Sustainability

for Piling Systems
Environmental Product Declaration

ductile iron solutions

DUCTILE IRON
PILING SYSYTEM
PHILIPPINES CORP.

Because we care about nature

Care for the environment has always been central to TRM's approach. For example, the iron for our casting process has been obtained from steel scrap for many years. In recent years, we have also found a way to make use of waste heat from the pro-duction of district heating for the local district heating network.

After long and intensive prepa-ra-tion, we are therefore parti-cularly pleased to have received an EPD (Environmental Product Declarati-on) for our TRM pile systems.

Waste heat

Our waste heat is fed into the regional district heating network, supplying 650 households and thus saving 3,100 tons of CO_2 annually.

Exhaust air and waste water treatment

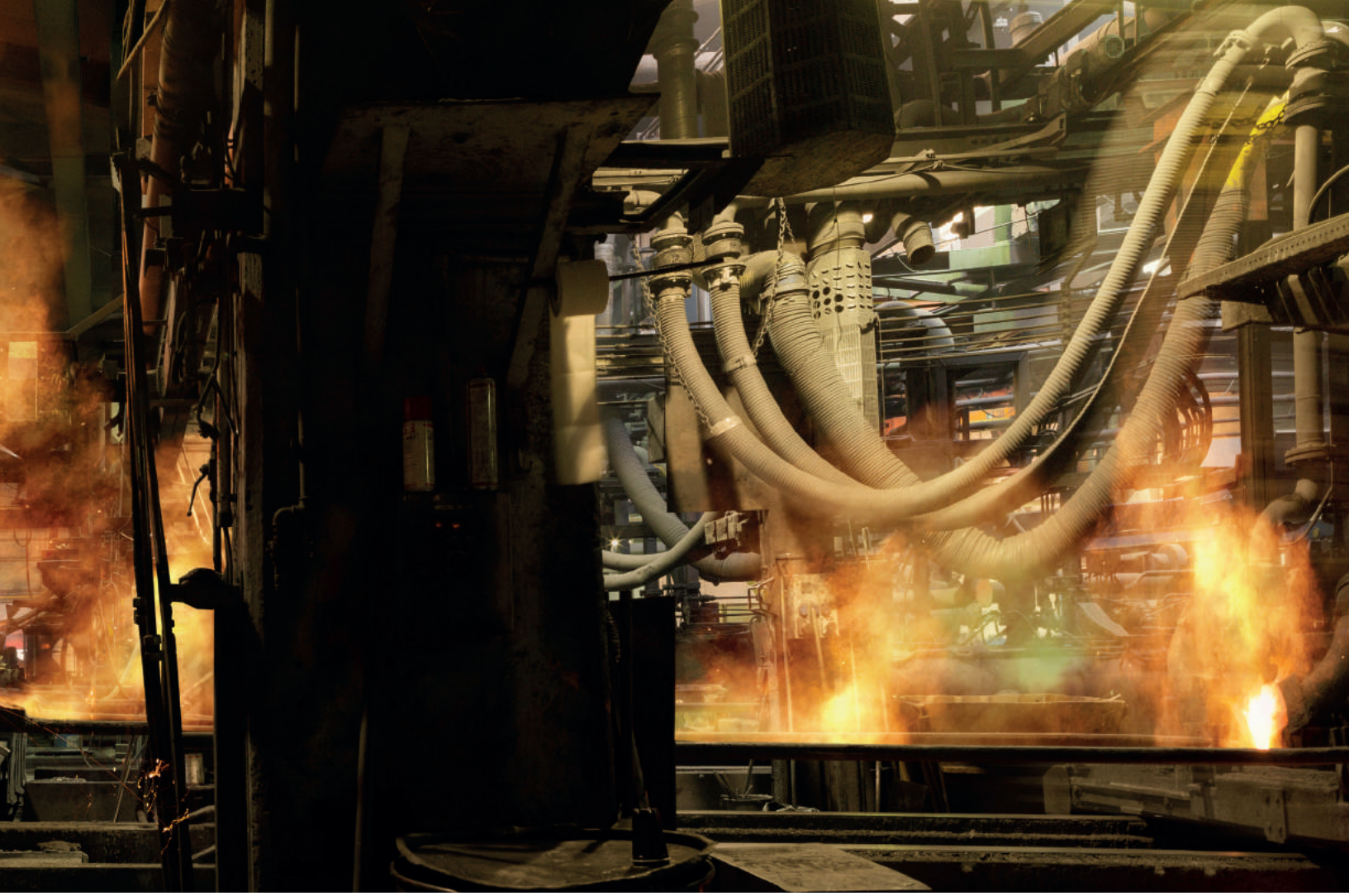
Tiroler Rohre GmbH ensures that no harmful substances are released into the atmosphere or the environment with the aid of sophisticated filter technology, which is always state-of-the-art.

Noise Control

The plant site is surrounded by a noise barrier to minimize the background noi-se from our production and to keep the impact on the entire environment as low as possible.

Transport

Most of our raw materials are delivered by rail. We also ensure that resources are used as ecologically as possible during delivery.



Environmental Product Declaration (EPD)

Photovoltaic system

Tiroler Rohre GmbH has the largest photovoltaic system in Tyrol with an area of 9,000 m^2. This generates an output of 851 kWp. The power fed into the grid supplies 300 households.

Production

Our products are made of 100% recycled material and have a service life of more than 100 years.

What is EPD?

The EPD (Environmental Product Declaration) summarizes environmental information so that the sustainability and impact on the environment of similar products can be compared. The awarding of EPDs and the content of an EPD are regulated by ISO 14025 and EN 15804. A notable component of the EPD is the GWP (Global Warming Potential – represented as CO_2 equivalent).

The award was based on data and parameters from central production and from construction sites. This data and the EPD itself were reviewed and approved by Bau EPD (issuer and „administrator" of the EPD) and a team of verifiers.

Why EPD?

Following inquiries from various corners of the world, we decided to take the lead among foundation systems in special deep-foundation engineering by putting the topic of CO_2 consumption (CO_2 footprint) on a sound scientific footing.

In our EPD statement, we give detailed information about (for example) the CO_2 consumption of our pile system, taking into account activities on the construction site as well as pile production in the factory (consideration of all life cycles „from cradle to grave“).

Facts, figures, data

Taking into account an „average“ transport route and an „average“ construction site, the following examples arise when considering all life cycles:

• TRM pile 118/7.5: 26.7 kg of CO2 equiv / m of pile (without cement-mortar)

• TRM pile 170/9.0: 45.8 kg of CO2 equiv / m of pile (without cement-mortar)

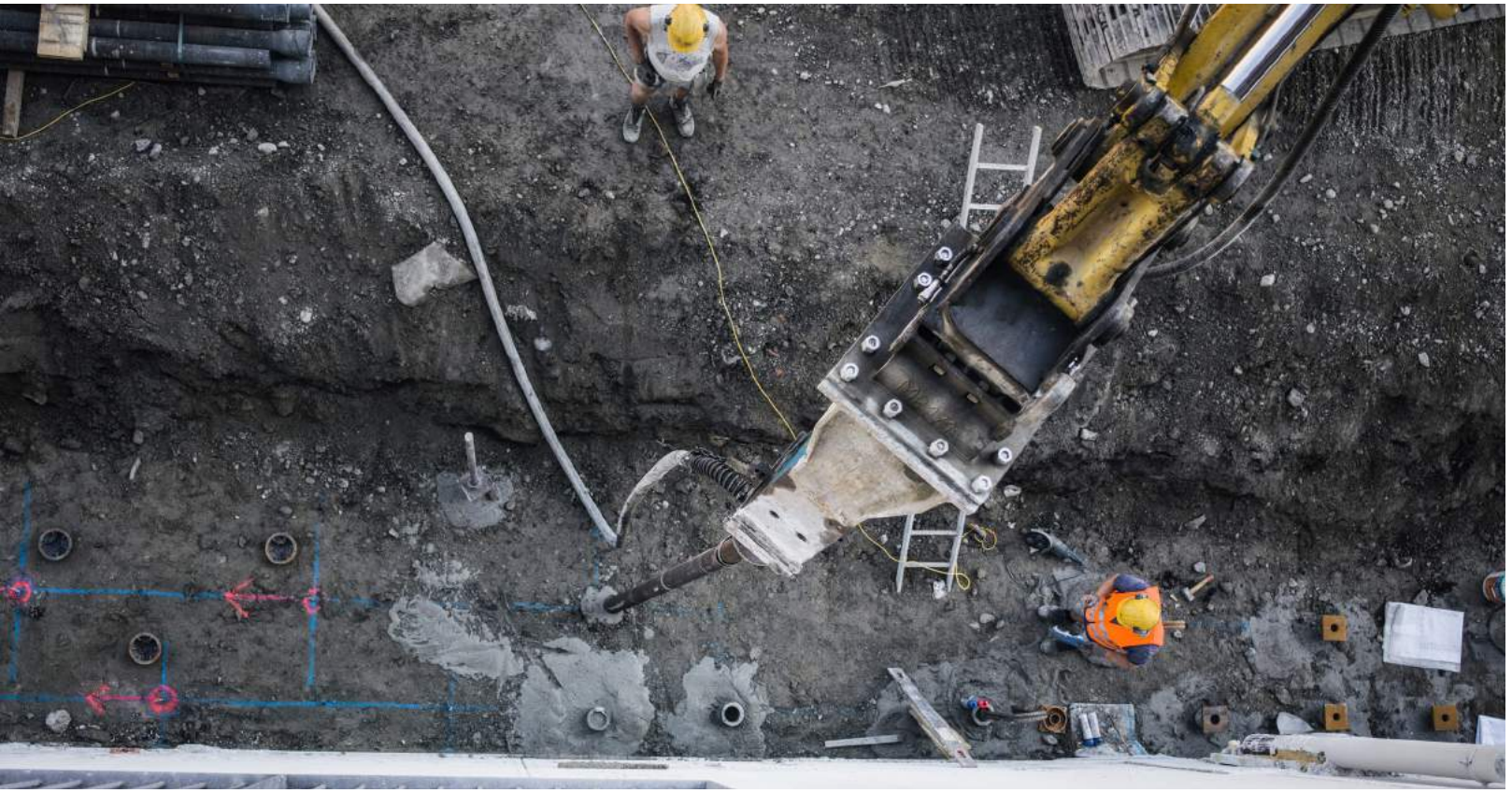
In a study seen by TRM, comparisons of TRM piles with bored piles were carried out on 2 projects (1 x industrial construction in Germany, 1 x bridge in South Afri-ca). Use of the TRM piles reduced the global warming potential by 30% and CO_2 emissions by 60%

Where is the EPD of Tiroler Rohre GmbH located?

Published on the following websites:

http://www.bau-epd.at/en/category/metalic-construction-products/

https://www.eco-platform.org/list-of-all-eco-epd.html



Ecological balance study

General

In projects, especially outside Europe, we constantly encounter the fact that deep foundations are designed with bored piles and that foundations with ductile piles are offered by project partners as a variant. We could only refer to general studies on questions about global warming potential. For that reason, we have decided to have an independent expert carry out a comparison of TRM piles and bored piles based on the results of the Environmental Product Declaration (EPD) for two specific construction projects. We were able to commission one of the verifiers of our EPD, DI Dr Florian Gschösser / floGeco, to get involved in this project. The results of this study are available in the report „Eco-balance assessment – Comparison of deep foundations of bored piles and ductile piles“. The results of this report are summarized below.

Building project 1 „Construction of a new production and logistics hall in Germany“, 2017

According to the original plans, deep foundations with 24 bored piles (Ø 620 mm, length 8 m) were planned. At the request of the contracting authority, foundations with 43 grouted TRM piles (TRM 118/7.5 mm with grout body Ø 270 mm, length 10 m) were offered as an alternative, which was then also implemented. The global warming potential for both variants is shown in detail in the tables below.

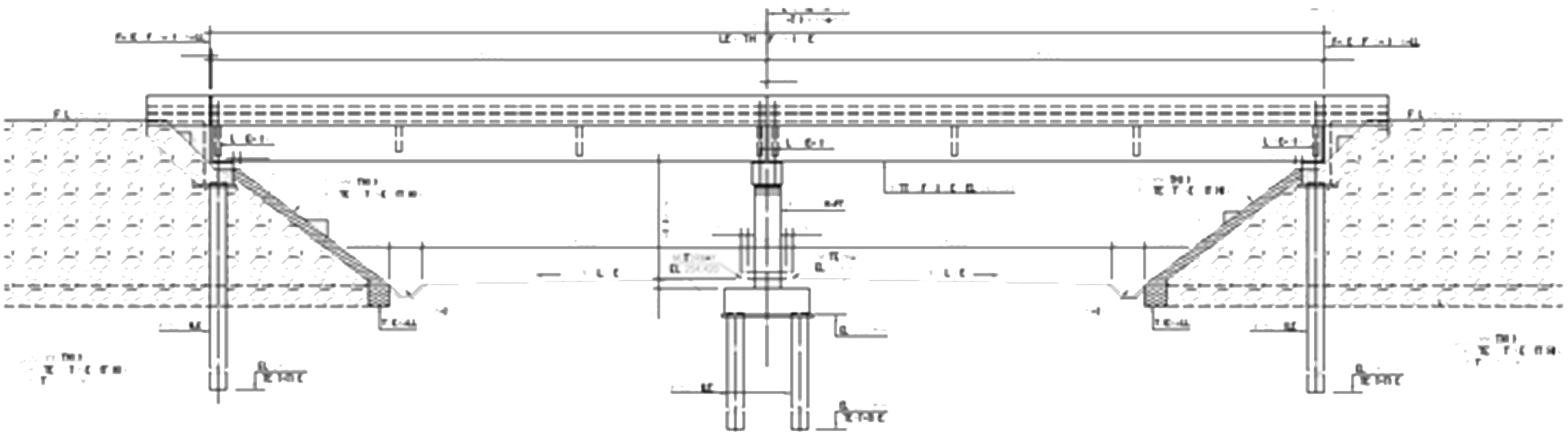
Table 1: 43 TRM piles 118/7.5 with V270 and 10 m – kg CO_2 equiv

Dimension: 118/7.5/10m x 43 Transport of ductile pipes by road 300 km Transport concrete: 30 km			Type of pipe - 118/7,5 kg CO_2 equiv V270
A1 - A3	Material production	Infill concrete	1.063,42
		Ductile pipe	9.589,00
		Grouting	5.136,33
		Total	15.788,75
A4	Transport to construction site	Ductile pipe - road	291,14
		Ductile pipe - ship	x
		Infill concrete	46,92
		Grouting	226,79
		Total	564,85
A5	Building process	Total	926,29
Total			17.279,89

Table 2: 24 bored piles 620 mm with 8 m – kg CO_2 equiv

Dimension: 620mm / 8m x 24 Transport concrete: 30 km Transport reinforcement: 100 km				diameter 620
A1-A3	Material production	Concrete	kg CO_2 equiv	15.967,41
		Reinforcement		3.195,53
		Total		19.162,94
A4	Transport to construction site	Concrete	kg CO_2 equiv	688,68
		Reinforcement		38,31
		Total		726,99
A5	Building process	Total per m of piles	kg CO_2 equiv	2.091,47
		Once per pile		2.358,39
Total			kg CO_2 equiv	24.339,79

- Using TRM piles results in a total of **17,279.89 kg of CO_2** equiv.
- Using bored piles results in a total of **24,339.79 kg of CO_2** equiv.



Ecological balance study

Building project 2 „Construction of a new bridge for a motorway junction in Pakistan“, 2017

According to the original plans, deep foundations with 16 bored piles (Ø 760 mm, ten with L=18.5 m / six with L=15 m) were planned. Foundations with 38 ungrouted TRM piles (TRM 118/9.0 mm, twenty with L=20 m / eighteen with L=11 m) were offered as an alternative. The global warming potential for both variants is shown in detail in the tables below.

Table 3: 38 TRM piles 118/9 ungrouted with twenty 16 m and eighteen 11 m - kg CO_2 equiv

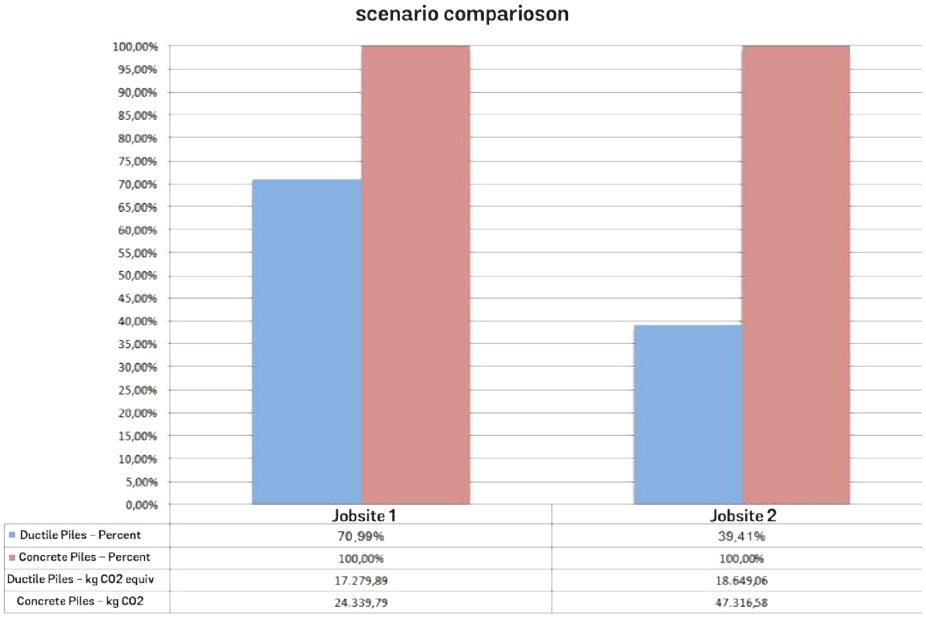
Dimension: 118/9/16m x 20 + 11m x 18 Transport ductile pipe - road 925 km Transport ductile pipe ship 12,160 km Transport concrete: 30 km			Type of pipe - 118/7,5 kg CO_2 equiv grouted
A1 - A3	Material production	Infill concrete	1.246,31
		Ductile pipe	13.416,20
		Grouting	x
		Total	14.662,51
A4	Transport to construction site	Ductile pipe - road	1.257,50
		Ductile pipe - ship	1.653,48
		Infill concrete	91,58
		Grouting	x
		Total	3.002,56
A5	Building process	Total	983,98
Total			18.649,06

Table 4: 16 bored piles of 760 mm with ten 18.5 m and six 15 m - kg CO2 equiv

Dimension: 760mm/18,5m x 10 + 760mm/15m x 6 Transport concrete: 30 km Transport reinforcement: 100 km				diameter
				760
A1-A3	Material production	Concrete	kg CO_2 equiv	34.304,98
		Reinforcement		6.878,91
		Total		41.183,89
A4	Transport to construction site	Concrete	kg CO_2 equiv	1.482,36
		Reinforcement		82,48
		Total		1.564,83
A5	Building process	Total per m of pile	kg CO_2 equiv	2.995,59
		Once per pile		1.572,26
Total			kg CO_2 equiv	47.316,58

- Using TRM piles results in a total of **18,649.06 kg of CO_2** equiv.
- Using bored piles results in a total of **47,316.58 kg of CO_2** equiv.

Recap



The figure shows a graphical comparison of the results of both building projects.

Savings of approx. 30 % can be achieved for building project 1 in terms of global warming potential, and of approx. 60 % for building project 2. In both building projects, the variant with ductile TRM piles yields significant savings in terms of global warming potential.

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