bleibt also die Frage, ob der Traditionswerkstoff Gusseisen nicht doch der modernere ist im Vergleich zu Plastik.

## The resources cycle – a solid reason

Steffen Ertelt and Friedrich Greiser

The “European Green Deal” focuses attention on the resource-conserving recycling economy, so that CO<sub>2</sub> emissions can be reduced in the foreseeable future to the extent that the 1.5 °C target can still be reached. Ductile cast iron pipe systems have already been taking this approach for decades: the raw material from which they are produced is, to the greatest possible extent, scrap metal which is supplied by an established scrap collection and trading system. Depending on the melting plant available, almost 100 % of the material used consists of iron and steel scrap. The melting process eliminates impurities, the finished cast iron product is always as good as new and no deterioration in quality occurs in the recycling. The article also shows how, by continual stages of optimisation, the use of primary energy can also be reduced and the residual heat occurring in the foundry can be used to useful and efficient effect. The reduction in CO<sub>2</sub> emissions is considerable.

## #reduceplastic – a solid reason

Kai Sengwitz

Plastic plays a prominent role in our daily lives. As the mountains of rubbish increase across the world, the risk for nature and the environment is becoming ever more apparent. At the end of the useful life of articles made of plastic comes incineration, euphemistically described as thermal reutilisation – there is no “cycle” in the same sense that there is with metals. To begin with there is crude oil, produced from natural deposits, and at the end there are millions of tonnes of CO<sub>2</sub> which end up in the earth’s atmosphere, where they remain with the known consequences. Things are different with metals: an established scrap economy ensures continuous recycling, for example of scrap steel and iron, from which pipes, fittings and valves in ductile cast iron can be produced time and time again without any loss of quality. With modern coatings and linings, these systems have useful lives of 100 years and more, which meets the challenge for sustainability. Also the damage rates with these systems are lower than with “modern” plastic piping systems. This raises the question of whether the traditional material, i.e. cast iron, is not in fact more “modern” as compared with plastic.



## Coolere Städte – ein guter Grund

Christoph Aigner und Christoph Bennerscheidt

Der Klimawandel ist definitiv nicht mehr zu leugnen! Seit Jahren nehmen die Extremwetterlagen zu: sowohl lang anhaltende Hitzeperioden als auch sintflutartige Regenfälle machen besonders den Städten zu schaffen. Hier heizen sich viele und große steinerne Gebäude und Straßenflächen aus Asphalt und Beton tagsüber auf und kühlen sich nachts nicht mehr ausreichend ab. Bei Starkregenereignissen ist die Kanalisation unter diesen versiegelten Oberflächen mit der Ableitung der Sturzfluten überfordert. Unterirdische Regenrückhaltebecken sind nur ein Teil der Problemlösung, weil das Regenwasser nur zeitverzögert in den Vorfluter gelangt und den Stadtbäumen nicht zur Verfügung steht. Für großflächige Versickerungsmulden und Baumrigolen fehlt in den Innenstädten der Platz.

So macht seit einiger Zeit das Stichwort „Schwammstadt“ die Runde: Gründächer und Fassadenbegrünung könnten einen Teil des Regenwassers aufnehmen, zwischenspeichern und über die Pflanzenoberflächen mit einem Kühlungseffekt wieder verdunsten. Der größte Effekt lässt sich jedoch erzielen, wenn man die in den Straßen ohnehin erforderlichen Leitungsgräben mit grobkörnigem Material verfüllt und so linienförmige Speicherräume schafft, die von den Straßenbäumen durchwurzelt werden. Duktile Gussrohre vereinigen in sich die Eigenschaften „Robustheit“ und „Wurzelfestigkeit“, und sie bilden die Grundlage für ein fachübergreifendes F- und E-Projekt mit Beteiligung von Kommunen, Hochschulen, Baufirmen und Rohrherstellern. Das Projekt startete am 1. Oktober 2021.

## Regionalität – ein guter Grund

Christof Mairinger

Langlebigkeit war schon immer ein Merkmal duktiler Guss-Rohrsysteme. Mit der immer dringender vorgebrachten Forderung nach CO<sub>2</sub>-Reduktion kommen noch die Kreislauffähigkeit und die Regionalität dazu, beides Forderungen, die duktile Guss-Rohrsysteme, hergestellt von den Europäischen Mitgliedern der EADIPS, voll und ganz erfüllen. Das Vergaberecht unterstützt die Regionalität ebenfalls, wie das Beispiel des Baus einer Rohrleitung in der Stadt Hall in Tirol zeigt: lokaler Bauunternehmer und lokal hergestellte Rohre sind verlässliche Partner des lokalen Versorgungsunternehmens.

## Cooler cities – a solid reason

Christoph Aigner and Christoph Bennerscheidt

Climate change is definitely something which can no longer be denied! Extreme weather conditions have been increasing for years now: extended spells of hot weather as well as torrential rainstorms have been afflicting our towns and cities in particular. Many large, stone-built edifices as well as road surfaces made of asphalt and concrete heat up during the day and can no longer cool down sufficiently at night. When severe rainfall events occur, the sewer system beneath these sealed surfaces is unable to deal with the resulting flash floods. Underground stormwater retention basins are only part of the solution to the problem as it takes time for the rainwater to get to the receiving structures and it is not available to the urban trees. There is simply not the space in the inner-city environment for extensive soakaways and tree irrigation troughs.

For some time now, the phrase “sponge city” has been catching on: green roofs and the greening of facades could take up some of the rainwater and store it for a time, from where it will evaporate through the plant surfaces and produce a cooling effect. But the greatest impact can be achieved if the pipe trenches in our roads, which are necessary anyway, are backfilled with coarse-grained material, thus providing linear storage spaces through which the roots of roadside trees can penetrate. Ductile iron pipes combine the advantages of “robustness” and “root resistance”, and they form the basis for an interdisciplinary R&D project with the participation of local authorities, universities, construction companies and pipe manufacturers. The project was launched on 1<sup>st</sup> October 2021.

## Regionality – a solid reason

Christof Mairinger

Durability has always been a feature of ductile iron pipe systems. In addition to the increasingly urgent demands for CO<sub>2</sub> reduction which we are facing, there are also the questions of recyclability and regionality – both of them challenges which the ductile iron pipe systems manufactured by the European members of EADIPS meet utterly and entirely. Regionality is also supported by EU public procurement law, as was demonstrated by the example of the construction of a pipeline in the town of Hall in Tirol: local construction contractors and locally produced pipes were sound partners for the local supply company.

## Kurze Wege – ein guter Grund

Andreas Wollnik

Regionalität ist das Stichwort, das sich immer häufiger in den Vordergrund schiebt, nicht nur beim Einkauf von Obst und Gemüse im Supermarkt, nein, auch bei Design, Entwicklung, Fertigung, Vertrieb und Einsatz komplexer Rohrsysteme für die Wasserwirtschaft. Die Vermeidung von Emissionen auf langen Transportwegen, die Nähe zum Anwender, Zuverlässigkeit bei der Beratung – dies sind Vorteile von unschätzbarem Wert, wenn man seine Lieferanten in der Nähe weiß. Das Motto der kurzen Wege gilt auf allen Ebenen, z. B. bei der Beschaffung der Rohstoffe: Schrott für die Erzeugung des duktilen Gusseisens; bei der Produktentwicklung: Ideen des Anwenders zur Optimierung der Bauteile; bei der Baustellenbetreuung: im Fall von Hilfe und Beratung. Immer häufiger zeigen sich die Vorteile der kurzen Wege und die Nachteile langer Lieferketten, die zum Teil bis in andere Kontinente reichen.

## Partner mit Weitblick – ein guter Grund

Stefan Neuhorn und Christoph Dietiker

Vor uns allen liegt eine riesige Aufgabe: Der Klimawandel zwingt uns, den Planeten für unsere Nachkommen zu heilen und gleichzeitig die Voraussetzungen für ihr Wohlergehen zu schaffen. Als Partner mit Weitblick verfolgt die Gussindustrie mehrere Wege, um dieses Ziel zu erreichen:

Perfektionierung der stofflichen Kreislaufwirtschaft, indem auf die Nutzung von Primärrohstoffen weitgehend verzichtet wird.

Die Gusseisen-Metallurgie erlaubt das wiederholte Einschmelzen von Schrott und Alteisen ohne Minderung der Qualität. Moderne Elektroschmelztechnik kann den CO<sub>2</sub>-Ausstoß auf bis zu 10 % des früheren Niveaus absenken.

Mit der Erarbeitung der RAL Güte- und Prüfbestimmungen für Duktile Guss-Rohrsysteme verpflichten sich die Europäischen Hersteller von Rohren, Formstücken und Armaturen zu den in Europa geltenden hohen Sozial- und Arbeitsschutzstandards und weisen damit den Weg zu einer modernen, ressourceneffizienten und wettbewerbsfähigen Wirtschaft.

## Short distances – a solid reason

Andreas Wollnik

Regionality is a buzzword which is increasingly gaining in importance, not simply when buying fruit and vegetables in the supermarket but also in the design, development, production, sale and use of complex piping systems for the water industry. Avoiding the emissions caused by long transport distances, proximity to the user, reliability in consultation – these are advantages of inestimable value when you have your suppliers close at hand. The “short distances” motto applies at all levels, for example when sourcing raw materials: scrap metal for the production of the ductile cast iron; in product development: suggestions from users for optimising components; with construction site support: providing assistance and consultation. The advantages of short distances and the disadvantages of long supply chains – sometimes extending into other continents – are becoming more and more apparent.

## Partners with vision – a solid reason

Stefan Neuhorn and Christoph Dietiker

There is a huge task facing us all: climate change is compelling us to heal the planet for our descendants while at the same time laying the foundations for their wellbeing. As a partner with vision, the foundry industry is pursuing a number of routes in order to achieve this target:

Perfecting the circular economy for materials and doing away with the use of primary raw materials as far as possible.

Cast iron metallurgy allows the repeated smelting of scrap iron and steel without any loss of quality. Modern electric melting technology can reduce the CO<sub>2</sub> emission to as little as 10% of the former level.

With the formulation of the RAL Quality and Testing Provisions for Ductile Iron Pipe Systems, the European manufacturers of pipes, fittings and valves have committed to the high social and occupational safety standards applicable in Europe, thus pointing the way to a modern, resource-efficient and competitive economy.

## Die Stellung des duktilen Gussrohres im Materialmix

Michael Schneider und Jürgen Rammelsberg

Die Trinkwasserversorgung in einer Millionenstadt wie Berlin stellt extreme Anforderungen an das Rohrmaterial, gleiches gilt für die Abwasserentsorgung. Besonders der immens gewachsene Auto- und Schwerlastverkehr setzt der Infrastruktur im Boden zu. So nimmt es nicht Wunder, dass die Berliner Wasserbetriebe nur das robusteste Rohr einbauen lassen, das duktile Gussrohr.

Der Beitrag stellt den jüngsten Stand der Technik in Berlin dar, vom Einbau im offenen Graben über den Neubau und die Erneuerung mit den geschlossenen Bauweisen. Eine weitere Facette ist der Bau und Betrieb von oberirdischen Interimsleitungen parallel zu Leitungen, die saniert werden müssen. Die Rohre der Interimsleitungen unterliegen speziellen Beanspruchungen, nach ihrem Rückbau können die Rohre an anderer Stelle wieder verwendet werden. Oberstes Gebot bei der Auswahl des Rohrmaterials ist die Langlebigkeit und der möglichst geringe Zeitbedarf für die Montage und Demontage der Verbindungen, weil in den städtischen Bereichen einfach keine Zeit für längere Straßensperrungen bleibt.

## The position of the ductile iron pipe in the material mix

Michael Schneider and Jürgen Rammelsberg

The supply of drinking water to a city such as Berlin with over a million inhabitants places extreme demands on the pipe material, and the same applies to sewage disposal. The immense growth in car and HGV traffic puts particular stress on the infrastructure beneath the streets. So it is not surprising that Berliner Wasserbetriebe only allows the most robust of pipes to be laid – the ductile cast iron pipe.

This article describes the latest state of the art in Berlin, from pipe-laying in open trenches to new builds and renewals using trenchless installation techniques. A further facet is the construction and operation of interim pipelines above ground running parallel to pipelines which have to be renovated. The pipes in the interim pipelines are subject to specific loads and, once dismantled, they can be used again at other locations. The top priority in the choice of pipe material is durability and for the time needed for assembling and dismantling the pipe connections to be as short as possible, as there is simply no time for lengthy road closures in busy urban areas.

Manfred Künze, Christoph Aigner and Christoph Bennerscheidt

## Annual report 2020/21 and perspective in 2022

EADIPS® / FGR® e. V. is changing

Climate change, the European Green Deal, circular economy and supply chain legislation were important key concepts in 2020/2021; however, they were rather overtaken by buzzwords such as pandemic, Corona virus and COVID-19. Nothing moved us as much in the years 2020/2021 as this global pandemic, while leaving us more or less immobile. It was brought home to us all how sensitive supply chains can be disrupted and how important it is to have reliable partners with production sites in Europe. While collapses in the supply of face masks stood at the centre of public attention, network operators were making sure that the

underground infrastructures still remained in operation for the supply of drinking water and the disposal of wastewater. The members of EADIPS FGR with their production sites in Europe have made their contribution to this with their usual reliability in delivering pipes, fittings and valves in ductile cast iron.

### The best ground – a solid reason

But the fact that products are manufactured in Europe means more than reliable delivery alone. This is backed up by regional production, short distances and partners with vision who make

sure, that the best water can be transported by the network operators to consumers with maximum security. As early as the beginning of 2020, the members of EADIPS FGR were already well on the way to making these and other advantages an achievable reality. In the campaign “The best ground – a solid reason” (<https://solid-reason.org/>), or “Der beste Grund – ein guter Grund” (<https://guter-grund.org/>), the economic, social and technical advantages of pipes, fittings and valves – all produced in Europe – are briefly and succinctly summed up against the background of the challenges which are currently facing us in just eight points:



The best ground – a solid reason; eight solid reasons behind soil and water protection [1].

- The best water
- Maximum security
- The resources cycle
- #reduceplastic
- Cooler cities
- Regional manufacturing
- Short distances
- Partners with vision

The Guter Grund campaign in the German language was started at the end of September 2020, followed by the Solid Reason campaign in the English language in mid-January 2021.

### Robust and verifiable requirements

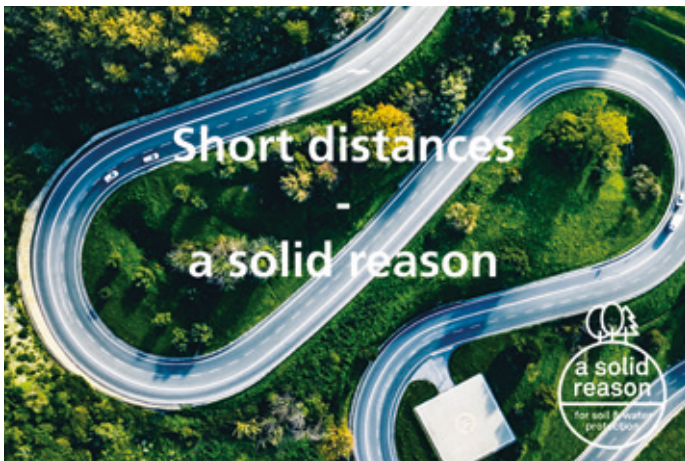
Robust requirements which can stand up to external monitoring help to guarantee that the eight solid reasons are also backed up by solid facts. This is possible, especially with the circular economy

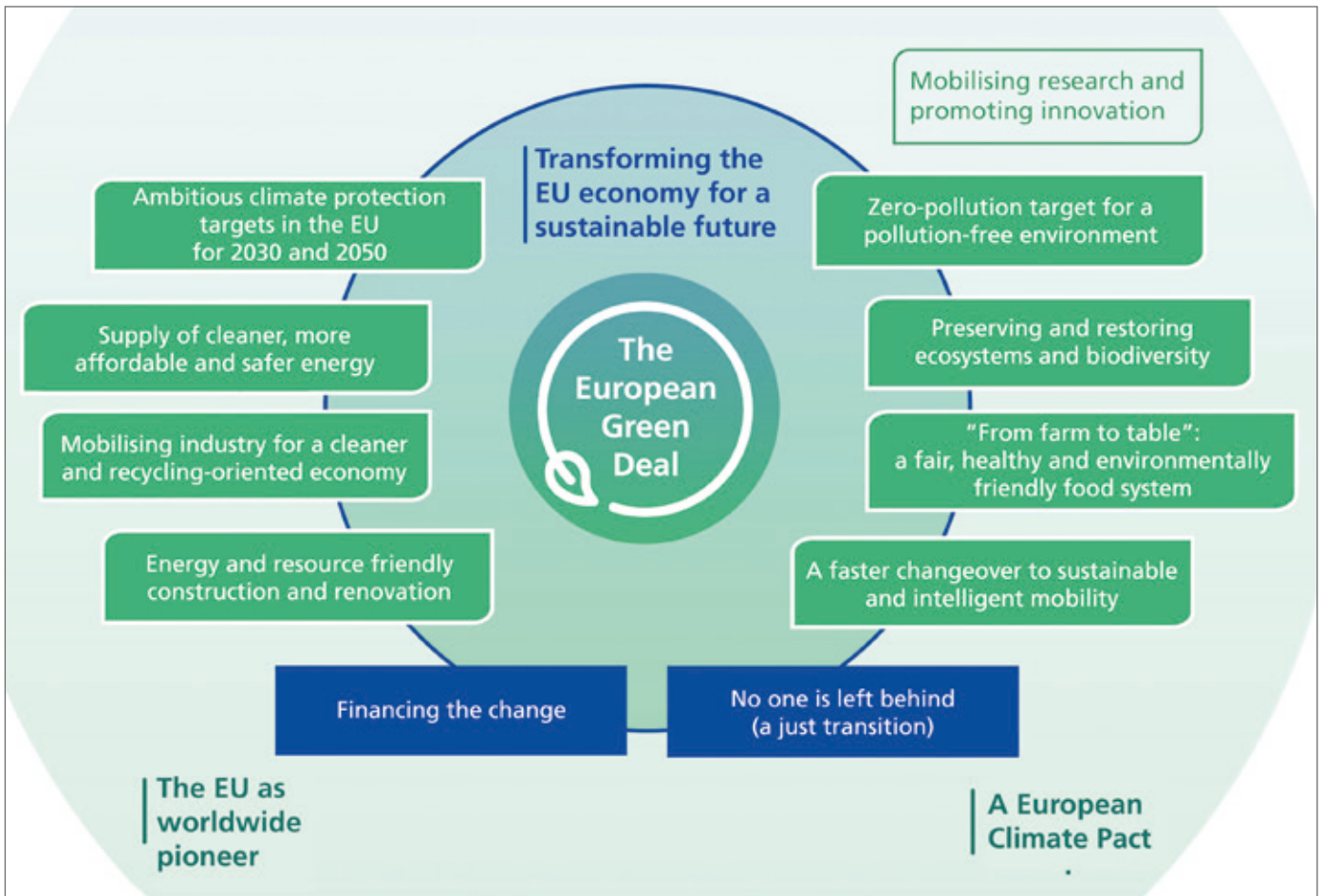
already put into practice at many locations by the EADIPS FGR members, combined with responsibility being taken for the materials used, which goes beyond simple product responsibility as is required in the current edition of legislation regarding the circular economy [2].

Already today, ductile iron pipe systems can be and are being produced from up to 99 % secondary raw materials. On the one hand this is reflected in the evaluation of one major German network operator where, in the years 2018 and 2019, 2,796 tonnes of cast iron pipes were dismantled and the metal recycled, producing 2,646 tonnes of cast iron pipes to be installed elsewhere. On the other hand, this active circular economy is also described in the "Quality and testing specifications for ductile iron pipe systems" as a checkable requirement

in the production of ductile cast iron pipes. Of course, account is also taken of requirements with respect to occupational safety and social standards as well as environmental protection requirements, as is expected for products of European manufacture.

After intensive preparation and in cooperation with GET, the German quality association for drainage technology, the draft of this RAL quality guideline is now also close to completion and will then be distributed to the interested parties for comment. This means that tendering authorities in towns and cities as well as regional and national network operators will have a document to hand which will help them invite tenders for high-quality products which have been manufactured in compliance with high occupational health and safety and environmental standards.





The European Green Deal [3].

### The Circular Economy and CO<sub>2</sub>-neutral production

As partners with vision, the members of EADIPS FGR had already started work on producing the quality and testing specifications even before the publication of the European Green Deal [3] by the European Commission in December 2019. Hence the quality guidelines represent the status quo for a recycling-oriented production ethos.

The members of EADIPS FGR are now faced with the task of continuing on the road to reducing CO<sub>2</sub> emissions, which was commenced as long as 40 years ago, in order to achieve CO<sub>2</sub>-neutral production methods in the year 2040.

The different types of smelting plant, such as induction furnaces, cupola furnaces or blast furnaces, need to be evaluated

with reference to conversion to CO<sub>2</sub>-neutral production and solutions must be found. This begins with the CO<sub>2</sub>-neutral generation of power and extends to the use of bio-coal and hydrogen. The technical, organisational and financial challenges anticipated by the members of EADIPS FGR are not to be under-estimated.

In order to implement this transformation efficiently by the year 2040, then – much as with the steel industry – this needs financial backing from the State. Ductile iron pipe system manufacturers in the EADIPS FGR organisation basically have a good starting position here: there already is a very high proportion of secondary raw materials used in production and they are producing pipe systems involving components consisting of a very low proportion of fossil resources.

During these transformation processes, however, it must be borne in mind that foundry scrap steel qualities are becoming increasingly important for steel production, meaning that as a result of the far greater market significance of steel production, foundries may be deprived of the metal they need. In addition, scrap exports are also contributing to the shortage.

Against this background it is conceivable that, in the near future, EADIPS FGR will have to make changes in production processes and adopt a coordinated approach with other industrial associations.

### Sponge city principle

In 2018 and 2019 the effects of climate change were more noticeable than ever across the whole of Europe. Long periods of high

temperatures combined with low rainfall levels in springtime put a strain on us humans, but the natural world visibly suffered as well. Torrential rain with devastating floods in 2021 showed the other side of climate change.

In as early as 2016, EADIPS FGR started proposing a solution for reducing heat stresses in towns and cities in combination with the storage of rainwater by the use of vegetation. Under the keyword “sponge city” or “sponge city principle”, these solutions are now being requested by more and more towns and cities. It is all the more pleasing that, since 01.10.2021, the Sponge City solution by EADIPS FGR members using ductile cast iron pipes is being developed scientifically hand-in-hand with network operators and supported by grant funds from the German Federal Ministry of Education and Research. The “BoRSIS” project which, in translation, stands for “soil-pipe systems as an innovative element of climate-adjusted urban drainage” is being led by the Ruhr-West University.

### Rules work

On 16 December 2020, the European Drinking Water Directive [4] was presented in its revised version and it came into effect in January 2021. With its publication, for the first time, minimum hygiene standards are defined at European level for equipment and materials coming into contact with water intended for human consumption. At national level, EADIPS FGR has already supported this and it will also continue to support the development of European requirements as well as materials in contact with drinking water at various levels.

In much the same way, this also applies for the further development on the subject of the recycling

economy at DIN, the German Institute for Standardisation. Once again, as EADIPS FGR, we can stress that, with cast iron as our material, the Circular Economy is

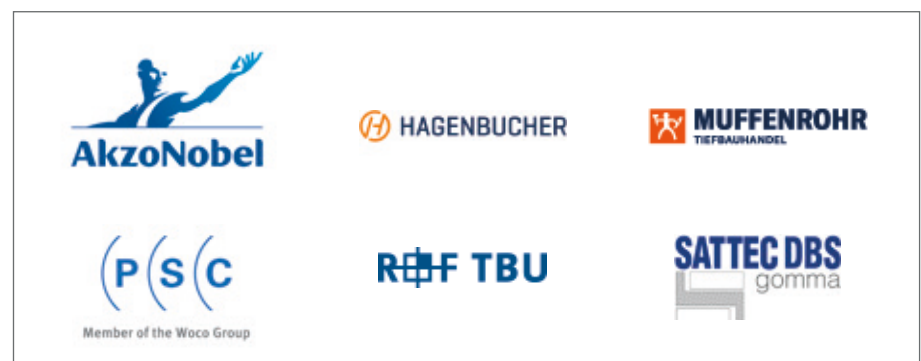
feasible even for hygienically sensitive drinking water applications, as there are no restrictions when it comes to drinking water hygiene!

EADIPS FGR and/or its members are represented on the committees listed below and actively participated in the revision or development of standards on their various subjects:

- **ISO TC 5 SC 2:** Cast iron pipes, fittings and their joints
- **CEN TC 203:** Cast iron pipes, fittings, accessories and their joints
- **DIN NA 003-01:** Standards committee for industrial valves (NAA)
- **DIN NA 082:** Standards committee for pipelines and boiler plants (NARD)
- **DIN NA 119:** Standards committee for water technology (NAW)
- **UBA – Federal Environment Agency**
- **FIGAWA: Gas and water companies**
- **EDW: European Drinking Water**
- **GSTT – German Society for Trenchless Technology**



Full members of EADIPS FGR.



Sponsoring members of EADIPS FGR.

## Perspective

Climate change, the European Green Deal with transition to a modern, resource-efficient and competitive economy as well as supply chain legislation were important keywords in 2020/2021. The activities of EADIPS FGR fit very well with these keywords:

As one possibility for adapting to climate change, the "BoRSIS" Sponge City project was launched on 01.10.2021. The aim is to develop a "soil-pipe system as an innovative element of climate-adjusted urban drainage" using ductile iron pipes and have this adopted by network operators.

The members of EADIPS FGR embarked upon the transition to modern, resource-efficient and competitive production methods while observing high health and safety, environmental and social standards as long as 40 years ago. Now that the effects of climate change have become visible and in view of the urgency of reducing CO<sub>2</sub> emissions, the need to rethink production processes has extended to include all sectors of industry. Because one effect which is already foreseeable is that there is going to be greater competition for scrap which is increasingly in demand.

Against this background it is conceivable that, in the near future, EADIPS FGR will have to make changes in production processes and adopt a coordinated approach with other industrial associations.

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# Social Media and EADIPS FGR Newsletter

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## Always up-to-date, always informed

Our Newsletter is full of information on current regional and European subjects. But always with cast iron pipe systems at the core.



Log in at [eadips.org/newsletter-e/](https://eadips.org/newsletter-e/)

Christoph Dietiker

## The best water – a solid reason

Our no. 1 foodstuff



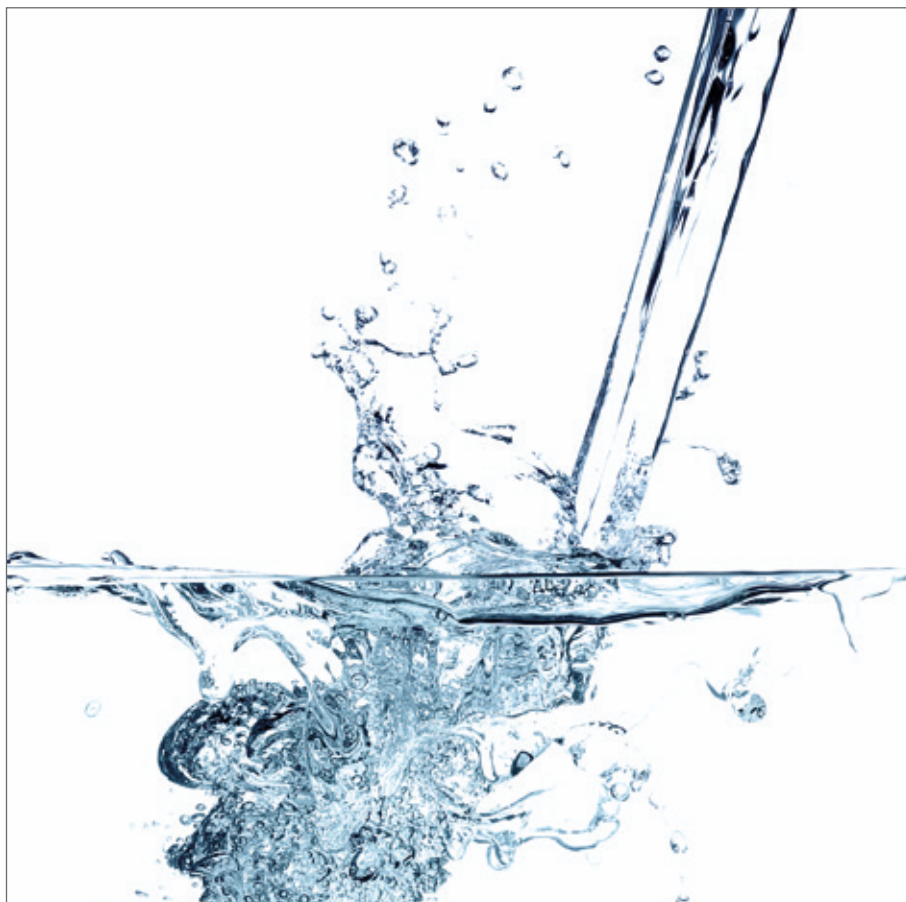
To us, it is quite normal that clean drinking water should come out of our taps – but it is not as obvious as all that.

A superlative in the title would normally invite a question. Is it really the best? Was it in fact the worst? The title here is not a question but, rather, it is a statement. We are not talking about a special type of water, which is better than this or that type of water, as the superlative might suggest. It is the fact that the best water is a solid reason; a solid reason for looking after our water and seeing it for what it is: our most valuable foodstuff. So valuable that even the choice of what it is contained in is important – and this is the case in terms of both its consumption and its supply and disposal.

### Drink tap water, donate drinking water

At the present point in time, across the world an unbelievable 750 million people have no access to clean drinking water! At the same time, in the industrialised nations, access to drinking water is frequently associated with the use of bottles made of PET (polyethylene terephthalate) for drinking water. So, according to [1], 88 billion single-use plastic bottles were produced in 2019 by the world's largest drinks manufacturer alone. Also, in German-speaking Europe and other European countries, many people drink water which in some cases, imported from abroad, is filled in PET bottles. This should never be the case.

Tap water in Switzerland or in German-speaking Europe is the best controlled food commodity and, as is also the case in many parts of Europe, is of equally high, or even higher, quality as mineral water and is also a thousand times cheaper. A drinking water organisation and a start-up in Switzerland want to curtail this ecological and economical absurdity. DRINK & DONATE is the name of a non-profit organisation which, for more than 14 years, has been making clean drinking



Security of supply from the source to the home.

water accessible to people in need. The organisation was founded by product designer Andreas Batliner. Originally from Liechtenstein but at the time living in Zurich, he took part in the city's competition for promoting the location: he wanted to make Zurich, with its 1,224 [2] drinking fountains, Lake Zurich and the River Limmat, into a City of Water. He was aware that having drinkable water from the mains is a great privilege. Thus DRINK & DONATE [3] was set up.

With this organisation, the name is also the agenda – drink and donate. With a great deal of commitment, it persuades companies, catering establishments and/or events to switch from expensive mineral water in bottles to tap water, while asking for a small amount to be paid in return. This led to major enterprises, such as the Zurich Kantonalbank (ZKB) for example, changing over completely to tap

water. Also, the “Züriwasser”, water which can be drunk in the restaurants and bars of Zurich for a small charge is part of the organisation's drive for sustainability. The money collected in this way goes entirely and directly into drinking water projects right across the world. Hence the motto: Drink tap water, Donate drinking water.

The DRINK & DONATE “WATER-FOOTPRINT Liechtenstein” initiative is based on this thinking [4]. The intention is that the entire principality with its 37,500 inhabitants should renounce bottled mineral water and drink the best regional mains water instead. With the donations generated by giving up bottled water, for each resident of Liechtenstein another person somewhere will be able to have access to clean water.

In the wake of the DRINK & DONATE sustainability work, the FILL ME bottle for drinking water came into being five years ago – and this is now the name of a small Swiss start-up.

### FILL ME bottle – more than a water bottle

Because the Zurich Kantonalbank (ZKB), which has been a partner in the DRINK & DONATE campaign, wanted a physical product which would make its commitment in the area of corporate social responsibility tangible and recognisable, the FILL ME bottle came into being. This – along with the thinking behind it – show that the company of the same name is really tapping the pulse of the times. Employees and customers are demanding more commitment from companies in the area of sustainability. The bottle, and the statement which goes with it in favour of tap water and against plastic waste, enable companies to do this.

However, the associated positive external effect is not the only incentive for the companies. Switching from PET bottles filled with water to a sustainable drinking bottle in glass saves them storage and delivery costs while, at the same time, they are donating to DRINK & DONATE drinking water projects. Because, for every FILL ME drinking bottle sold, 1 Swiss franc is donated. The bottle is made of robust and hygienically safe borosilicate glass [5]. It can be reused multiple times and is recyclable. What is more, because they are produced locally, short transport distances also mean low CO<sub>2</sub> emissions for their delivery from the production site to Zurich.

Currently, more than 200 companies in Switzerland and Liechtenstein have already set a standard for their colleagues and customers



Two strong, recyclable products: above: FILL ME bottle. below: ductile iron pipes.



with the FILL ME bottle on the sustainable handling of water. In so doing they are also making a contribution to the UN 17 Sustainable Development Goals UN (17-SDG [6]).

Charitable organisations such as DRINK & DONATE, start-ups like FILL ME or the WATER-FOOTPRINT Liechtenstein initiative are making more and more citizens aware that the best water comes

out of the tap and above all that it should be enjoyed using sustainably produced products such as the FILL ME bottle.

### The best water – a solid reason

The manufacturers of pipes, fittings and valves from ductile cast iron who are members of EADIPS FGR (the European Association for Ductile Iron Pipe Systems/Fachgemeinschaft Guss-Rohrsysteme) have been producing products for the secure transport of drinking water to the consumer and the safe disposal of wastewater for decades.

One of the member companies is VONROLL HYDRO. This company has been producing cast iron pipe systems for more than 200 years and places great value on sustainability in water management. *“Water is one of our most valuable commodities and therefore dealing with water in a sustainable way is our mission”,* says the VONROLL HYDRO head of Marketing. *“When it comes to the Circular Economy, it’s not just something talked about, it is a lived experience”.* Therefore the Swiss company, based in Oensingen, has also set itself an equally ambitious target: ZERO WATER LOSS, especially as regards drinking water. *“This is precisely why ductile cast iron pipe systems, like the ones we produce, are so important for our soil and for our drinking water”.*

The initiative introduced by the members of EADIPS FGR entitled “The best ground – a solid reason” is aimed on the one hand at the target of transporting the best water to consumers by means of a hygienically faultless and recyclable product and on the other hand at securing a reliable wastewater disposal system; both soil and water here are commodities to be protected.

There is a simple reason behind the fact that the members of EADIPS FGR place such high value on ductile iron pipe systems: while time and again there is talk in the media about pollution of the oceans and beaches or poor air quality in our cities, there is seldom any discussion about what goes on in our soil. While the pollution of the world’s oceans is visible and constantly in the headlines, the pollution of the soil remains in the dark. Whether it is contaminated wastewater, the ingress of fertilisers or waste disposal – our soil is exposed to numerous sources of pollution. So often here it is forgotten that the soil also supplies us with drinking water, our most important foodstuff, and of course water is also transported through the soil!

In German-speaking regions alone, the network of drinking water pipelines is around 581,000 km long – which is 1.5 times the distance from the Earth to the Moon. If we assume a distribution of materials used for main and supply pipelines as determined for Germany and apply this to the whole German-speaking area, just over 50% are recyclable [7], this also taking account of hygiene aspects. It is therefore all the more important that drinking water is transported in an environmentally friendly and sustainable way; which is where ductile iron pipe systems come in.

### A ductile iron pipe system – more than a pipe

Ductile means malleable, which is also why ductile cast iron is a popular material for the production of pipes, fittings and valves. But it is not this property alone which makes ductile iron pipe systems especially appropriate for drinking water supply and wastewater disposal networks. Even over long transport distances, ductile iron pipe systems also guarantee the best water quality with the highest degree of reliability, they have a long working life, they are produced at regional level and they are not only recyclable but also can be reused as new pipe systems. Diffusion integrity protects the best water from possible soil contamination and food-quality linings give protection against undesired reactions on the inside of the pipe.

More information on this can be found in the articles of this Annual Journal.

EADIPS FGR and its member companies are not alone in supporting the sustainable handling of water. While member companies such as VONROLL HYDRO, among others, stand up for the sustainable and secure transport of water, organisations such as DRINK & DONATE are busy with promoting sustainable consumption.

## Summary and outlook

At the end of the day, the developments, the strategies, the products or the areas of competence of EADIPS FGR, VONROLL HYDRO, DRINK & DONATE or FILL ME may differ. But they all have one thing in common: they have really committed to the sustainable handling of water. And – to come full circle to the superlative at the beginning of this article – the best water truly is a solid reason.

## Keywords

Drink tap water, the best water, DRINK & DONATE, good reason, FILL ME bottle, drinking water fountains, sustainability, ductile iron pipe systems

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## TAKE AWAY

# The best water – a solid reason



**The best water also needs the best means of transport:**

### Water is:

- our most important no.1 food
- life
- our greatest asset

### Water needs:

- protection
- healthy soil
- secure, stable, food quality means of transport
- means of transport which meet sustainability criteria
- recyclable drinking bottles in glass instead of single-use plastic bottles

In the context of the drive for sustainability by the charitable organisation DRINK & DONATE, the glass FILL ME bottle was introduced by the start-up of the same name five years ago.

**Drinking water/ mineral water in single-use plastic bottles is not just unnecessary but it is also costly and in no way sustainable.**

Daniela Usenbenz

## Maximum security – a solid reason

Interplay of all components of a ductile pipe system



Ductile iron pipes systems are more than simply components for our drinking water and wastewater networks, for snow-making equipment or for power plant pipelines. They guarantee high security in all areas. For one thing they are robust, with a long working life and so are optimum products for secure piping systems. And for another thing their production in Europe guarantees high social and environmental standards.



Access to clean, high-quality drinking water is a valuable commodity and not something that can be taken for granted everywhere in the world. We in Europe are lucky to have the privilege of being able to rely on clean drinking water at any time. For us, drinking water is first and foremost a source for quenching our thirst, but we also use it for many everyday things: for brushing our teeth, for washing up, for cooking, for washing our hands, when bathing and showering, for flushing the toilet, for washing our clothes and so on. We come into contact with tap water just about everywhere and absorb it with our food and drink. But how does this essential commodity actually get into our homes and where does it come from?

### Security everywhere – from the outset

A large proportion of our drinking water is taken from groundwater and spring water, and/or from reservoirs, lake and river water as

well as other types of surface water. After appropriate processing of all of this so-called “raw” water at the waterworks, it is transported through a network of piping systems into our homes, to industrial and commercial premises and anywhere else where drinking water is needed. High security of supply and the constant availability in the desired volumes associated with this is taken for granted by most people these days. Behind this are firstly the drinking water network operators who are in charge of the responsible handling of the precious commodity which drinking water represents and who minimise water loss by their maintenance and operation of the drinking water networks.

Then there is the result of a decades-long collaboration of European network operators with European manufacturers of pipes, fittings and valves. DIN, DVGW, CEN etc. regulations form the visible interfaces here between the requirements of the network operators and the products.

ERHARD GmbH & Co. KG, as a manufacturer of cast iron valves, places great value on the maximum reliability of the choice of materials they use, and on the development, manufacture, testing and operation of their valves.

Valves differ in one important respect from pipes and fittings: they contain moving parts which must be matched to each other as perfectly as possible if they are to be able to work reliably and over long periods in the drinking water networks! The moving parts, as well as the coatings used for the cast iron body, must be approved for use in drinking water. This is why high-quality stainless steels, for example, or other alloys are used [see 1]; this means that they contribute both to a long working life and to high operational reliability.



The precious commodity of drinking water in the best quality: we have the privilege of being able to turn on the tap 365 days a year and 24 hours a day for fresh and healthy drinking water.



An internally enamelled butterfly valve as a crucial component of a ductile cast iron piping system.



Safe and secure: installation of fittings and valves in buried pipeline construction.

### Security with durable and recyclable materials

The most important aspect for the reliable supply of clean drinking water is the use of high-quality materials in all the individual components of systems for processing and transporting water. Because a system is only as secure as its individual parts (e.g. pipe, fitting, valve). The choice of spheroidal graphite cast iron to EN 1563 [2] which, because of its properties is also known as ductile cast iron, in combination with an appropriate wall thickness, represents a robust, secure and recyclable solution here for valves.

These days, the optimum cast material, paired with the optimum wall thickness, is determined for valves by 3D-development, stress calculations with FEM simulations and by empirical trials on the pipe systems, such as appropriate burst tests. The choice of material here often goes to ductile cast iron, e.g.: EN GJS 400-15 (GGG-40) or EN GJS 500-7 (GGG-50), whereby both material options have different properties:

- GGG-50 stands for higher tensile strength
- GGG-40 offers higher percentage elongation

By contrast, the highest security even at low temperatures is offered by the material EN GJS 400-18LT (GGG-40.3).

The appropriate material option is finally selected by highly qualified engineers according to the conditions on site.

### Security with corrosion protection

Over the last 50 years and more, enamel has established itself as an excellent and long-lasting corrosion protection for valves in the water supply industry. During the enamelling process the enamel is not simply applied onto the component as a separate layer, as with powder or wet coatings, but it physically and chemically bonds with the base material (cast iron). Due to the diffusion process during firing, excellent adhesion is produced, forming a true composite. This is also reliably protected against possible disbonding in case of mechanical damage to the valve.

The cast iron-enamel bond is absolutely tight against water vapour and oxygen and diffusion or blistering between base material and coating is excluded. Because of the extremely smooth surface, bacteria and other organisms cannot find

anywhere to proliferate while it is impossible for any kind of contamination to adhere to the surface – therefore perfect hygienic conditions. The outstanding properties of the enamel guarantee a long working life and reliability, even in use with aggressive media.

In addition, enamel also has a lasting corrosion protection effect. The extremely smooth surface reduces pressure losses, which results in increased efficiency and reduced energy consumption. What is more, only approved substances are used in its production [3]. With these properties – in combination with the extreme hardness and the accordingly minimised abrasion – enamel is safe for people and the environment and ideally suited for use in drinking water systems.

### Security with reliable sealing

In practice, ductile cast iron pipes, fittings and valves are assembled in two ways: with positive-locking, friction-locking or non-positive-locking push-in joints or with flange joints, as well as combinations of push-in joints and flange joints. Valves, too, are produced with these joints, which have long since been standardised.

But it is not only the connections of the valves to other components in pipe networks which must be leak-proof in all operating situations. The same applies to the tightness of the moving elements of valves. This all depends on the interaction between approved, high-quality stainless steels or other alloys [4] and elastomer sealing faces, injection-moulded wedges or O-rings.

### Operational security with testing

Factory tests, as described in testing standards EN 12266 [5] and EN 1074 (parts 1 to 6) [6], come at

the end of the process chain inside the factory. These include, for example, body pressure tests with a nominal pressure of 1.5 bar. These tests are carried out on all valves before they are delivered, meaning that maximum security is guaranteed at the point of delivery. In addition, fatigue tests, e.g. by opening and closing the valves 2,500 times under full pressurisation, are performed to establish security under operating conditions.

### Security with the use of safety valves

Excessive flow rates and pressure surges in the piping system can cause pipe bursts, which can have unwelcome consequences for the public water supply. Pipe bursts in the supply networks can lead to the ingress of contamination and germs forming at the leakage points, resulting in flooding and costly road repairs and excavation work right through to water emergency situations. In individual cases, pipe bursts can even cause fatal accidents.

In order to protect the piping network from such pipe bursts, complex valves are used, such as double eccentric butterfly valves, needle valves or ball valves and they are equipped for example with hydraulically controlled brake-and-lift units, which are calculated by highly qualified employees. The brake-and-lift units work without any auxiliary energy. When a maximum flow defined by the network operator is reached, the valve is closed by the brake-and-lift unit. The closing time characteristic of the brake-and-lift unit is adjusted on the basis of the pressure surge calculations. So, for example, the valve can close the water pipeline in two stages, fast at first and then slowly at the end. With this staged closing process, pressure surges and the risk of pipe bursts are demonstrably minimised.

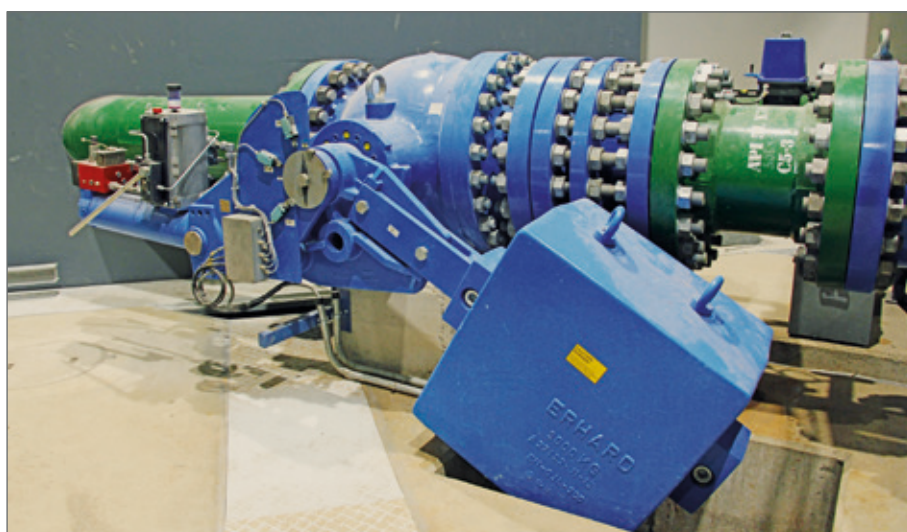
There is a further type of drive which works in a similar way – the slider-crank mechanism in which, with the help of the so-called internal lever effect, a slower closing speed is achieved.

### Security with regional quality

Last but not least, the guarantee of constant high quality and maintenance of standards for materials plays a very important role. In



Enamelling for outstanding and long-lasting corrosion protection.



To protect the piping network from pipe bursts, ball valves, among other valves, are used and equipped with specially designed hydraulically controlled brake-and-lift units.



The regional or European production of ductile iron pipe system is of immense importance: regional jobs are secured and sustainable environmental protection is aided on account of shorter transport distances among other things.

order to achieve and guarantee this, highly qualified engineers together with as much regional and/or European production as possible is of immense importance. Not only does this secure many regional jobs, it also makes a sustainable contribution to environmental protection in that long transport distances are avoided.

Hence, cast iron pipe systems of European production not only contribute thanks to their outstanding properties for the security of piping networks and thus the security of a clean drinking water supply for us all, but, right now, they are forming the basis for a sustainable future with security and for good reason.

## Keywords

Valves, safety valves, good reason, corrosion protection, security, cast iron pipe systems, enamel

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## TAKE AWAY

### Maximum security – a solid reason



**Pipe systems in ductile cast iron, produced in Europe, guarantee high security in all areas because:**

- they guarantee stable supply and disposal for 100 years and more
- they withstand massive mechanical stresses
- they retain their very good material properties even under severe stress
- they offer an excellent synergy of pipe, fitting and valve, even in complicated locations and construction sites
- each individual component consists of high quality materials
- safety valves provide additional protection for the equipment as a whole
- the production of the material for all individual components is sustainable
- all individual components can be exposed to extreme weather conditions

**All components of a ductile iron pipe system are robust and have a long working life and so are the optimal solution for secure piping systems. Their European production also provides social and economic security.**

Steffen Ertelt and Friedrich Greiser

## The resources cycle – a solid reason

Transforming scrap into high-quality products



We need to handle the limited resources of our environment responsibly and sustainably. Anyone who manufactures products from these resources must ensure that they can be used for as long as possible and that, at the end of their "life", the materials are not only recyclable, but also part of the circular economy. It is precisely for this reason that we use ductile cast iron.

Each and every year, the temperature of the atmosphere increases and the climate changes. One million of the eight million species of plants and animals on Earth threaten to disappear [1]. Forests and oceans are being polluted and destroyed. The European Green Deal is one answer to this. This is a new growth strategy by means of which the European Union (EU) should become a fair and prosperous society with a modern, resource-efficient and competitive economy. In this way, in the year 2050, there should be no more net release of greenhouse gas emissions and economic growth should be uncoupled from the use of resources [2].

An important element of the European Green Deal is the Action Plan for the Circular Economy. This means that priority should be given to less single use and more re-use of materials as opposed to recycling [3].

### Circular Economy in real life

The European manufacturers of ductile cast iron pipe systems can support this Action Plan for a solid reason:

In the casting industry, the circular economy is an economic and industrial system which, for many decades, has been based on the reutilisation of secondary raw materials and on by-products occurring within the factory (e.g. waste heat for use as district heating). Thus it makes a substantial contribution to the protection of natural resources and so adopts a policy of minimum consumption of resources of primary raw materials. The aim of a circular economy is the longest possible problem-free use of products and raw materials and then their reintroduction into the cycle of materials.

Of course, if materials are to be reused as drinking water pipe systems, high drinking water hygiene standards must be observed at all times in the cycle of materials. With cast iron as the material, this is unproblematic: cast iron is 100 % recyclable to the same standard of quality and therefore fully reusable. With other materials – for reasons of hygiene – this is limited, for example to the reuse of recycling material produced by the manufacturers themselves [3].

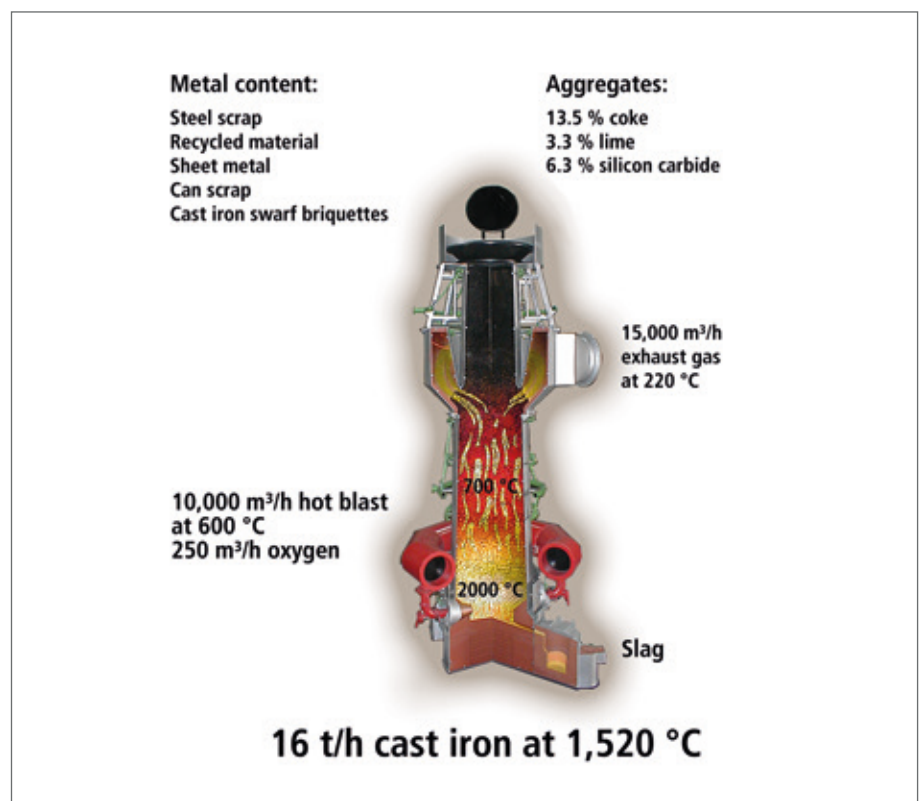
### Production processes and materials cycles

For the manufacture of ductile cast iron pipes, the cupola furnace is a typical smelting plant for the production of molten iron. These upright-standing shaft furnaces make it possible to apply and use high-quality raw materials for recycling such as scrap steel, return material, packs of sheet metal, can scrap, cast iron swarf briquettes.

The smelting of the primary raw material (iron ore) in a blast furnace is completely unnecessary here. Subsequently there is a reduction in CO<sub>2</sub> emissions of around 1.62 tonnes of CO<sub>2</sub> per tonne of pig iron produced. Thus the cupola furnace process offers a good eco-balance in two respects:

- by reducing the CO<sub>2</sub> emission as compared with the blast furnace process
- by using almost 100 % secondary raw materials in the form of high-quality scrap.

On the basis of three examples it will be shown how scientific knowledge and process screening in the factory improve the smelting process at the cupola furnace and so make contribution to energy efficiency and CO<sub>2</sub> reduction.



Cross-section and operation of a cupola furnace.  
(Source: EADIPS FGR Iron Pipe Systems Manual)

## Increasing energy efficiency by modernising oxygen injection to optimise the smelting process

At the cupola furnace of the production site in Wetzlar in 2020, with the installation of a new oxygen injection system [Highjet-TDI oxygen technology from the Linde company], to improve the performance parameters of the existing plant technology while at the same time reducing the environmental pollution to a significant extent. The Linde Highjet-TDI process is an optimum solution for a reduced-power operating mode which, even with a lower melt rate, does not mean a reduction in the quality of the iron smelt.

The oxygen concentration of the Linde Highjet-TDI process ranges between 30 % and 40 %, while the concentration with direct injection systems is 100 %.

The inlet speed of the oxygen-enriched gas mix can be adjusted to the specific furnace conditions and requirements. The air added to the oxygen is taken directly from the air supply of the cupola furnace, which means that additional equipment for air supply and for ensuring safety when the plant is the shut down is no

longer necessary. This equipment allows noise levels to be considerably reduced [4].

The illustrations show the operating principle of the TDI process as well as the TDI equipment at the tuyères of a cupola furnaces during operation with injector air supply regulation.

With the use of this process, the following effects are possible with respect to the environment:

- Reduction of waste gas volumes by up to 30 %
- Reduction of dust levels in the waste gas of up to 50 %
- Decrease of CO/CO<sub>2</sub> emissions by up to 30 %
- Decrease of SO<sub>2</sub> emissions by up to 20 %.

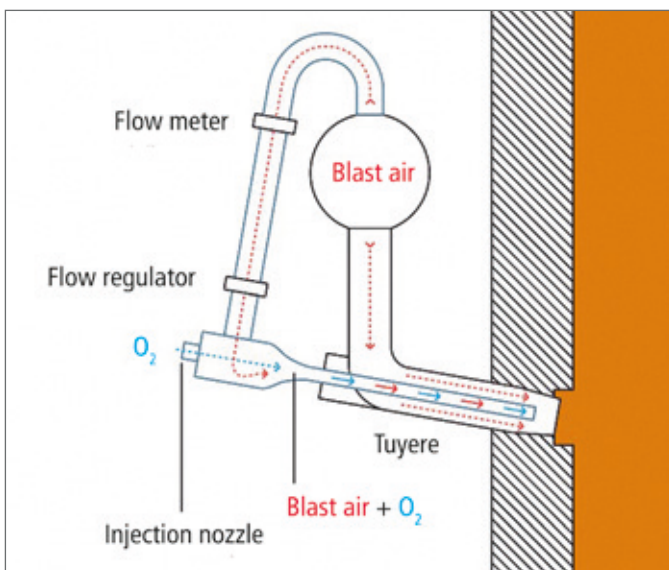
At the Wetzlar location, there has been a reduction in the amount of coke used previously of approx. 17.2 % per year, with a simultaneous improvement in firing efficiency from 38 % to 45 % since the installation of this equipment technology and the experience gathered to date, based on an average melt rate of 25 tonnes per hour. The reduction of the coke consumption results in a CO<sub>2</sub> reduction of approx. 2,000 tonnes per year.

## Sustainability with the use of the waste heat produced for district heating

The cupola furnace process offers many possibilities for using the waste heat produced. With von-Roll production (DUKTUS) gmbH in Wetzlar, in an initial stage, such further use was found for it within the foundry and the factory premises. Gas produced by the cupola furnace process is used in a so-called recuperator in order to produce a hot blast which is then fed directly into the cupola furnace.

In a second stage, an extensive district heating network has been constructed in the town of Wetzlar, by means of which the “Berghütte”, the Zeiss company and the open-air pool are supplied with heat [5].

In 2020, with an investment of around 350,000 Euros, the district heating network was extended so that the Modus 3.0, Lahnhof, and Gloelstraße construction projects and an adult education centre can be supplied with environmentally friendly district heating [5].

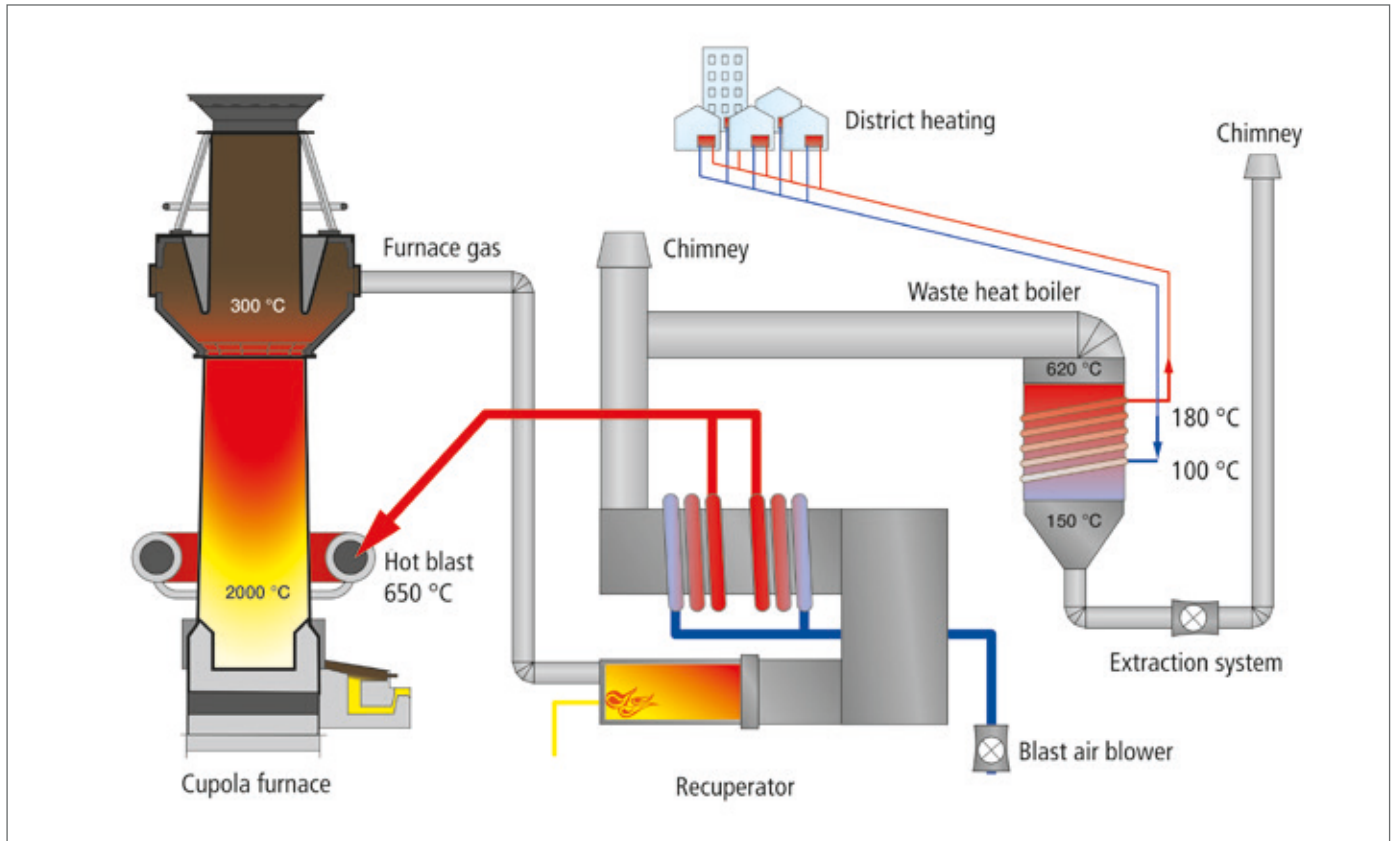


Linde Highjet-TDI process.  
(© Linde Gas Deutschland 2021)



Regulation of the injector blast supply.





Schematic diagram of the district heat feed.

With these measures, the use of waste heat from the cupola furnaces reduces the annual CO<sub>2</sub> emission in the region.

The effective output available at the vonRoll production (DUKTUS) gmbH location in Wetzlar for the supply of district heating is approx. 33,000 MWh. Just about 50 % comes from the available waste heat from the cupola furnace and a cogeneration unit. The other 50 % is fed in from a natural gas boiler.

The commissioning of the cogeneration unit occurred in December 2015 with an investment volume of around 1 million Euros.

At the heart of this unit is a natural gas-powered internal combustion engine which drives a generator and so produces electricity. Heat is taken from the cooling water circuit of the engine from where it passes through a plate heat exchanger and from the exhaust gas flow through an exhaust gas heat exchanger. By means of a hydraulic

separator, the heat is fed into the return flow of the district heating network, thus increasing the return flow temperature. With this technology, using two forms of energy at the same time, we speak of cogeneration.

The performance characteristics of the combined heat and power unit (CHP) are the following:

- Electrical output 850 kW;  
Thermal output 890 kW;  
Rated thermal output 2 MW (natural gas-powered)
- Annual power generation approx. 6.7 MWh
- Annual heat generation approx. 7.5 MWh.

Of the available effective output, approx. 15,300 MWh per year is used inside the production plant and surrounding premises and approx. 17,700 MWh per year is fed into the regional district heating network of the town of Wetzlar as district heat. With a consumption of 10,000 kWh per residential unit,

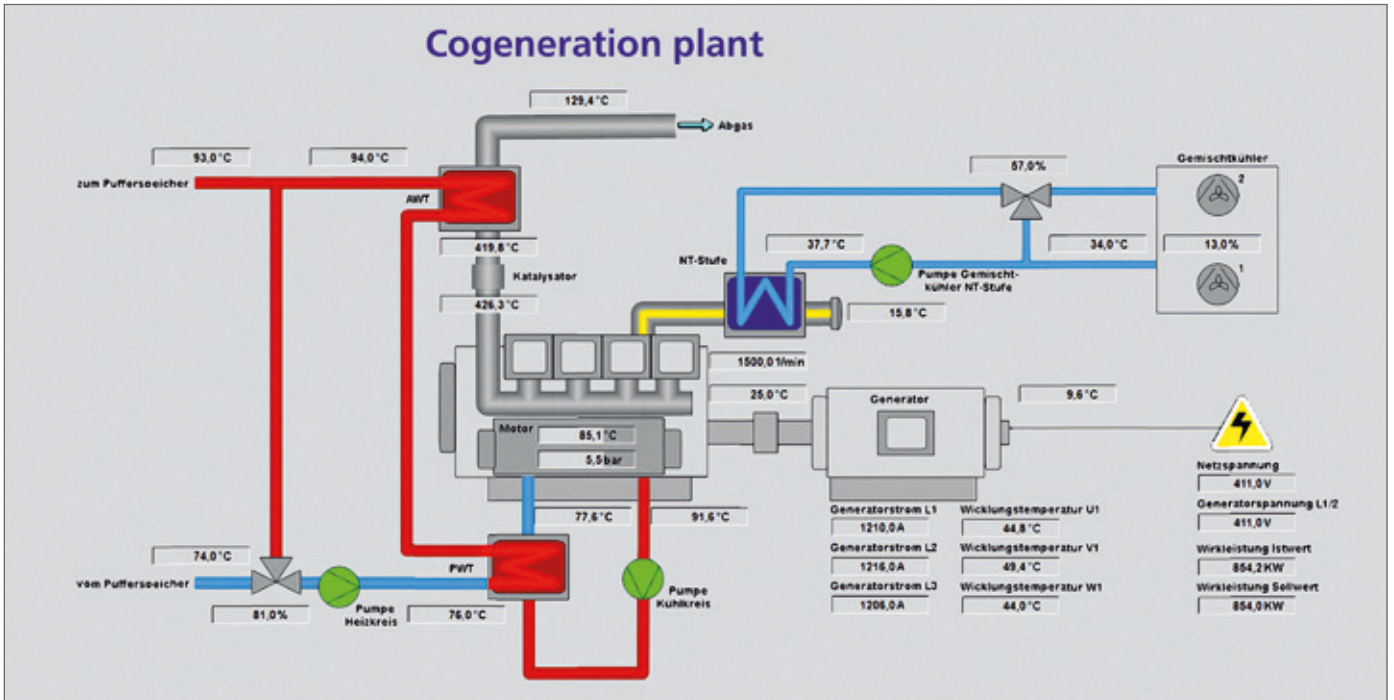
that corresponds to a supply to the town of Wetzlar for around 1,700 homes.

Together with the CO<sub>2</sub> saving from the use of waste heat from the cupola furnace, this results in a CO<sub>2</sub> reduction of about 5,500 tonnes per year.

### Process optimisation by reusing flushing iron

So that a consistent quality can be guaranteed for the molten iron in the casting process, it is necessary for the aggregate (converter, see illustration) and transport containers (casting ladles, see illustration) to be used are brought up to operating temperature before the start of production.

In order to make sure of this in the production process, at the beginning of each production stage the aggregate and transport containers required are filled with molten iron (flushing iron).



Cogeneration: schematic diagram of how a cogeneration plant works with energy being produced by a generator and the use of waste heat.



Converter in the area of the forehearth.



Casting ladle on the overhead crane.

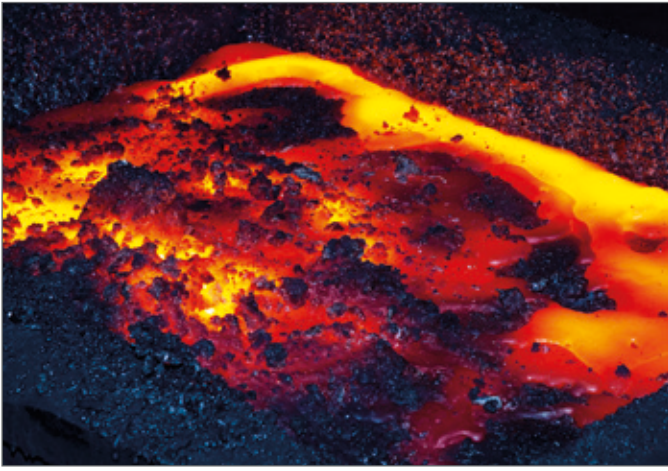
Approximately 4 to 5 tonnes of molten iron are needed for this. In this process the molten iron cools to temperature ranges at which direct further processing in the production process was not possible. Previously the flushing iron was taken off in cast blocks. Because of their dimensions, direct reuse as recycled material in the supply of

material to the cupola furnace was not possible. The blocks were sold to a stainless steel mill directly adjacent to the factory premises for further processing and re-smelting.

With the acquisition of two additional new ladles and by adapting the plant technology for smelting at the Wetzlar location, it is now

possible for the flushing iron to be fed back into the production process directly while still in the liquid state via the forehearth available in the smelting system (see illustrations).

In energy terms, this means a considerable reduction in energy loss by avoiding the complete cooling



Flushing iron. Left: After removal, while cooling. Right: Cooled cast blocks.

of this flushing iron into the solid state while at the same time reducing the additional CO<sub>2</sub> emission, which would occur if the cooled cast blocks were transferred as cast blocks in the molten iron state. For this significant improvement in energy use and the reduction of CO<sub>2</sub> emissions amounting to approx. 330 tonnes per year, a total of 80,000 Euros has been invested.

### Conclusion

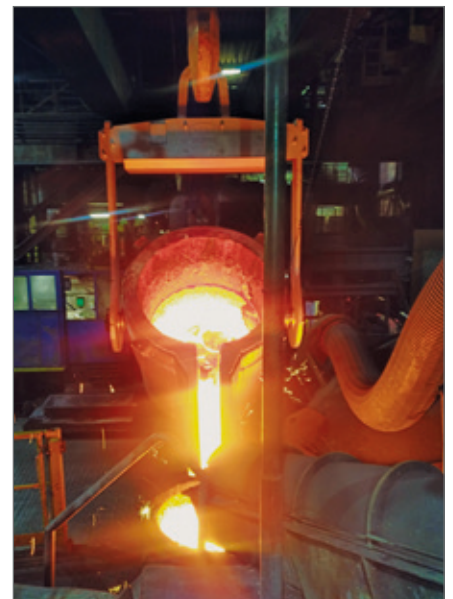
The European Green Deal is a response from the European Commission to the changing climate and the destruction and pollution of our

natural resources. It is about a new strategy for growth, with which the EU should become a fair and prosperous society with a modern, resource-efficient and competitive economy. In which, in the year 2050, no net greenhouse gas emission are released anymore and economic growth should be uncoupled from the use of resources [3].

Today, ductile iron pipes are already being produced to almost 100 % from secondary raw materials (scrap). The Circular Economy is not just being talked about, it is being lived already.

Just as in the saying “standing still is going backwards”, the focus of the manufacturers of ductile iron pipe systems continues to be on the development of environment and recycling oriented production processes, the further development of existing material cycles and the sustainable substitution of primary raw materials while simultaneously reducing CO<sub>2</sub> emissions.

In particular against the background of the European Green Deal, ductile iron pipe systems are “Made in Europe” and more modern than ever as they meet the requirements for protecting resources and the environment. They



Recirculation of flushing iron with additional ladles and enhanced plant technology. Left: Filling a ladle. Centre: Transport of the still liquid flushing iron to the forehearth. Right: Back into the forehearth and use in the production process.

guarantee secure network operation, they have a long working life and they are also part of the Circular Economy. Thus they also offer significant long term cost advantages and are a true added value in terms of sustainability.

The vonRoll Group has already made an early start on the road to CO<sub>2</sub> neutrality. With the three self-financed projects described here for oxygen injection, district heating supply and the use of flushing iron, the annual CO<sub>2</sub> emission will be reduced by a further 7,830 tonnes a year.

So, all in all, a “Good Reason” to set the course for the future with ductile cast iron pipe systems.

## Keywords

Cupola furnace, combined heat and power unit, CO<sub>2</sub> reduction, energy efficiency, process optimisation, recyclability, protection of resources, good reason, ductile cast iron pipe systems

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## TAKE AWAY

### The resources cycle – a solid reason



**Pipe systems in ductile cast iron have a long working life and are recyclable – and this has immense advantages because:**

- the raw material consisting of steel scrap and cast iron scrap comes mainly from regional materials cycles
- the eco-balance is very good since the metals used consist of almost 100 % scrap
- CO<sub>2</sub> emissions are already reduced at the point of production
- their useful life is more than 100 years without problems
- “waste products” are fed back into the product cycle
- waste heat produced in production is used as the basis for district heating increasing energy efficiency is considerably improved by the latest equipment technology while reducing environmental pollution at the same time
- modern production equipment also reduces energy loss

**The resources of this world are very limited and we must handle them with care. This means: products produced from should have a long working life and then go back into the cycle of materials – which is why we count on ductile cast iron for water supply and wastewater disposal.**

Kai Sengwitz

## #reduceplastic – a solid reason

Plastic – is it really a modern material?



Plastic is ubiquitous and we can scarcely imagine our everyday life without it. But we are learning more and more about the growing risk which plastic represents for us and our environment. For a solid reason, we recommend pipe systems in ductile cast iron.

These days everyone is talking about plastic and can scarcely imagine life without it. At the moment, plastic is present in many everyday products: it is a fixed element in countless types of food packaging, bottles for drinks and household products, not to mention toys, and it is used for piping systems in the drinking water supply industry. The first plastics only occupied a niche in the market initially; its real ascent only began after the Second World War. After that, plastics such as polyvinyl chloride (PVC), polyethylene (PE) or polypropylene (PP) for things like household and industrial products conquered the world. For many years plastic was seen as stylish, clean and modern, but today the problems and consequences associated with it for humans and nature have come more and more to the forefront.

The first discoveries of plastic objects out in the open sea in the early seventies were rather random and unexpected; at the time, scientists estimated the hazards for people and animals as being slight [1].

■ **In 1970, the global production of primary plastic was approximately 30 million tonnes a year (see illustration and [2]).**

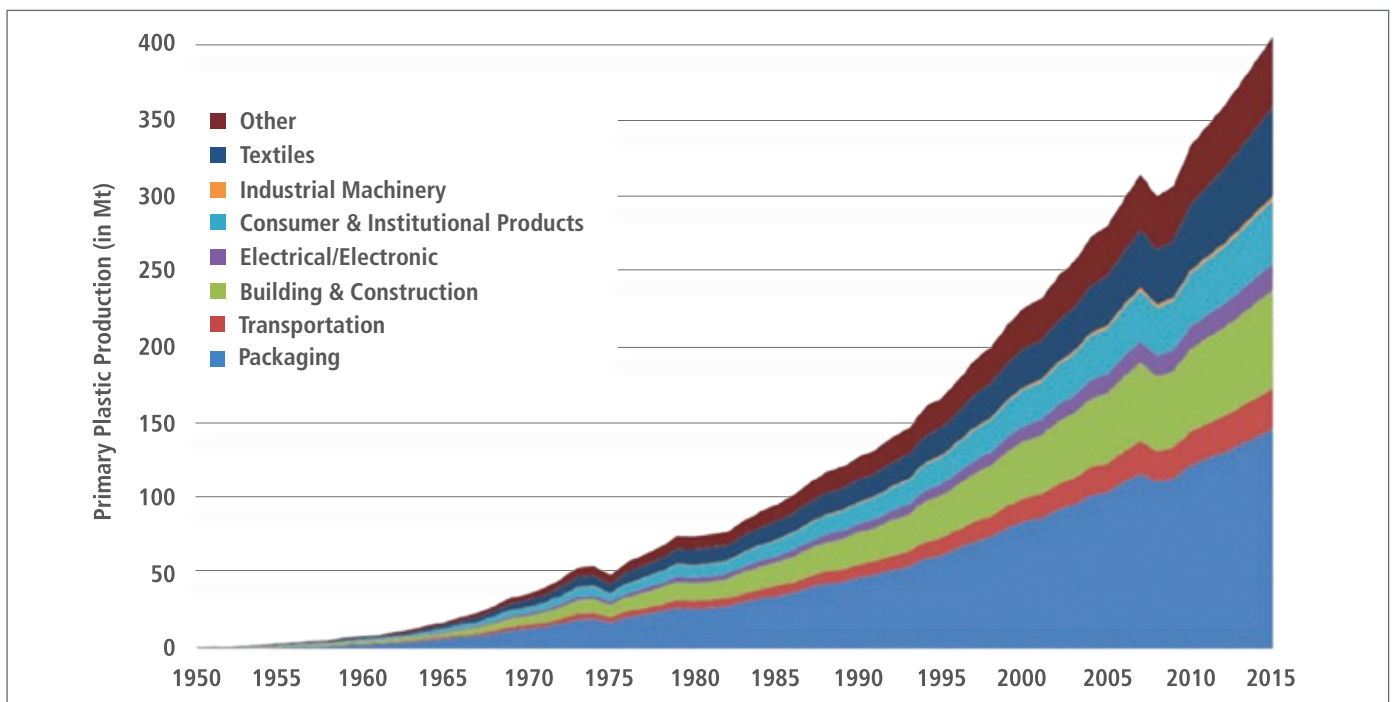
In the following two decades, objects made of plastic were used in science to calibrate models of ocean currents and ocean circulation [3].

Interestingly, on the basis of the models of ocean currents they produced, the researchers were able to predict an accumulation zone in which objects and waste would circulate for decades because of the currents [4].

At the same time a Japanese scientist got interested in another aspect of plastic: so-called persistent organic pollutants which, for a long time, have been used as softening agents in plastics or paints. He established that these POPs also accumulated on the plastic granulates floating in the ocean and found on beaches [5].

This came at a time when the understanding of plastic as a material began to change: at first seen as a homogeneous, integral substance, it gradually became apparent that the elements of plastics do not remain bound in them for ever. In addition to the polymer type, plastics have other chemicals added to them such as softening agents, flame retardants and dyes, all of which can “migrate” [6].

It was only in the year 1997 that the Pacific “Garbage Patch” was discovered by accident by American oceanographer and boat captain Charles Moore when he observed lots of plastic objects floating in the predicted accumulation zone [7]. On closer consideration of this vortex of waste, it transpired that it was not a collection of larger objects but a concentration of countless tiny plastic particles in the entire water column, in other words from the surface down to the ocean floor. In 2004 a team headed by British marine biologist Richard Thompson described these particles as “microplastic” for the first time in an article in “Science” [8].



Global production of primary plastics by sector of industrial use from 1950 to 2015.

Published in [2]

**Table 1: Five stages of intervention for combatting the plastic threat [2]**

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Development of natural replacements for plastic and production of biologically degradable plastic	Production of goods and services using plastic and its natural alternatives	Use of plastic-based goods and services by consumers: - Reduce - Reuse - Recycle	Disposal of plastic-based goods	Collection of plastic waste and making sure that it is properly disposed of
<b>Main players</b>				
Research institutes Businesses Administrations and governments	Businesses and their research and development departments	Consumers Communities Administrations and governments	Consumers Communities Businesses Administrations and governments	Individual communities Associations Social organisations and environmental organisations Administrations and governments

■ **In 2004, the global production of primary plastic was approximately 300 million tonnes a year (see illustration).**

■ **By now, talking in 2019, the worldwide production of primary plastic has increased to 368 million tonnes a year [9].**

Organisations such as the United Nations, for example, have recognised the challenges posed by the use of plastic for the environment and humans. In the article “Frontier Technologies for addressing plastic pollution” [2], there is a description of the five stages (see Table 1) by means of which the risk of pollution of the environment with plastic can be reduced.

In the first place (stages 1 and 2) is the development of natural replacements for plastic and the associated development of products with these replacement materials. Stage 3 “Use of plastic-based goods and services by consumers” (see Table 1) is directed at consumers, communities and administrations and governments. Reducing (#reduceplastic), reusing and recycling are actions which can be implemented right now. Also, because of the increasing pressure to act, requirements [10] and measures [11] for increasing the recycling quotas for plastic

are to be found at different points. However, these are also to be critically examined [12]. One fascinating question is the extent to which, by using plastic as a secondary raw material, the volume of plastic from primary raw materials can be reduced.

Statements in a public discussion among experts in the German Bundestag on the subject “How can we get more recycled materials from plastic packaging into the circular economy” would suggest that these secondary raw materials will be used in order to replace other materials in products with a longer working life and not to reduce the volume of primary plastic [13].

While we are currently occupying ourselves mainly with the recycling of short-lived products in plastic, we should not lose sight of products with longer lives as well.

#reduceplastic is a solid reason, right now, to pay attention to the recycling and reuse possibilities of products with long working lives.

### **Not just recyclable but fit for the circular economy**

We need to handle the limited resources of our environment responsibly and sustainably. In this

connection, it is the recyclability of materials which is becoming increasingly more significant.

Every object made of metal will, at the end of its useful life, go to scrap, which is almost fully recorded everywhere in Germany, and then put into the recycling loop. From many everyday articles, such as drinks or food cans, washing machines or cars, new pipes can be produced in ductile cast iron. In the German metal industry more than 20 million tonnes of steel and iron scrap are used each year for producing new products [14]. The cast iron for this, which is produced from steel and iron scrap, needs a considerably lower use of energy and raw materials than products which are manufactured on the basis of iron ore. What is more, with the use of 1 tonne of scrap, for example, greenhouse gas emissions of 1.67 tonnes of CO<sub>2</sub> are saved as compared with the use of primary raw materials [15].

Already approximately 40 % of the supply pipelines for drinking water in Germany consist of different types of plastic [16]. These drinking water pipes are indeed recyclable – products such as park benches and sheet film can be made from them for example. But using plastics in drinking water



pipes does have its limits: the use of recycled plastics is restricted exclusively to the use of in-process material (remainders and offcuts) occurring in the manufacturing process itself; also they must not be contaminated and they must not have been put on the market previously [17]. Unlike ductile cast iron pipes, therefore, no recycled materials can be used for the production of plastic pipes (for drinking water supply), but only fossil – and hence non-renewable – primary raw materials such as crude oil, natural gas or coal!

In contrast to this, and unlike most competitive materials, cast iron can be recycled again and again to the same level of quality, without loss and to 100 %. It is therefore a true “working material” from which products with long working lives can be manufactured again for water supply and wastewater disposal which meet the highest requirements in terms of health, hygiene and environmental protection.

Pipe systems in ductile cast iron thus contribute a great deal to the reduction of emissions, the protec-

tion of the environment and the conservation of valuable resources and therefore make a positive contribution to the eco-balance.

### Long-lasting

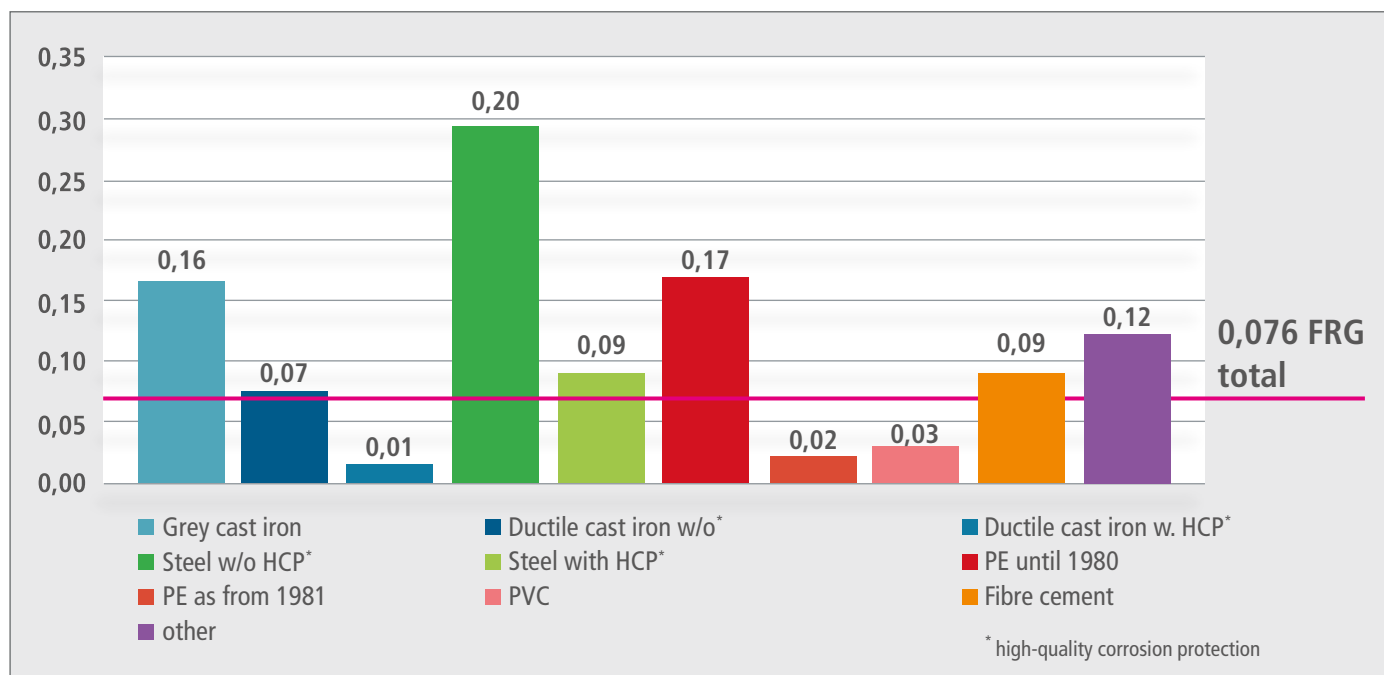
Cast iron pipes have already been in use for more than 500 years for municipal supply infrastructures. Part of the present-day supply networks still date back to a time more than 100 years ago. Over the course of time, cast iron as a material has been continuously refined to adapt to the constantly increasing loads of the piping networks and so have become the material we know today: pipes made of ductile cast iron have been produced in Europe since the beginning of the 1950's.

With the introduction of 2nd generation ductile iron pipes in the 1970's, the basis was established for high durability and a long useful life: they were given high-quality corrosion protection with a zinc coating with protective finishing layer and coatings of cement mortar, polyethylene or polyurethane. Last but not least, the development of the zinc-aluminium alloy with

a synthetic resin finishing layer at the turn of the millennium was a further milestone.

As the failure statistics of the German gas and water association (DVGW) for recent years show, supply networks in ductile cast iron with high-quality corrosion protection (HCP) have very low failure rates in comparison with all other competitive materials. These lie between 0.01 and 0.02 compared with an average failure rate of 0.078 incidents per kilometre and per year [16] and [18]. According to DVGW worksheet W 400-3 [19] this failure rate can be classified as low.

As the average useful life is influenced by the materials themselves and their coatings then, on the basis of many years of experience with cast iron supply networks, a technical useful life of 100 to 140 years can be inferred. By comparison, according to the DVGW technical note reference W 401 [20] – a decision-making aid for the rehabilitation of water pipeline networks – for PE pipes a useful life of around 60 years is assumed.



Damage rates in supply pipelines by type of material [17].

Source: energie | wasser-praxis 3/2017

This is less than half the working life which is stated for pipes made of ductile cast iron.

With its long working life, the “traditional material” of cast iron meets all the current requirements for a modern material and, with its very high reliability and low frequency of failure incidents, it stands for sustainability in the area of water supply.

## Impermeable

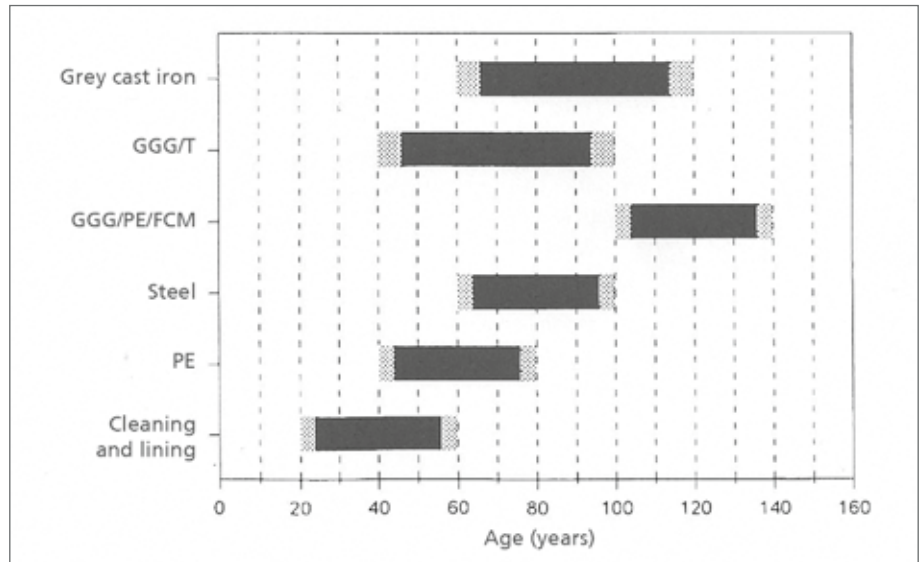
### Ductile Cast iron pipe systems as food-grade packaging

Only the right materials and coatings guarantee long-term hygiene. Cast iron pipe systems in the drinking water network close the quality chain.

The goal here is to avoid the contamination of drinking water by undesirable substances due to the permeability of the pipeline or from the pipe material. Organic substances can be diffused through permeable pipe walls and get into the drinking water, affecting its taste. The causes of taste deficiencies permeable with maypipelines be e. g. contaminated soil, the proximity of the pipeline to petrol stations, leaking sewers or over-fertilised ground.

The pressure inside the pipe does not play any part in diffusion; the only crucial points are the concentration gradient, the pipe geometry and the diffusion coefficient of the material.

Drinking water is a natural product which is extracted in near-natural conditions. Therefore its “packaging” – in other words the drinking water supply network – should also consist of near-natural products. Cast iron pipes have an impermeable pipe wall and thus represent the ideal packaging for drinking water.



Technical useful life by group of pipelines.

Source: DVGW-reference W 401, Figure 2 [20]

## Environmental and health protection

### Resource-saving

Over the course of time, cast iron pipes have undergone some major changes. It is true that they have always been reliable, robust and durable, but they were also seen as being massive and heavy.

With the modernisation of casting machinery and the optimisation of the centrifugal casting process, it has been possible not only to reduce energy consumption but also to reduce the amount of raw materials used. Within the last 50 years the consumption of iron in the production of cast iron pipes has been almost halved on average [21].

From water distribution in towns and cities to high-pressure applications, these days cast iron pipe systems can be manufactured with wall thicknesses which meet the specific requirements of the relevant area of application, and this while making sure that nothing is compromised in terms of reliability and safety.

### Solvent-free (VOC free)

In some cases, pipe systems in ductile cast iron are provided with coating systems in which the

finishing layer consists of an environmentally friendly water-based paint and so is free of volatile organic compounds (solvents) and bisphenol A.

Although the manufacture of the finishing coat is not covered by the Federal Emission Control Act (BImSchV) or simple “solvents regulations”, the requirements for limiting emissions of volatile organic compounds (solvents in paints) are met. The goal is to reduce the pollution of the atmosphere with volatile organic compounds. These can not only have a direct adverse effect on the health of humans but they also contribute to ground-level ozone formation, the so-called “Summer smog”.

By coating ductile iron pipes with a water-based finishing layer, the environment is not polluted with solvent emissions.

### Free of bisphenol A

Bisphenol A (BPA) is a chemical substance which is predominantly used in combination with other chemical substances for the production of plastics. The assessment of possible health risks caused by bisphenol A has been controversially discussed for years because of its hormone-like effects.

In recent years, the European Food Safety Authority (EFSA) has lowered the tolerable daily intake (TDI value) to 4 micrograms per kilogram bodyweight per day. This is 12.5 times lower than the previous value [22].

However, some European countries do not rule out health hazards due to the substance and have adopted precautionary legal measures which are more far-reaching: for example, Austria, Belgium, Sweden and Denmark have banned it in all food contact materials for small children and France has in fact done this for all food containers with bisphenol A.

Strictly speaking, pipe systems in ductile cast iron do not in fact count as packaging for foodstuffs, but they nevertheless are the “packaging” for our most important lifeline: drinking water. They contribute a great deal to the conservation of resources and to the protection of health and the environment and, against the background of sustainability, they are a byword for an environmentally friendly material which is up with the times. In contrast to other materials, ductile cast iron is a true “resource” from which long-lasting products which meet the highest health, hygiene and environmental requirements for water supply and wastewater disposal are being made today from secondary raw materials. In pipeline construction there is now the possibility of deciding in favour of a product which is part of the Circular Economy: #reduceplastic – a solid reason.

## Keywords

#reduceplastic, recyclability, circular economy, long-lasting, DVGW failure statistics, failure rates, useful life, impermeable, conservation of resources, bisphenol A, solid reason, cast iron pipe systems

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## TAKE AWAY

### #reduceplastic – a solid reason



**Pipe systems in ductile cast iron have enormous advantages over pipe systems in plastic. The most important of these are:**

- the considerably longer useful life of over a hundred years
- the hundred-percent recyclability at the same level of quality
- not only recyclable but fit for the circular economy too
- extremely resource-friendly
- considerably less use of energy
- significantly lower greenhouse gas emissions because of the use of scrap as compared with using primary raw materials
- use of recycled cast iron pipes to produce new pipes for the supply of drinking water
- the positive contribution to the eco-balance
- the very low failure rates achieved thanks to high-quality corrosion protection
- the impermeable pipe wall of the cast iron pipes is an ideal “packaging” for our no. 1 commodity, drinking water
- the coatings of the ductile cast iron pipes are solvent-free and free of bisphenol A

**Pipe systems in ductile cast iron contribute a great deal to the conservation of resources and to the protection of health and the environment. In terms of sustainability, they are a byword for a modern and environmentally friendly material.**

Christoph Aigner and Christoph Bennerscheidt

## Cooler cities – a solid reason

An ecological solution for climate problems in inner cities



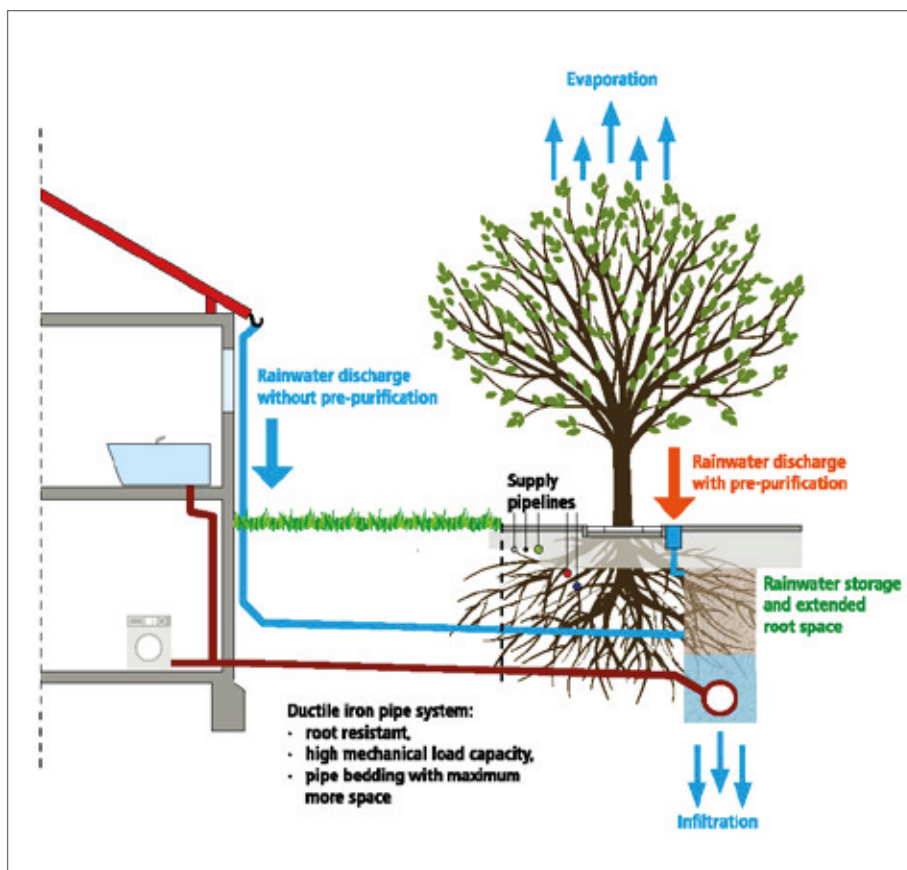
Nowhere else can global warming and the rising temperatures associated with it be felt so clearly as in our towns and cities. During the Summer months, surfaces sealed with asphalt and concrete do not cool down and when it rains hard, the water cannot soak away into the soil beneath. The results are heat islands in Summer, floods and cellars full of water when it rains. So living in the city is becoming more difficult but also less healthy.

There are solid reasons why our urban infrastructures should be adapted to the challenges being set by climate change. The focus here should be on using products, technologies and construction methods which meet the future requirements applicable both in technical terms and in terms of recyclability, the Circular Economy and CO<sub>2</sub>-neutral production.

### Cooler cities – sponge city principle

The “sponge city” is a synonym which stands on the one hand for a change in the way we deal with rainwater in towns and cities, making it more water-sensitive, and on the other hand for a greater use of cooling vegetation in the urban environment. This sponge city principle is vividly described in a publication by the Federal Institute for Research on Building, Urban Affairs and Spatial Development [1]. Among other things it states: *“One aspect which is becoming increasingly significant both for precautions against heat and for stormwater management in cities which is as natural as possible is the cooling potential of soil and vegetation surfaces. Green surfaces which have a sufficient supply of water are the city’s natural “fridges”. This cooling potential can be increased by the storage of stormwater, soil improvement measures and a continuous supply of water for the vegetation. The promotion of the “sponge city principle” and the development of sustainable storage and irrigation systems are therefore central tasks for the future for climate-adapted towns and cities.”*

The cooling capacity of soil and vegetation areas should be ensured by water evaporation in the form of cooling by evaporation from plants. The level of evaporation from planted surfaces depends on the type of plant, the growth phase and the degree of cover. Table 1 gives approximate



The sponge city principle in the street space.

**Table 1: Average evaporation capabilities of different plants** (Harlaß 2008; from Wohlrab et al. 1992, Larcher 2001, DWA 2002)

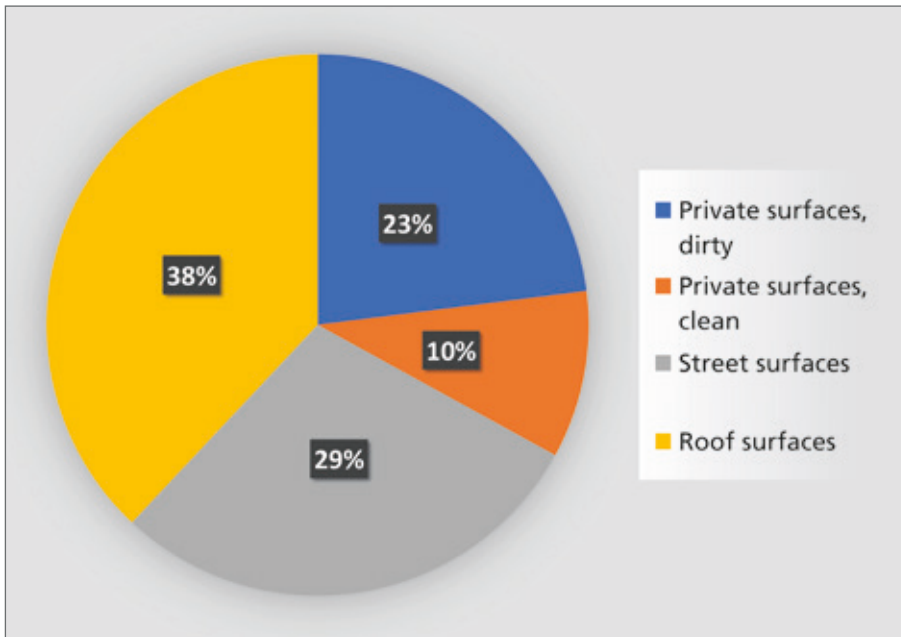
Type of plant	Average evaporation capability [mm/a]
Floating plants	1,000–5,000
Tall perennials in flood plains	800–1,500
Marsh plants	ca. 1,100
Coniferous forests	500–700
Deciduous forests	500–600
Grassland	400–500
Arable land	300–400
Heathland	ca. 200

figures for the annual evaporation levels of a few species of plants by way of example. It can clearly be seen here that, in the urban environment, deciduous and coniferous trees offer the greatest potential for cooling towns and cities.

In addition, back in 2006 and taking the viewpoint of a major drainage network operator in Germany as the example, consideration was

given as to what the proportional distribution of sealed surfaces in the urban environment looks like and in which locations (Table 2) the greatest potential for separation is to be expected [2].

These considerations have not however led to extensive road surfaces and roof surfaces, e.g. in residential roads (see Table 2), being separated. But this has happened



Proportional distribution of sealed surfaces in the Emscher area.

**Table 2: Potential for separating clean and polluted**

Category of road	Reference potential for separation in percent	
	short-term (minimal)	long-term (maximal)
Residential road	30	60
Service road	20	30
Main road	10	15

in connection with the optimisation of tree planting in Stockholm. This example of the implementation of the sponge city principle using urban trees was described in 2008 in [3] with a focus on the optimisation of tree planting. The design described in the “Planting trenches in Stockholm” handbook [4] served as a blueprint for examples of implementation in the Austrian cities of Graz [5] or Vienna [6].

### Soil-pipe system – BoRSiS

The more far-reaching implementation of the sponge city principle in the street space is a goal being pursued by the project initiated by EADIPS FGR entitled “BoRSiS – soil-pipe system as an innovative element of climate-adjusted urban drainage” [7], which got underway on 1st October 2021.

In addition to the industry partners’ own contributions, the project is financed by a grant from the German Federal Ministry of Education and Research (BMBF) under the funding program „Research at Universities of Applied Sciences” with the funding code 13FH002KA0.

Unlike many pilot projects for adjusting to heavy rainfall and climate change, in this research project there was a marketable and practical storage concept to be developed. For this reason, an industrial representative, a tree ecologist and a municipality were involved in the project right from the start. In addition to water management and geotechnical issues, there are also economic aspects (cost-benefit analyses, issues concerning sewage charges for joint public and private use) and ecological aspects (requirements for trees, efficacy

analysis) to be taken into account. This interdisciplinary collaboration should enable an holistic and innovative set of solutions to be developed and its feasibility in real and practical terms to be still further enhanced by the involvement of expert partners.

### European Green Deal

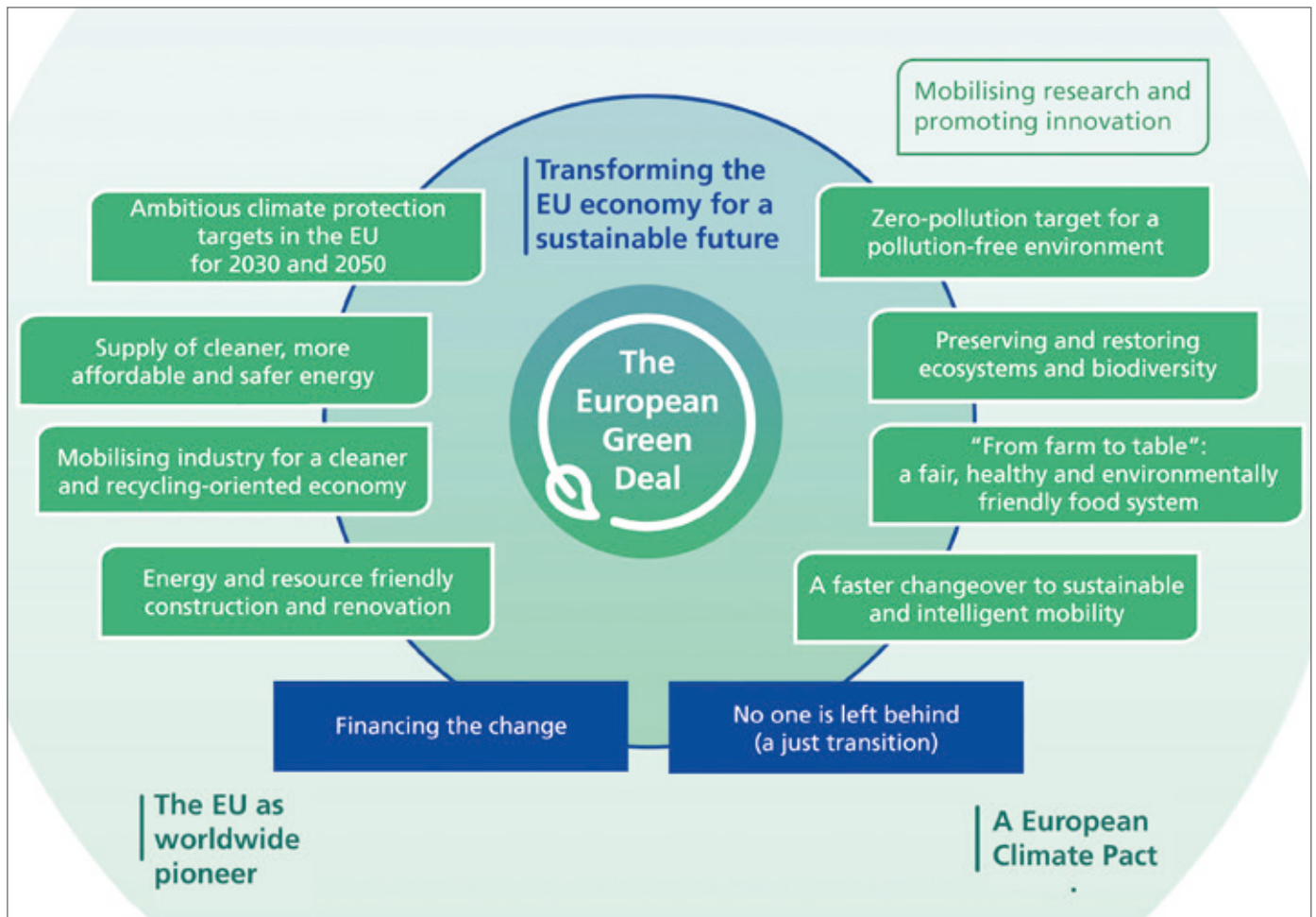
With the publication of the new growth strategy by the European Commission under the title “European Green Deal” (see illustration) the development of the marketable and practical storage concept in the context of the R&D “BoRSiS” soil-pipe system project will be done on the assumption that economic growth must be decoupled from the use of resources. This is possible – because the members of EADIPS FGR are already living in the circular economy.

### Summary and outlook

Cooler cities – a solid reason: cities all over the world must tackle the tasks posed by the challenges of climate change. As if seen through a magnifying glass, 2019 and 2020 directed our focus – not surprisingly – on the topics of water management and coping with heat (see [8]). In order to counteract this, corresponding processes and methods have been thoroughly researched and described from different perspectives by the specialist disciplines with competence in the area concerned. In most cases the associated approaches for solutions are not based on what is technically feasible but on what is workable from an administrative point of view according to recognised engineering rules.

As described in [2], there is a great potential for water management in the area of residential roads, where roof surfaces and street surfaces can be separated from each other. The limited underground space





Focal points of the European Green Deal [9] with "Mobilisation of industry for a cleaner and cyclically oriented economy".

and the conflicts of use associated with this have hindered the realisation of this potential, meaning that only piecemeal measures have been implemented so far, such as the installation of tree irrigation trenches for example.

The R&D "BoRSiS soil-pipe system project as an innovative element of climate-adjusted urban drainage" should accelerate implementation. On the one hand, from the technical viewpoint, the use of robust and root-resistant cast iron pipes means that so far unused volumes in the pipe trench can be utilised. And on the other hand, it throws light on the normative and administrative restrictions which have existed to date meaning that, with the collaboration of network operators and legislators, solutions can be worked out.

A further focal point is the increased use of products which, at the end of their working life, are not simply recyclable but are part of the Circular Economy. Requirements such as those described in 2019 with the publication of the European Green Deal as a growth strategy for a fair and prosperous society in the EU will therefore be taken into account in a sufficient manner.

### Keywords

Sponge city, climate change, soil-pipe system, cooler cities, solid reason, recycleable, European Green Deal

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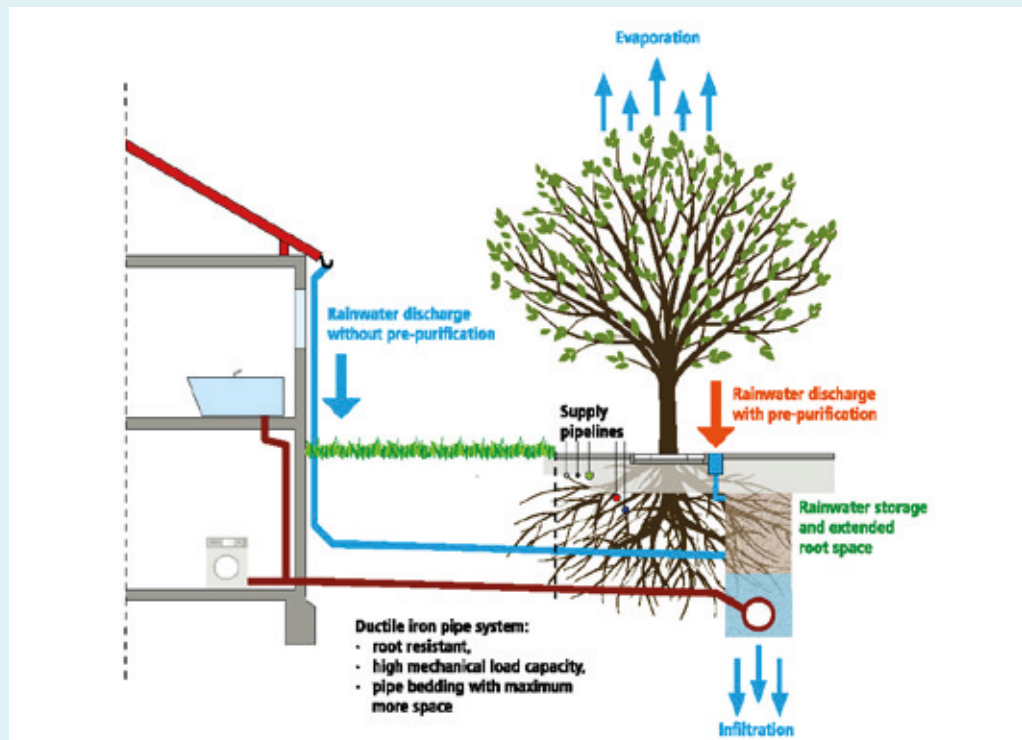
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## TAKE AWAY

# Cooler cities – a solid reason



**Sponge city – a solution for climate problems in inner cities, e.g. by means of:**

- Reduction of heat islands by improved shading
- Providing more root room to favour the growth of urban trees
- Targeted irrigation of urban trees with rainwater
- Increasing the evaporation rate of trees with improved climate control in the surroundings
- Protection of waterways by reducing the proportion of rainwater in the drainage systems
- Improved flood protection by the retention of rainwater during severe rainfall events

**An ecological solution such as the sponge city, naturally also needs sustainable construction methods and the avoidance of plastic components (#reduceplastic), e.g. by using:**

- European manufacturers with short transport distances
- Compliance with environmental and working standards at manufacturers' works
- Natural filter materials
- Ductile iron pipe systems which are part of the Circular Economy

Christof Mairinger

## Regionality – a solid reason

Regional power – in a time of crisis



Long-lasting, recyclable and regional: our cast iron pipe systems are not only sustainable in the production of their material but also in terms of transport as they are produced in our European factories. So we are providing important jobs for the region and avoiding global transport routes.

The Covid-19 crisis has kept the world in suspense for more than a year now. What started as a local epidemic in China developed into a disease encompassing the globe. And this pandemic brings with it some massive restrictions but it is also a cause for some rethinking. Until now it has been tempting to purchase a product simply on the basis of the best price principle, regardless of origin and production conditions, but now regional factors are playing much more of a decisive role again. One particular example of how this regional power can be put to optimum use was demonstrated by the town of Hall in Tirol in the Spring of 2020. According to the saying “Strong together” the water main running along the Salzbergstraße, one of the main thoroughfares of the town, has been replaced. This operation is a perfect example of a project which reinforces regional economic cycles and also shows how well local companies work together, while also being aware of the environment.

## Regional economies – a prime example

The town of Hall and its municipal service providers put their trust in regional professionals for the new main water pipeline – beginning with recycled raw materials (RAGG GmbH), on to production (Tiroler Rohre GmbH) and right through to installation (Fröschl AG & Co KG). The mayor of Hall, Eva Maria Posch, stressed: *“In the case of this construction project, it shows how proud we can be of the companies from the region who achieved this and of the quality of their work.”* However it is also a clear acknowledgement of the production location in the heart of the Alps. Despite – or perhaps precisely because of – the high environmental and social standards.



The beautiful town of Hall in Tirol does not exist on tourism alone; the traditional company of Tiroler Rohre GmbH based here also offers jobs, work and training here for around 220 people.

### Regional recycling

The RAGG GmbH company was responsible for recycling the leftover materials. Managing Director Petra Mussmann: *“We see ourselves as an important link in these proceedings in that we provide the conditions for recycling and for new products. I see this not only as an economic pillar of the business but also as a responsible commitment to people and the environment.”*

### Regional production

The company responsible for the production of the pipes was Tiroler Rohre GmbH who, each year, produce around 45,000 tonnes of ductile iron pipes and driven piles. What is special about the product is that it is produced almost 100 % from recycled material. And so, for Managing Director Max Kloger, this closes the circle: *“Because of the long working life of our products, sustainability has always held great significance for Tiroler Rohre GmbH. Short distances for procurement of recycled raw materials form a good starting point. Their use close to the production location reduces the ecological footprint still further. And especially in the current situation it is a solid reason for being able to rely on regional partners.”*

For this construction project, the traditional Hall company supplied 1,500 m of ductile iron pipes in nominal size DN 300. The pipes used here had cement mortar lining with the PUR Longlife coating and the proven VRS®-T joint system.

### Regional construction company

Franz Fröschl, too, was pleased to be able to apply his know-how in Hall: *“As a Hall construction company, we are happy to work on projects at our own front door with and for other companies from the region and implement them for the population of Hall. In the Salzbergstraße case, our employees are proud to have replaced the water pipelines and so secure the water requirements of 15,000 people as well as numerous enterprises in Hall for the coming decades.”*

And the people of Hall, too, are happy that, in the shortest time and with two construction teams working from both sides, the job was quickly done. The pipes from the old water supply pipeline were well over 100 years old. High time, therefore, for something new – sustainable and with heart from the region for the region.



For more than 70 years high quality ductile iron pipe systems have been produced in the modern Tiroler Rohre GmbH (TRM) foundry.

This example clearly shows how important the regional economy is. Tiroler Rohre GmbH and RAGG GmbH work closely together but not only on this project. RAGG GmbH supplies the steel scrap from which the new pipes will be produced. Because the two companies are directly adjacent to each other, the ecological footprint can be kept to a minimum. In addition, both companies have a rail connection available to them which is obviously naturally used for delivering the raw material.

### Regionality for awarding procedure

But regionality also has a role to play in the awarding procedure. The European Union has been grappling with the details of this subject and on 1st January 2020 it issued a decree which stipulates an awarding process as from a certain threshold value. With construction contracts or the granting of concessions, this is 5,350,000 euros and for contracts for supplies and services it is 214,000 euros. A further distinction is made between sectoral contracting entities with a limit of

428,000 euros and top and mid-level Federal authorities as from 139,000 euros.

### Sectoral contracting entities and their activities

Sectoral contracting entities are considered to be public contracting entities whose activity applies to a specific sector and natural or legal entities under private law whose activity applies to a specific sector on the basis of a specific right. In the area of water management, these sectoral activities include the provision or operation of fixed networks for supplying the general public in connection with the extraction, transporting and supply of drinking water and the delivery of drinking water into these networks [2].

### Open and restricted awarding procedures

When awarding contracts, public contracting authorities can choose between an open procedure and one that is restricted. The open procedure is a process in which the public contracting authority asks an unlimited number of companies to submit offers publicly. With a restricted procedure, after prior, restricted invitation, the contract-

ing authority asks a limited number of companies to submit offers according to objective, transparent and non-discriminatory criteria [3]. As regards the duration of the awarding procedures, these only differ by 5 days, so the open procedure lasts 35 days and the restricted procedure 30 days. In case of urgency, the period of the procedure is reduced to 15 and 10 days [4].

The companies instructed are to be selected on the basis of objective criteria, which must be made accessible to all interested parties. The exclusion of companies is possible for private sectoral agents where there are compelling reasons for exclusion; for amendments to existing contracts the price limit cease to apply. Framework contracts are covered in the relevant legislation (§§ 21VgV and 19 SektVO).

So Framework contracts must be put out to tender while individual orders in the context of agreements can go ahead without tendering or with a simplified tendering procedure in the case of agreements with a number of companies. But in this case, the individual order may not deviate from the framework agreement..

The period of validity of such an agreement in Germany is set at a maximum of 4 years, and for sectoral ones 8 years. The contract is to be awarded to the most cost-effective bid. This is the one with the best price-performance ratio. In addition, qualitative environment-related or social aspects are to be taken into account. The awarding criteria must be made known to the bidders [5].

### Procedure with bidders from third countries

Where bidders from third countries are concerned, there is basically no difference from those for bidders from other EU countries.

However, in order to provide a little protection for the domestic economy and production, there is always the possibility of excluding third-country bidders from the tendering process who do not come from a country with which the EU has signed binding international agreements or bilateral free-trade agreements.

### **Equal competition conditions for all**

When transferred to the sectoral area, this possibility means that an offer can be rejected if a proportion of more than 50 % of the goods originate from non-EU countries. For Germany this additionally means: also with EEC countries and all those with whom no agreement on reciprocal market access exists [6]. Furthermore, the European Commission has reacted as follows in a communication: If a public contracting entity does not reject such an offer but allows it to be included in the awarding procedure, the public contracting entity must give preference to equivalent offers which include less than 50 % of products originating in third countries. This means that the principles of the EU treaty with reference to transparency, equality of treatment and non-discrimination must be observed in awarding procedures.

With exceptionally low offers, the public contracting entity has the possibility of rejecting these, thereby guaranteeing equal competition conditions for all bidders.

### **Equal standards for all**

The EU Commission has also issued a statement to the effect that the strategically oriented awarding of contracts can make a more conscientious and targeted use of public money possible, encourage investments within the EU and contribute to achieving equal competition conditions in which all bidders – regardless of their country of origin – meet the same standards. This also includes the socially responsible awarding of public contracts and a procurement process which is environmentally oriented and encourages innovation when bidding for and awarding public contracts [7].

### **Regionality at all levels**

Additional criteria are the type of production process, the location of the production facilities, the wage and social standards prevailing and observed there and the complexity and transparency of the supply chain. Above all, the practice of wage and social dumping

should be brought to an end. Such regional projects procure and secure jobs close to home, which also comply with labour law requirements and meet social standards. Higher production costs in Europe are no barrier here. Municipalities in which the production facilities are based benefit from the municipal rates if the local businesses are healthy and the order books are full. It is specifically the supply chains which have often been put to the test by the Covid-19 pandemic and which have been the focus of public attention.

In addition to the demand for certain standards which the products must meet, awareness of delivery routes is becoming ever greater and more important – even at tendering stage. But this is of little value to the client if they have purchased a product – perhaps more cheaply – outside Europe but does not receive it because delivery has been adversely affected by pandemics, blockades, wars or other events which are difficult to foresee. With European products it is not merely reliability of delivery that one is purchasing. With a good awareness one can expect that, in addition to high product quality, social standards will be observed.



The production of an extensive range of pipes and fittings provides abundant stocks and thus guarantees fast delivery without red tape.



For local partners, such as the local construction company, reliability and trustworthiness are a matter of honour.

With a reinforcement of the regional economy, a good foundation is being laid for us to build on – this is more than a solid reason.

## Keywords

Regionality, awarding procedure, European standards, regional production, social standards, regional economy, solid reason

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## TAKE AWAY

# Regionality – a solid reason



**Regionality plays a very special role because it means:**

- strengthening regional economy
- creating local jobs
- environment-friendly production
- independent optimisation of production stages
- short transport distances
- high quality standards (for all)
- sustainable production of materials
- observance of wage and social standards
- transparency of the supply chains
- reduction of the ecological footprint
- equal competition conditions

**In addition to the many environmentally relevant aspects, regionality offers security, reliability and sustainability at all levels.**

Andreas Wollnik

## Short distances – a solid reason

Security, reliability and sustainability at all levels



Regionality offers the inestimable advantage of short distances – for consultation, for decision-making, for collaboration, but also in the context of logistics. Global delivery difficulties or bottlenecks are not something that we have to cope with on a daily basis. Our work and our logistics are exactly like our product: reliable, robust and sustainable.

More than ever, in the time since the beginning of the Corona pandemic, it has been demonstrated that for the procurement of raw materials, for production and dispatch, for operational issues and finally also for recycling and reuse, short distances are a guarantee of the secure operation of drinking water and wastewater networks. When worldwide supply chains temporarily collapse and delivery bottlenecks lead to production stoppages and/or delays, short distances are – a (very) solid reason.

### Short distances for the procurement of raw materials

Manufacturers of pipes, fittings and valves in ductile cast iron are part of a European metals cycle

which has already been functioning for decades. The use of up to 100 % scrap iron for the production of cast iron is part of a circular economy in practice.

The regional purchase of old metals with short delivery distances and reliable partners is the focus of EADIPS members:

Separating and classifying the scrap as meticulously as possible guarantees the consistent quality of the cast iron (the intermediary product in the production of steel in the blast furnace is called pig iron). Qualified metal recycling companies supply this scrap without complications and by the shortest routes.

The safe operation of the production plant for producing fittings and valves is an essential condition for being able to maintain the delivery capability even in difficult times. Short distances to medium-sized companies as suppliers or for servicing and maintenance work safeguard the operation of complex equipment.

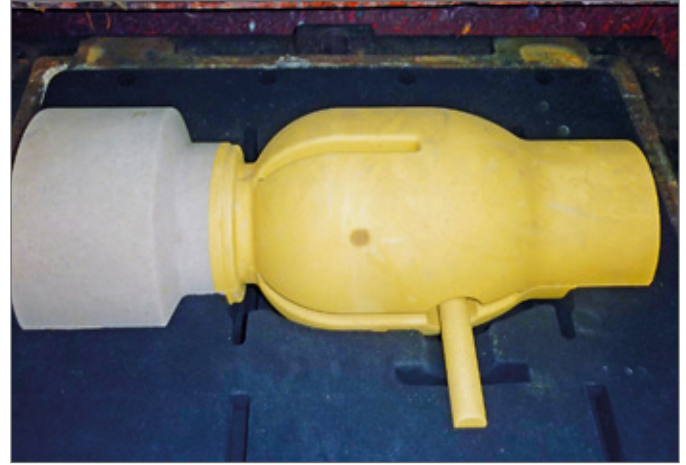
All in all, these short distances to regional partners help reduce CO<sub>2</sub> emissions, reduce the carbon footprint of the cast iron sector and have also contributed to the uninterrupted supply capability in times of pandemic.



A closed-loop recycling system has already been in operation for the production of cast iron in Europe for many years.



Plunger valve.



The core of a plunger valve.

### Short distances for product development

A network operator sees and buys a finished product but, for lack of information, he often knows nothing about the development stages necessary between product concept and finished product and the quality assurance measures which have to be taken in series production in order to produce e.g. technically and hygienically fault-free valves. Always important here are the aspects which show that the products are on the one hand made of recyclable materials and on the other hand as capable as possible of being disassembled into single material types.

There are good conditions for achieving these characteristics with ductile cast iron pipes and fittings, but particularly with valves, if construction, core production, casting, mechanical processing, coating and quality assurance are all done at short distances.

Experienced and well-trained employees are supported in the construction by modern software solutions. 3D construction drawings with CAD programmes form the framework of the product which is then optimised with strength calculations in finite element programmes (FEM), so that, on the basis of this, the feasibility of producing the cast body can be

checked by simulating the casting process (CAP: computer-aided process simulation). Naturally it is not only the mechanical values which are important; taking account of the feasibility of production and hydraulic characteristics such as pressure loss and friction coefficients (the so-called-values) are also regularly determined by means of CFD flow simulations.

Only after all that are prototypes of casting moulds with special cores produced, the production possibility of the cast body tested and then, at short distances, the quality assessed by experts from construction and casting. In a repetitive process of mechanical processing, coating and installation of further components the cast body then becomes the prototype of a valve.

A short distance away, in the test workshop, the hydraulic characteristics determined by computer can be verified on the hydraulic test bench and the mechanical characteristics determined by fatigue tests. With the client nearby and a short distance to innovative network operators, a reliable and durable product is produced from the prototypes and a pilot series.

### Short distances for installation, commissioning and operation

Particularly with control valves, it must be noted that installation situation, operating parameters and power supply on site are decisive factors when deciding which control valve should best be used; these parameters are therefore determined individually. Control valves are not designed according to the nominal size of the pipeline but according to the existing operating data. In most cases this means that the nominal size is reduced in order to achieve the best possible control characteristics.

So there is a network of technically skilled field workers at short distance from the network operators, who are supported by the valve manufacturer in the choice of valves and their installation, commissioning and operation.

### Short distances for dispatch

Short distances from production, on to warehousing and finally to dispatch are a good basis for being able to make the products requested available at the right time and in the right volume. When stock movements, stock levels, orders pending etc. are linked with the average turnover in past weeks, accurate signals can be sent to production so that they remain ready



Consulting with network operators at the Düker location at Laufach/Aschaffenburg.



Support for the installation company by expert service teams.



Exploded view of the type 7015 plunger valve: body in spheroidal graphite cast iron; control cylinder and slider-crank mechanism in high-grade steel, steel bolts and brass cylinder liner.

to meet orders. Short distances across the whole of the production chain right through to dispatch make this possible. Coupled with a reliable forwarding agent with a sufficient number of branches in Germany and Europe, the most widely varying client wishes, such as fixed delivery dates, advance notice of delivery via Cargoclix or telephone notification and so on can be fulfilled.

### Short distances for maintenance, repairs and after dismantling

As with all mechanically moving constructions, repairs are also needed with valves if optimal functioning is to be maintained and working life prolonged. The availability of spare parts and the short distances to the manufacturer improve ease-of-care characteristics and hence also the useful life of the valves.

Innovative construction means that, for example with the plunger valve, the spheroidal graphite cast iron body, the high-grade steel control cylinder and slider-crank mechanism, the steel bolts and the brass cylinder liner can be separated according to type at the end of their working life. That's what is meant by the circular economy and it is being practised in this way at short distances.

### Keywords

Short distances, solid reason, metals cycle, circular economy, supply chains, supply bottlenecks, valves

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## TAKE AWAY

### Short distances – a solid reason



**Short distances play a particular role: from the procurement of raw materials to consultation, production, implementation and then the final dismantling of the ductile iron pipe systems. They guarantee the reliable operation of drinking water supply and wastewater disposal pipelines. In particular short distances are good:**

- for the procurement of raw materials and the regional purchase of scrap metals with the maximum possible separation and classification according to the type of scrap
- for an efficient product development with experienced and well-trained employees who work, closely together on construction, core production, founding, mechanical processing, coating and quality assurance
- for a network of technically skilled field workers at short distances from the valve manufacturer, who assist the network operators in the choice, installation, commissioning and operation of the valves
- for dispatch, supplying the right products promptly and in a short time
- for the availability of spare parts for repair work and

**Global delivery difficulties and/or bottlenecks are foreign words for EADIPS member companies. Regionality is their advantage, meaning short distances in all stages of the supply chain.**

Stefan Neuhorn and Christoph Dietiker

## Partners with vision – a solid reason

Acting together at local level, making changes at global level



It takes many operations to produce a cast iron pipe. In the same way, it takes many committed people to prepare the ground for a good future. This is why we count on our network of reliable partners who, together with us, enhance and extend cast iron pipe systems.



Dealing with climate change and its effects, the promotion of a more efficient use of resources by shifting to a cleaner, circular economy, restoring biodiversity and combatting the pollution of the environment are huge tasks for the coming years and decades. The European Commission started out on the road to tackling these tasks with the European Green Deal, which was presented on 11 December 2019. Since that time, action plans, strategies or proposals for achieving the targets of the European Green Deal have been published almost every month.

It is not surprising that the European ductile cast iron pipe system manufacturers, as partners with vision, had already started to do their “homework” on this even before the proclamation of the European Green Deal.

### From a linear economy to a circular economy

On 11 March 2020 the European Commission published the **Circular Economy Action Plan** with the focus on the sustainable use of resources. This is what Executive Vice-President and Commissioner for Climate Action Frans Timmermans, who was responsible for the European Green Deal, has to say about on the subject:

*“In order to achieve climate neutrality, to preserve our natural environment and to reinforce our economic competitiveness by 2050, we need a closed-loop circular economy. At the moment our economy is still predominantly linear and only 12 % of secondary materials and resources get back into the economy. Many products break down or fall apart too quickly, and cannot readily be reused, repaired or recycled or else are only intended for one-off use ...” [1].*



As long as around 40 years ago, the cast iron pipe industry made the change from a linear economy to a circular economy: at the end of their lifecycle cast iron pipe systems find their way back into the existing cycle of materials in the form of high-quality materials.

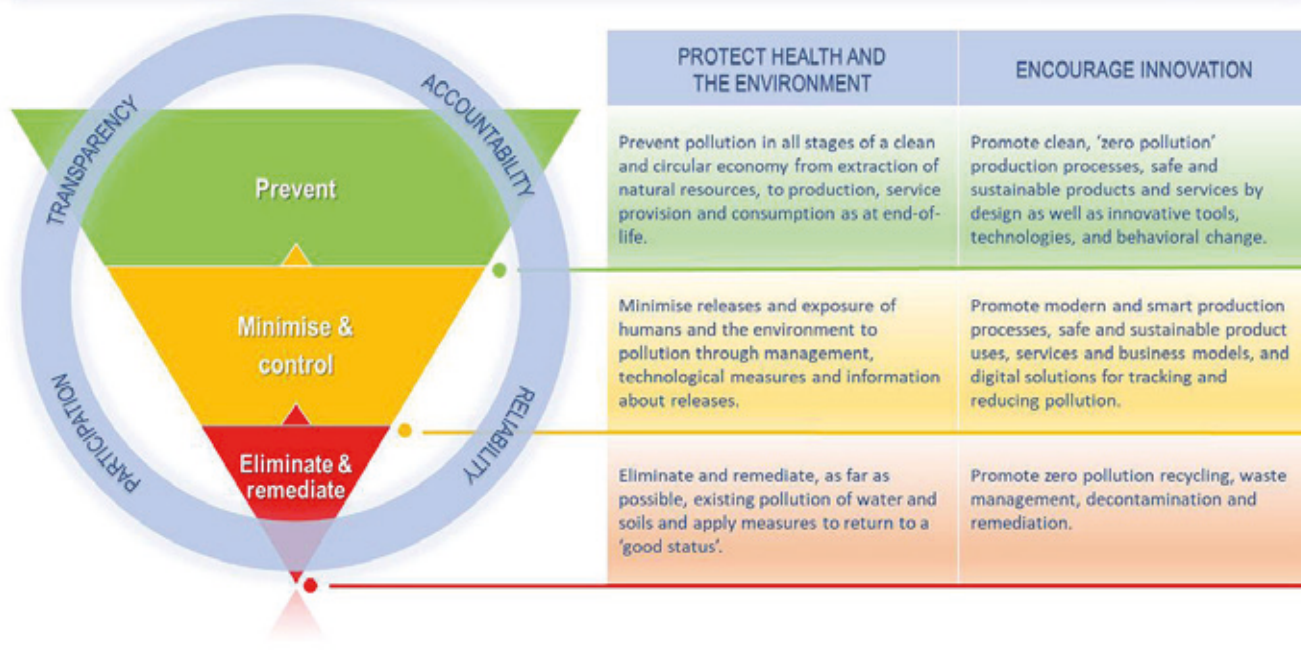
With ductile cast iron pipe systems, the transition from a linear economy to a circular economy occurred as long as 40 years ago. For example, in 1981 the blast furnace in Wetzlar was blown out and a modern cupola furnace was put into operation. Since then, ductile iron pipes have been smelted from 95 % scrap. The equivalent in the production of ductile cast iron for fittings and valves takes the form of induction furnaces, in which more than 60 % is used as a secondary raw material. It is therefore not surprising that the European ductile cast iron industry, as a partner with vision, is very interested in ensuring that, at the end of their lifecycle, the high-quality materials also find their way back into the existing European cycle of materials. In addition, we are continuing further on our way to achieving strict CO<sub>2</sub>-neutral production.

As partners with vision, we take our product responsibility very seriously.

### Awarding criteria

The circular economy and the target of CO<sub>2</sub>-neutral production are closely linked in Europe with high standards of occupational safety and environmental protection as well as compliance with the usual high social standards. Only in this way can the European Union (EU) transform itself into a fair and prosperous society with a better quality of life today and for future generations and a modern, resource-efficient and competitive economy [2].

Union policy on the environment shall be based on the **precautionary principle** and on the principles that **preventive action** should be taken, that environmental damage should as a priority be **rectified at source** and on the **polluter pays principle**.



The zero-pollution hierarchy – reversing the pyramid of action, prioritising the approaches for tackling pollution.

From [4.2]; ©: European Commission, Brussels

What we here in Europe perceive as being obvious is, in some third countries – countries which are not parties to the Agreement on the European Economic Area – far from being taken as standard. As partners with vision we therefore continue to have our production bases in Europe.

Something which is broadly unknown is that, in the context of awarding contracts for the supply of products, farsighted public contracting authorities in the EU in the areas of water, energy and transport services have the possibility of rejecting offers in the threshold range if the proportion of goods coming from third countries is more than 50 % of the total value. Furthermore, public contracting authorities also have the possibility of stipulating other awarding criteria, such as qualitative, environment-related or social aspects in particular, when procuring services.

With the compilation of the “RAL quality and testing specifications for ductile iron pipe systems” – we, as partners with vision, are providing public contracting authorities issuing enquiries with a tool which simplifies the inclusion of qualitative, environment-related or social aspects in the procurement of services [3].

### Zero-pollution target for air, water and soil by 2050

On 12 May 2021, the zero-pollution action plan was published by the European Commission [4.1 and 4.2].

Executive-Vice-President Frans Timmermans who was responsible for this stated: *“The aim of the Green Deal is to achieve a healthy planet for all. In order to make the environment free of pollutants for people and the planet, we must act now. This action plan is a guide for our work. With the new green technologies which we already have, we*

*can reduce environmental pollution and develop new business opportunities. Also, Europe’s efforts at reconstructing an economy which is cleaner, fairer and more sustainable must contribute to making the zero-pollution target a reality.”*

In order to put the EU on a course to a healthy planet for healthy people in the year 2050, the action plan sets staged targets for reducing environmental pollution at the source by 2030. These are e.g.:

- The improvement of air quality in order to reduce the number of premature deaths caused by pollutants in the air by 55 %
- The improvement of water quality, in that it will be ensured that less plastic waste gets into the ocean (50 %) and less microplastic gets into the environment (30 %)
- A considerable reduction in waste generation as a whole and residual waste by 50 %.

As partners with vision, the manufacturers of ductile cast iron pipe systems within EADIPS are open to the idea of achieving the zero-pollutants target. Compliance with high environmental standards in conjunction with a continuous reduction of emissions are part of standard activities for manufacturers with their main production facilities in Europe. But partners with vision go even further, in that the environmental standards applicable in Europe are to be applied to all products [5].

With the right choice of product, partners with vision can contribute to less plastic waste getting into the ocean and less microplastic getting into the environment while at the same time reducing the generation of waste.

### Secure access to drinking water and good water quality

On 16.12.2020 the new edition of the drinking water directive was passed by the European Parliament; it was published on 23.12.2020 and came into effect on 12 January 2021 [6].

On this point, the Commissioner for the Environment, Maritime Affairs and Fisheries, Virginijus Sinkevičius said: *“Access to safe drinking water and sanitary facilities is a fundamental human right. The present health crisis has made us even more sharply aware of its vital importance. Today’s approval of the directive by the Parliament sends out a strong signal of the commitment for safe and secure tap water for all Europeans”* [7].

In this directive, the water suppliers are obliged to subject their supply system to risk assessment and risk management (article 9). In the context of the risk analysis, they ensure that the hazards and hazardous events in the supply system are identified and the risks which these hazards and events might represent for human consumption and human health by the use of water are assessed, taking account of the risks arising out of climate change, water losses and leaking pipelines.

As a partner with vision VONROLL HYDRO supports supply companies with these very complex tasks with the “ZERO WATER-LOSS” strategy and the INFRA-PORT digital solution.



With the INFRA-PORT digital solution, supply companies and others can keep a constant eye on their water networks – in space and time, sustainably, efficiently and easily.

## Conclusion

Climate change and its effects as well as the proposal by the European Commission in a European Green Deal to improve economic growth, as well as protection of the environment for the well-being of the people and to safeguard a healthy planet for future generations represent a major task.

As partners with vision the members of EADIPS are already making a significant contribution to achieving the targets associated with this, e.g. by means of :

- the changeover from a linear economy to a circular economy which was started as long as 40 years ago
- the production of pipes, fittings and valves under the high social and occupational safety standards applicable in Europe
- compliance with the high environmental standards applicable in Europe, so that the continual reduction of emissions is already common practice for the members of EADIPS.

The members of EADIPS are already modern, resource-efficient and competitive today and will remain so in the future. Together with other strong partners, such as Küttner GmbH & Co. KG, ABP Induction Systems GmbH or the Würth Group, they are continuing on this path which they adopted at such an early stage. Together they are partners with vision – a solid reason.

## Keywords

Circular Economy, European Green Deal, linear economy, climate neutrality, action plan, zero-pollutant target, awarding criteria

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## TAKE AWAY

### Partners with vision – a solid reason



**With the European Green Deal, the European Commission has set itself the tasks of climate change, environmental pollution, more efficient use resources and restoring biodiversity. Partners with vision are already involved with this as they:**

- already made the transition from a linear economy to a circular economy some 40 years ago
- produce ductile iron pipes from 95 % smelted scrap
- manufacture exclusively in Europe
- meet high standards of occupational safety and environmental protection
- with the RAL quality and testing specifications for ductile iron pipe systems they will in future be providing public contracting authorities with the possibility of also taking aspects of sustainability into account as awarding criteria
- are fully behind the achievement of the zero-pollutants target by 2050 and this is already part of their standard activities
- produce ductile iron pipe systems for the transport of drinking water which are absolutely hygienic and do not impair the good quality of the water from the supply companies in the slightest.

**The European cast iron pipe system manufacturers, as partners with vision, had set themselves climate and environment related challenges long before the publication of the European Green Deal concept and so have already done their “homework”.**

Michael Schneider and Jürgen Rammelsberg

# The position of the ductile iron pipe in the material mix

Example of a successful project by Berliner Wasserbetriebe



## Range of services at BWB

### Ductile sewage pipes solve space problems

For many years, the internal rules of Berliner Wasserbetriebe (BWB) specified the following pipe materials for the various areas of application:

- drinking water pressure pipelines up to DN 400: cast iron
- drinking water pressure pipelines >DN 400: steel
- sewage pressure pipes up to DN 400: cast iron
- sewage pressure pipes > DN 400: steel
- wastewater pipelines: vitrified clay
- mixed waste water pipelines: concrete

Depending on civil engineering requirements, it was always possible to deviate from these rules. And the only sewage pipes which

could solve the space problem which cropped up in 2008 when a DN 600 gravity sewage pipeline in the Tiergartenstraße needed to be replaced had to be ductile pipes [1].

### Ductile iron pipes stand the test for trenchless laying

Even with the development of the trenchless replacement technique at the turn of the millennium, BWB places its faith firmly in the use of ductile iron pipes with restrained

joints; initially for drinking water supply pipelines in DN 100 to DN 400 in the root space of roadside trees [2] and later also with larger pipe sizes and also for pressurised sewage pipelines, e.g. trenchless replacement where the nominal size is to be increased from DN 300 to DN 500 using the press-pull technique with soil removal [3].

### **Ductile iron pipe systems with many advantages**

Meanwhile there were more and more construction and renewal projects where the BWB planners found innovative solutions and for which they had to make exceptions to the rules for materials in order to gain constructional and economic advantages with ductile iron pipe systems. One difficult task, for example, was the replacement of existing asbestos cement pipelines. Before the Berlin wall came down, a factory in the Rudow district of Berlin produced asbestos cement pipes which, for political reasons, were installed in Berlin. The technical and environmentally correct removal of these pipes was able to be managed smartly with ductile iron pipes using the auxiliary pipe technique [4].

The pulling-in of twin-pipe pressure pipelines, 2 x DN 1200 [5] and DN 500 and DN 600 [6] for waste-water transport into reinforced concrete pipes driven underground, is also part of the tried and tested repertoire of BWB. A wastewater culvert, designed in three stages for hydraulic reasons in DN 200, DN 300 and DN 400 ductile iron pipes, and installed in a DN 2000 reinforced concrete jacking pipe, also belongs in this category [7].

Because of various restrictions imposed by different Senate Administrations of Berlin, the BWB had to apply new construction techniques time and again in order to perform their real tasks properly – namely securing the supply

of drinkingwater to the capital city with its 3.6 million inhabitants. For example, in 2011, replacing the DN 700 raw water pipeline for the “Schildhorn” series of wells. The use of welded steel pipe, which was usual elsewhere, was scarcely possible here because of the external constraints meaning that, here again, it was necessary to deviate from the old rulebook. The problem was solved with the HDD technique, in which the ductile iron pipes with restrained positive-locking joints were laid in the trenchless single pipe pull-in method over a length of 486 m [8]. For this extraordinary project, BWB received the GSTT Award 2011 – for an innovative and significant project in trenchless technology.

### **Water works standards give confidence**

With increasing knowledge about the handling and use of ductile iron pipe systems, confidence grew among the responsible planners at BWB to tackle ever more difficult projects. Although positive experiences had been achieved some years before with pipes of smaller dimensions (DN 80 to DN 250) for temporary pipelines [9], finally the range of nominal sizes could be extended [10], [11]. Because these temporary pressure pipelines were used in the public street space to provide a bypass function to take over while existing wastewater pressure pipelines were being replaced, this forced safety aspects to the fore in the planning stage. In the absence of a sophisticated set of technical rules for planning, installing, operating and removing “interim pipelines” of this kind, BWB, in collaboration with EADIPS FGR, compiled their own detailed works standard, WN 321 – Planning, installation, operation and dismantling of interim pipelines of ductile cast iron pipes and steel pipes laid above ground – Laying guidelines [12]. This publicly accessible works standard

allows the providers of planning and construction services to develop their own ideas for certain projects without abandoning specified safety frameworks.

## **Construction of interim pipelines**

Below are descriptions of two more recent examples of interim pipelines in practice:

### **Jungfernheide forest/woodland on the Flughafensee**

Berliner Wasserbetriebe has replaced a large wastewater pressure pipeline, more than 4 km long, in the Jungfernheide forest and the lakeside woodland on the Flughafensee – which was done in autumn and winter only, with ecological monitoring and protection for animals and plants.

For the work on the 4,083 m long stretch running through the landscape and drinking water conservation area between Seidelstraße and Bernauerstraße, there was a whole range of conditions, from nature and species protection to keeping free access at all times for the Tegel Airport fire service. The planners at BWB responded to this by dividing the project into five sections, on which construction work could only be done between August and February and so outside the breeding season. In order to guarantee construction times and proper drainage services, the individual construction phases were temporarily bypassed with temporary pipelines laid above ground (interim lines). Pipe bridges made of steel pipes in the airfield fence guaranteed constant passage for the airfield fire service.

### **The pipes of interim pipelines can always be reused**

Wastewater flows through the existing asbestos cement pipeline from the main pumping station at Wittenau to the treatment plant at Ruhleben. The asbestos cement pipes needed to be replaced



Installation of ductile iron pipes with restrained joints.



Replacement of the raw water pipeline at the "Schildhorn" wells.



Pipe bridges in steel pipes maintain accessibility.

because, after 60 years, they are now considered to be at risk of breaking. The new pipes are made of ductile cast iron, a material with a working life of more than 100 years. In Tegel, the water company also worked with reusable interim pipelines for the first time in this dimension. With their push-in joints, these pipes – unlike welded

steel pipes – can always be used again at other locations because they are easy to install and dismantle. The pipes of the interim pipelines were always installed in the next construction stage for the final wastewater pressure pipeline.

During an unusually strong storm in October 2017, dozens of trees were uprooted in Jungfernheide forest and a decades-old oak tree fell into the interim pipeline.



This did not cause any interruption to operations. After the tree had been removed from the pipeline, no damage was to be seen on the surface of the pipe [10].

**Ecological monitoring: assistance with relocating ants and orchids**

In the context of the ecological monitoring of the construction work, nests of the protected red wood ant were relocated, in the early morning and by hand. A similar service was also provided for the broad-leaved helleborine, a rare native orchid. If trees with nesting holes actually had to be felled, these holes were closed with wire months beforehand, so that they were uninhabited when the axe was applied. With nesting boxes, replacement homes were provided, newts were given amphibian bridges and protective fences were supplied for sand lizards.

The approx. 5.6-million-euro construction project has been completed and by January 2020 the last traces of the work in the wood were removed.

**Hermann-Hesse-Straße**

In the Pankow district of Berlin, 458 m of DN 1000 interim pipeline was laid in the central reservation of Hermann-Hesse- Straße so that wastewater could continue to be routed to the Schönerlinde treatment plant during the construction phase.

First of all, culverts had to be laid for the residents in the street so that they could have access to their property. These consisted of steel pipes which were laid underground (no pipe bridges). At the entrance to the culverts, hand-operated vent valves were installed in order to keep the odour nuisance as slight as possible for the residents.



An uprooted oak tree caused no damage to the interim pipeline.



Interim pipeline in Hermann-Hesse-Straße

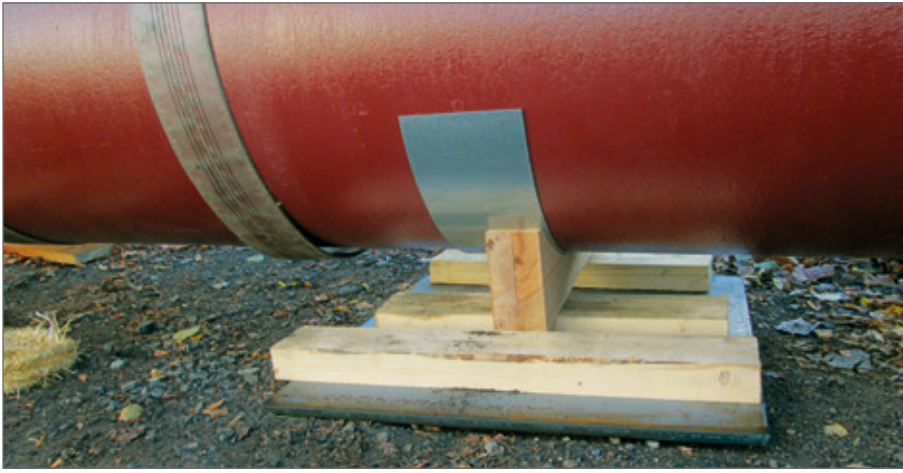


Section-by-section tightness testing of the interim pipeline.

The pipes of the interim pipeline were subsequently installed as part of the final wastewater pressure pipeline.

BLS®-push-in joints come in nominal sizes up to DN 1000. They can be bent by 1,5 ° and are easy to instal and dismantle.

For this construction project, an engineering office was commissioned in order to calculate the statics for the pipeline, the supports and the securing of the pipeline in the event of a traffic accident. Then, in unsurfaced areas, load distribution plates had to be laid beneath the pipe supports.



Hardwood support with sliding plate and load distribution plate.



New DN 1200 GGG sewage pressure pipeline and DN 1000 GGG interim pipeline on the right.



DN 1000 pipe with BLS®-joint in Bergstraße (Steglitz district of Berlin).

### Minimising time and the nuisance for residents

For some years now, ductile iron pipes have been used on all straight-running routes with a length of more than 70 m in order to keep construction times as short as possible in roads which are already overloaded with traffic. The assembly of the restrained cast iron pipes takes considerably less time than the welding of steel pipes with the subsequent application of corrosion protection in the area of the weld seam. Minimising construction times in often narrow streets is a top priority as the work involves significant restrictions for the residents. For example, in the Kulmer Straße section in Schöneberg, both parking strips had to be kept free so that there was space for both material and installation equipment beside the pipe trenches.

Even in the suburbs, there is usually little space available and the residents of Bergstraße in Steglitz have to park their cars some distance away from the construction site and put up with a longer walk. It stands to reason that BWB should give highest priority to shortening construction times.

### A big Plus for efficiency and a long working life

What is more, ductile iron pipes in the large nominal sizes are more cost-effective than plastic pipes and the long useful life of cast iron pipes is convincing in itself. The oldest cast iron pipeline, still in operation and still problem-free, located in Berliner Wasserbetriebe area is 300 m long; it dates back to the year 1860. With its 760 nominal size it is older than the pipe standard introduced in 1882.

Additional interim pipelines have been installed: for a DN 800 and DN 1000 wastewater pressure pipeline and for drinking water as a bypass for DN 400, DN 600 and DN 800 main and transport pipelines. With all projects, static analyses have been calculated according to the requirements of factory standard WN 321.

### Keywords

Interim pipeline, recyclability, cast iron pipe systems, solid reasons, factory standard 321

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Verlegerichtlinie, 2020

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## Press date

16. Januar 2022

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