From hose pod to hose laying system

With fewer personnel, over more than twice the distance and twice as much firefighting water.

In Cooperation with Tony Brändle AG

Brändle
FIREFIGHTING, AMBULANCE AND POLICE VEHICLE CONSTRUCTION

FLADT
Engineering GmbH
30 YEARS OF INNOVATION & SERVICE

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Fladt Engineering

In collaboration with partner companies, our firm develops and manufactures pipe-laying systems in a range of designs and sizes.

Fladt Engineering has been the Brändle representative for hose laying equipment in Germany since 2020.

The Brändle system

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Brändle's revolutionary, patented and proven hose laying system has enjoyed a track record of consistent success throughout Switzerland for some 13 years!

But why?

> **Because** hoses can be deployed much faster! At speeds of up to 50 km/h.

> **Because** hose recovery is many times faster!

> **Because** hoses are washed at the same time and are then immediately ready for use again.

> **Because** it now takes only 1 person to lay hose over a long distance.

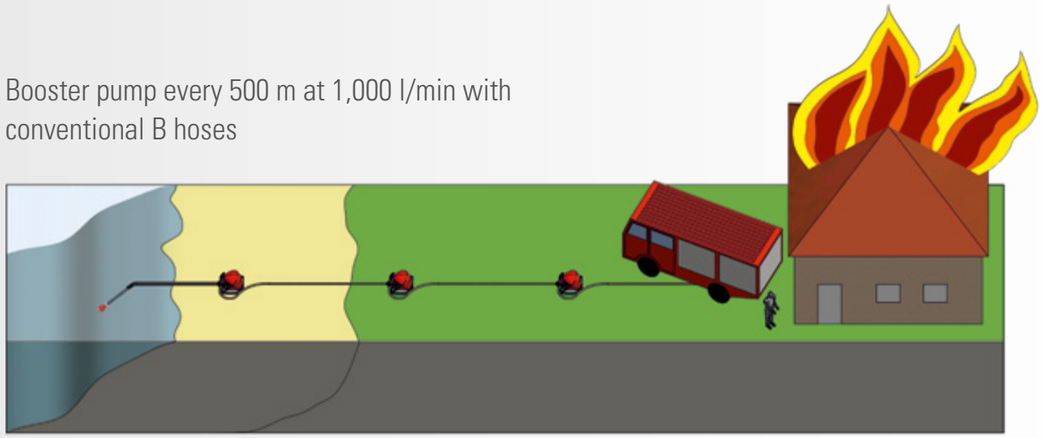
> **Because** the system can be integrated into almost any vehicle.

> **Because** your safety after an operation will improve significantly!

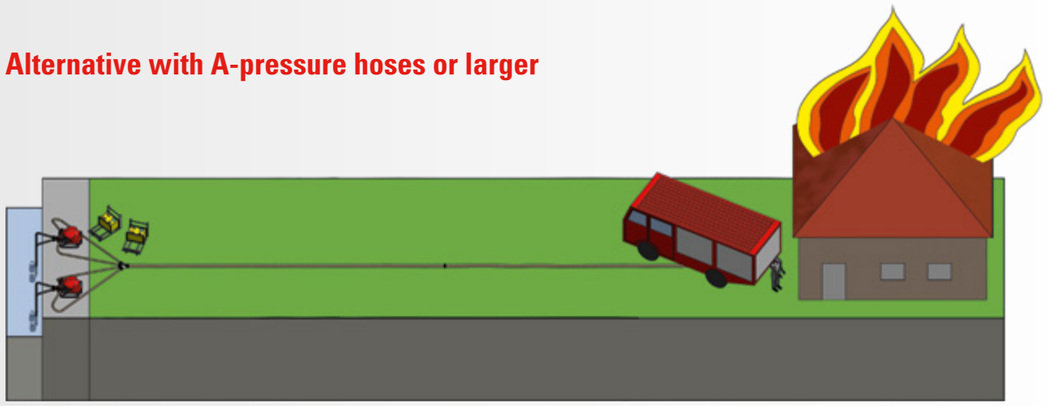
Pumping water over long distances

New tactical considerations with standardized, portable firefighting pumps, e.g. PFPN 10-1500

Booster pump every 500 m at 1,000 l/min with conventional B hoses



Alternative with A-pressure hoses or larger



Connection	A-110	A-110	125	125	F-150	F-150	F-150
Flow rate	1,000 l/min	2,000 l/min	1,000 l/min	2,000 l/min	2,000 l/min	3,000 l/min	4,000 l/min
Hose length	3,000 m	1,200 m	4,000 m	1,700 m	3,000 m	1,800 m	1,000 m

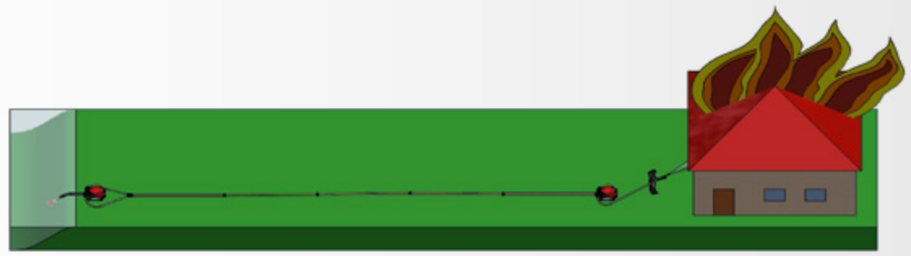
Conventional water delivery over long distances is made possible by connecting several water pumps in series. New solutions are based on hose laying systems manufactured by Tony Brändle AG and Fladt Engineering GmbH:

- Variable hose laying and effortless recovery: left, centre or right with no changeover required!
- Considerable time savings, securely placed hoses, little manpower required
- Hose laying route and recovery route identical (same in reverse)
- Hoses can be washed in the recovery chute at the same time
- Hose laying for hose diameters 75, 110, 125 and 150 mm
- Special rot proof hoses with maximum abrasion resistance, very high burst pressure and special screw-on binding, Storz couplings
- Exceptional range of options available (www.braendle.ch/de/produkte/schlauchverlegekonzepte.html)

Drills with hose laying system

2,000 m Storz-A-110

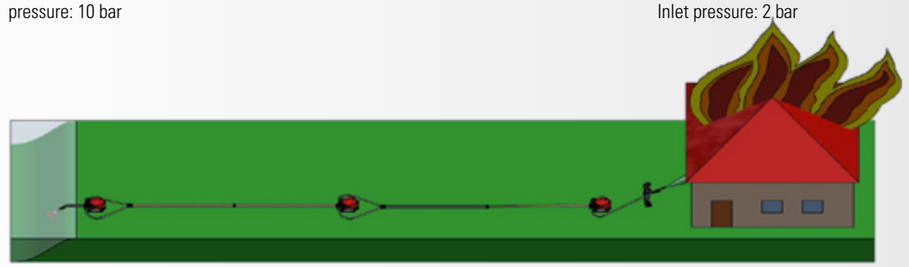
Setup 1
2,000 m
1,600 l/min



Pump: 1 x PFPN 10–1500
Water intake: open water Outlet pressure: 10 bar

Transfer at point of use Delivery rate: 1,600 l/min
Inlet pressure: 2 bar

Setup 2
2,000 m
1,800 l/min

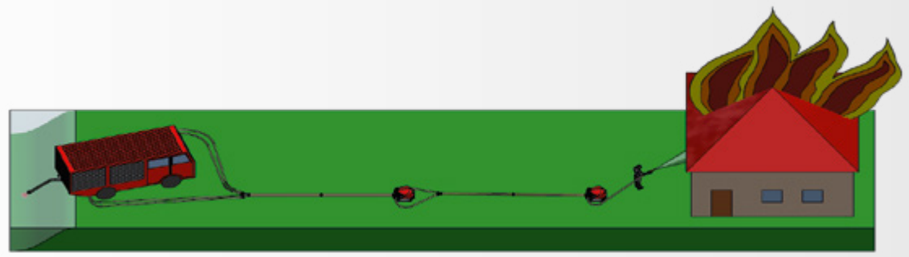


Pump: 1 x PFPN 10–1500
Water intake: open water Outlet pressure: 10 bar

Booster pump
Pump: 1 x PFPN 10–1500
Distance: 2 x 1,000 m = 2,000 m
Inlet pressure: 4 bar, outlet pressure: 10 bar

Transfer at point of use Delivery rate: 1,800 l/min
Inlet pressure: 5 bar

Setup 3
2,000 m
2,000 l/min

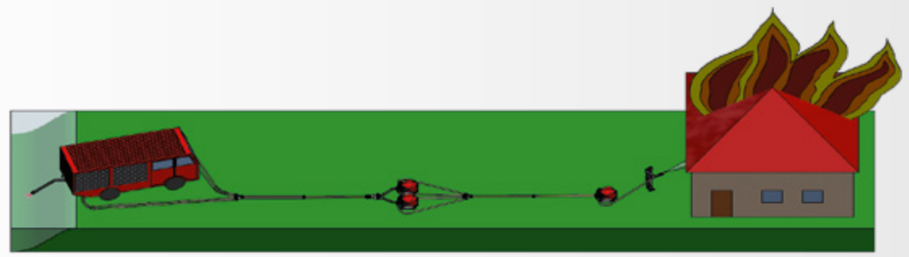


Pump: 1 x PFPN 10–3000
Water intake: open water Outlet pressure: 10 bar

Booster pump
Pump: 1 x PFPN 10–1500
Distance: 2 x 1,000 m = 2,000 m
Inlet pressure: 1,5 bar, outlet pressure: 10 bar

Transfer at point of use Delivery rate: 2,000 l/min
Inlet pressure: 2 bar

Setup 4
1,000 m
3,000 l/min



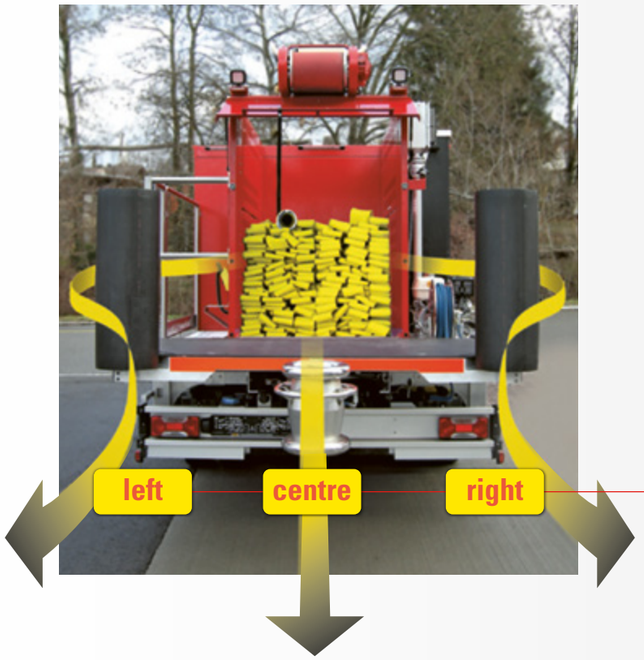
Pump: 1 x PFPN 10–3000
Water intake: open water Outlet pressure: 10 bar

Booster pump
Pump: 2 x PFPN 10–1500 parallel
Distance: 2 x 500 m = 1,000 m
Inlet pressure: 2 bar, outlet pressure: 10 bar

Transfer at point of use Delivery rate: 3,000 l/min
Inlet pressure: 2 bar

Difficult hose laying
with conventional deployment of the hoses

Left: SW 2000 hose pod
Right: conventionally laid hose with bridges



Benefits

> Low manpower requirement

> Follow-up teams do not have to drive over hoses

> Fast location changes

Variable hose laying
Left, centre or right, with no changeover required!

Solution
Brändle hose systems

Introduction – from SW 2000 hose pod to hose laying system

Since the mechanisation of firefighting equipment more than 150 years ago, C-52/C-42 and B-75 pressure hoses have been used. These two hose sizes have demonstrated their effectiveness in firefighting operations to the present day.

For laying hose over long distances, systems for B-type pressure hoses are still available today. Following the withdrawal of the DIN standards for the SW 1000 and SW 2000 demountable hose pods, interesting and technically advanced hose storage systems were developed by almost all vehicle manufacturers and suppliers for the newly standardised logistics vehicles, while retaining the hose sizes.

Deploying or laying hose along an imagined line, e.g. at the side of the road, is only possible with additional personnel following behind the hose as it is laid. Retrieving the hose is labour-intensive, extremely tedious and hard work.

Performance developments of firefighting pumps, which have gradually been introduced by fire brigades over the past 20 years were completely disregarded. This process is not over; and further increases in performance are only a question of time.

The traditional TS 8/8 portable firefighting pump, with a flow rate of 800 litres and a delivery pressure of 8 bar, thousands of which have been in use for years, is nowadays replaced by portable 10-2000 pumps, with a flow rate of 2,000 litres and 10 bar delivery pressure.

When planning any local operations, it doesn't take long to realise that, due to the high flow rate, enormous pressure losses will occur and a second, parallel hose line will have to be laid.

Fast, simple and flexible

At the latest when using an FP 10-2000, or even larger units, laying B-hoses over long distances will prove impractical. Take the following as a good example: using a B-hose with a flow rate of 1,000 litres/min and an outlet pressure of 10 bar. If a pressure of 2 bar is required at the end of the hose, this will be reached after just 500 metres. If an A-hose is used, however, this pressure will be reached after no less than 3 km.

A more practical solution, therefore, taking tactical considerations into account, and one that is ideally suited to the wide range of municipal fire brigades is the use of A-hoses, since all the relevant valves and fittings, hose bridges, etc. are available in fire brigade catalogues.

High flow rates, the choice of the right pipe cross-sections, pressure losses in the hoses, installing booster pumps, systematic and safe hose laying and recovery can be fully optimised with new solutions.

For the use of B-hoses, we have developed hose trolleys that can be equipped with an attachable electric hose recovery unit.

Hoses can be recovered with a minimum of manpower, as the hose trolley remains on the vehicle.

In terms of tactical operational requirements, state-of-the-art solutions are available for the use of A-hoses.

The range of solutions we provide extends from hose trolleys designed as on-board equipment for logistics vehicles to solutions based on trailers and vehicles, including roller containers for swap body vehicles.

Laying & recovery

Child's play

Hose laying

The patented "Brändle V/max" hose laying system combines the benefits of "fast and safe laying" and "super-fast and easy hose retrieval".

Ok, here we go!

Because the hoses are stored very carefully in the box, i.e. they are placed loosely on top of each other, they are pulled out of the box with virtually no resistance whatosever. When laid in curves or around corners, the hose is not pulled towards the inside of the curve. The hose line can also be laid directly along the left or right-hand side of the road by means of an ingenious deflection system that requires no changeover. This makes everything a lot easier and saves precious time, since the hose line does not have to be moved to the side of the road by hand to keep the road clear for any emergency vehicles.

Several hose lines can also be laid parallel to each other.

1 to 2 crew members can easily lay up to two hose lines at high speed.

No assistant is needed on the hose layer unit or trailer during the hose laying operation. This minimises the risk of accidents.

Laying operation

- > Little manpower required
- > Hose is laid from the left, right or from the middle of the vehicle, as required
- > High time gains, hoses placed safely and efficiently result in tactical operational benefits
- > Depending on hose size, fewer booster pumps needed

Recovery

- > Little manpower required and ready for operation immediately
- > Effortless retrieval of hoses via patented pull-in unit with electric drive – left, centre or right
- > Hose laying route and recovery identical (same in reverse)
- > Hoses can be washed in the recovery chute at the same time
- > Hoses dry out inside the box

Hose recovery

The "Brändle V/max" hose recovery system was developed to retrieve the hose line after use. The hose conveyor unit is mounted on top of the hose box at the rear. The system is powered by a 230 volt electric motor using a portable generator (e.g. Honda) or via a 12/24 VDC - 230 VAC inverter. No power take-offs or complex hydraulic components are required above the chassis.

When retrieving the hose, the hose line is picked up between the wheels of the hose layer unit when the hose line has been laid along the middle of the road. However, the hose can also be picked up from the left or right-hand side of the road as there is a guide ring mounted on the rear of the hose box. The hose is drawn into the hose box along a conveyor belt with high friction grip. This ensures that wet hoses can also be retrieved. The speed of the conveyor belt can be regulated using a pendant control station with potentiometer. This enables the hose conveyor unit to be adjusted to the driving speed. If the hose becomes jammed for any reason, the conveyor belt keeps running, which practically eliminates any risk of accident. When mounted on the hose layer unit, the hose box can be opened on one or both sides. One or two crew members can pull the hose into the hose box with virtually no effort. Reloading the hose onto the conveyer belt is done very quickly.

Hose washing system

An optional hose washing system can be added. In this case, the guide ring mounted on the rear of the hose box is replaced by a circular washing unit fitted with four to five special, water-saving nozzles that spray water supplied from a modified high-pressure washer.

The water tank capacity is designed to meet the size of the vehicle and the amount of hose (200 to 1,000 litres). The hose is pulled through the tube during recovery and cleaned. The hose box is provided with perforated plates on all sides and on the floor, which allows the hose to be stored wet with no problems.

Clean job

Hoses can be washed with a high-pressure washer in the recovery chute and are pulled through the chute by the pull-in unit.

Vehicles
Complete solutions

Hose laying at up to 50 km/h

The hose layer unit is a modular system that in each case can be tailored to the customer's individual requirements. In addition, the system is designed for any number of hoses as well as for different hose diameters – in principle, B-75, A-100, A-125 and F-150 pressure hoses can be laid.

The only basic components required for the system are the hose box and the pick-up system with recovery chute and intake belt.

The size of the hose box is determined by the amount of hose carried, the hose size and enough space to provide whatever reserve is necessary to store the hoses. The hose boxes can be built to take at least 800 metres of B-hose. A maximum of 5,000 metres of A or B-hose or 2,000 metres of F-hose can be stored – primarily due to the weight. Unlike the standard hose storage method used in Germany, the hoses are laid in bays arranged one above the other.

The hose boxes can also be equipped with a partition in the middle or one vehicle can carry two different hose boxes. In this way, two hose lines can also be laid in parallel – even on one side.

The advantage of the hose box is the careful storage of the pressure hoses, in addition to the working principle, which is simple and requires little effort.

When the Brändle system is used, the pressure hose simply runs out of the hose box. The hose line can be laid either from the middle of the vehicle or from the left or right-hand side of the vehicle's path with no modifications to the vehicle required. Hose laying using these options, in terms of the vehicle's position on the road – even in curves – is uncomplicated and safe, so that rearranging the hose line is usually unnecessary.

Hose laying trailers

Payload: e.g. 2,400 m B-hose or 1,500 m A-hose

Payload: e.g. 6,000 m B-hose or 3,500 m A-hose

Hose laying units

Payload: e.g. 2,000 m B-hose or 1,000 m A-hose

Payload: e.g. 2,400 m B-hose or 1,200 m A-hose

Roller containers mounted on swap body vehicle

Payload: e.g. 2,000 m A-hose or 1,000 m F-hose

Payload: e.g. 4,000 m A-hose or 2,000 m F-hose

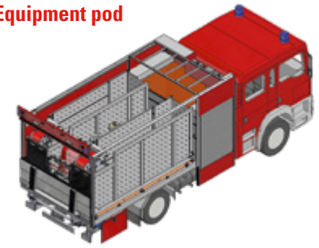
Mobile hose boxes

for demountable equipment pods and roller containers

NEW: mobile hose box from 1.8 m to 4.2 m in length (image shows version 3.6 m)

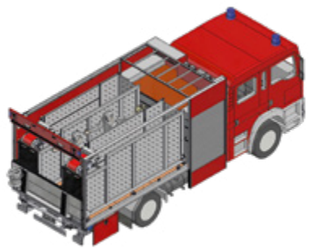
Additional generator and washing system pick-up unit

Equipment pod



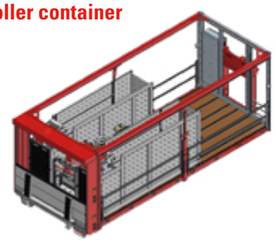
Fully loaded

Hose laying boxes



Hose recovery boxes

Roller container



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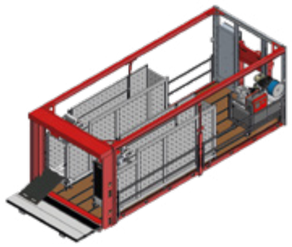
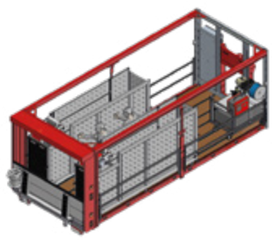


Hose laying boxes



Hose recovery boxes

Unique concept for logistics vehicles

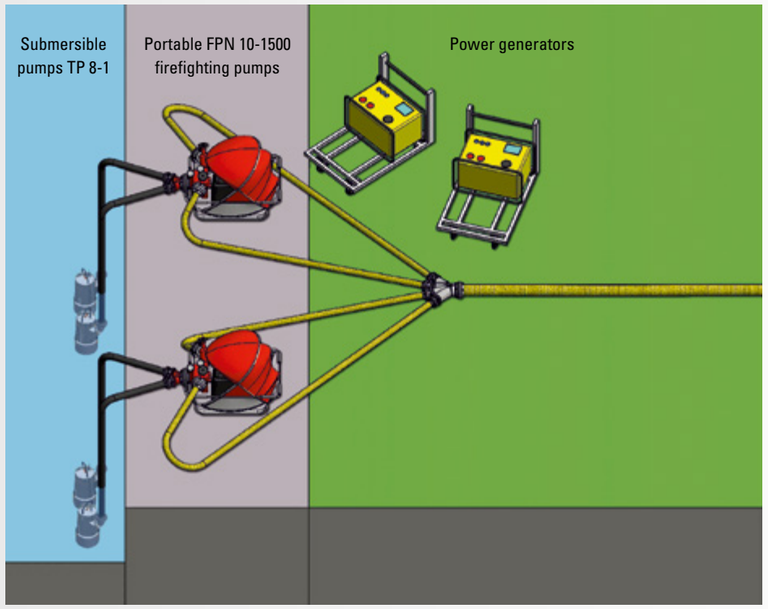
Our newly developed mobile hose boxes now offer an alternative to fully integrated hose laying systems – with a hose pick-up unit and washing system from Tony Brändle AG for hose sizes A-110 to F-150.

The hose box can be picked up and loaded from the side and front with a forklift truck, but is also a mobile unit with its own extendable heavy-duty castor wheels.

This principle combines the benefits of Brändle's well-known hose laying systems and logistics vehicles! Even washing is possible with the appropriate roller container.

Hose boxes are available in lengths ranging from 1.8 m to 4.2 m – and are designed to carry 350 m to 1,200 m lengths of A-hose. Optionally available with 230 V and generator, or 28 V battery.

Example of 3,000 l/min water extraction



"Water extraction" roller container for suction heads above 7.5 m:

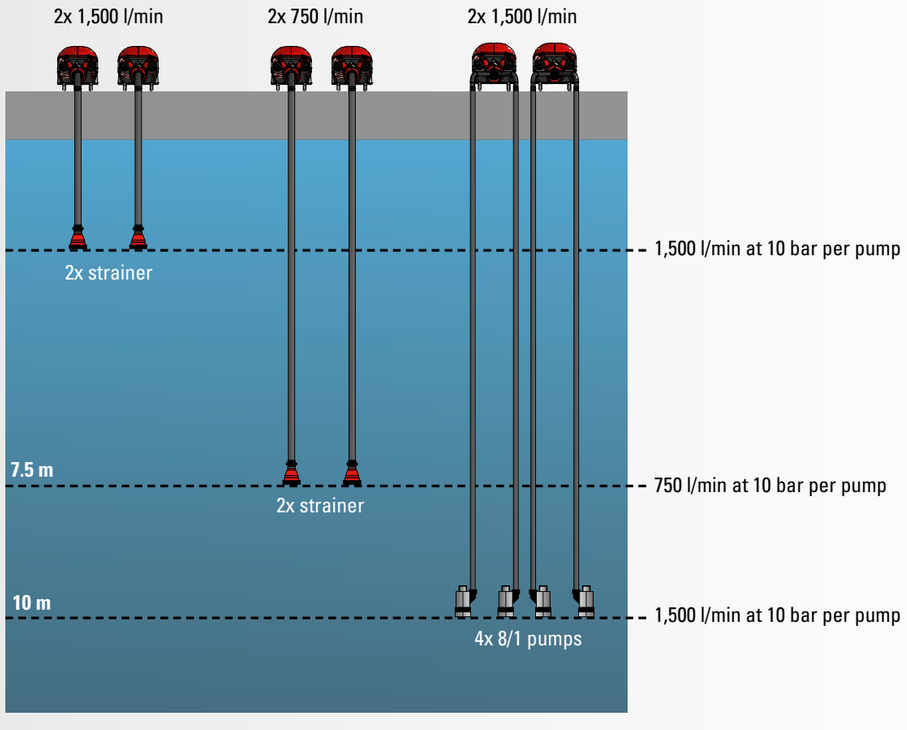
> 2x submersible pumps (TP 8-1)

> Power generator

> A-2B intake manifold

> Accessories

Alternative ways to extract water for portable firefighting pumps



Water extraction trolley

designed for FPN 10-1500 submersible firefighting pumps, to supplement pumping water over long distances

With electric submersible pumps

With hydraulic submersible pump

> 2,000 l/min at 10 m delivery head

With floating pump

> 1,500 l/min at 15 m delivery head

> Storz-A hose coupling

What the press says

Extract from **BRANDSchutz** German Fire Brigade Newspaper 6/22

Fewer staff, less equipment, but twice as much water and distance

Pumping water with A-pressure hoses over long distances

The supply of firefighting water over long distances is usually carried out using B-pressure hoses, which are laid by hose layer units or logistics vehicles with roller containers. Due to friction losses, there are limits to the use of modern centrifugal firefighting pumps. F-hose systems, which are in fact kept in stock in some countries, can only cover a limited distance due to their weight and volume. A-pressure hoses are an alternative. The volunteer fire brigade in Eggenstein-Leopoldshafen developed and tested the system together with Brändle and Fladt Engineering - with surprising results. This article presents the system loaded on a roller container.

Let's go!

In the case of major fires and extensive vegetation fires, the supply of firefighting water over long distances is standard practice. Since the Second World War, B-pressure hoses with corresponding booster pumps have been used for this purpose. The problem with the supply of firefighting water is so-called friction loss, which increases significantly as the flow rate increases.

While the friction loss of a section of B-hose with a flow rate of 800 l/min is approximately 1.1 bar per 100 metres, in the case of a B-hose line with a flow rate of 1,500 l/min, this increases to 3.1 bar per 100 metres. If one assumes a required minimum pump inlet pressure of 1.5 bar, this means that the maximum distance on level ground between the centrifugal firefighting pump at the water extraction point and the booster pump (or firefighting pump), when older FP 8/8 centrifugal firefighting pumps are used with a nominal flow rate of 800 l/min at 8 bar, can be as much as 590 metres. If current centrifugal firefighting pumps with a nominal flow rate of 1,500 l/min at 10 bar (e.g. PFPN 10-1500) and standardised in accordance with DIN EN 1028 are used, then the booster pump will have to be added after a distance of 274 metres. It is only possible to extend this distance using a PFPN 10-1500 in the event that the flow rate is limited, e.g. only 1,000 l/min at 10 bar (maximum range 531 metres) or if the flow rate is divided into two delivery lines and a double line is connected to the portable pump.

If the firefighting pump's delivery rate of 1,500 l/min at 10 bar is divided into two lines, the flow rate is halved to 750 l/min per delivery line, so that the maximum distance between pumps increases to around 940 metres.

The delivery of firefighting water over long distances using B-hose lines and corresponding firefighting pumps has been standard practice for decades by deploying hose pods (SW 2000-Tr or SW-KatS) or logistics vehicles equipped with corresponding B-hose roller containers, despite the fact that the effects of friction loss are frequently not taken into account when modern firefighting pumps are used. An alternative implemented in a number of federal states is based on F-hose water delivery systems, which have only low friction losses even with high flow rates. The friction loss per 100 metres of F-hose line (DN150) on level ground, for example, is only 0.13 bar (flow rate 1,000 l/min) or 0.75 bar (flow rate 4,000 l/min). Accordingly, delivery distances to the booster pump of around 6,150 (with 1,000 l/min) or 1,060 metres (with 4,000 l/min) are theoretically possible. However, the corresponding hose line and booster pumps would have to be available, which is rarely the case in practice.

The better alternative: A-pressure hose

A genuine alternative for water delivery using B or F pressure hoses is the use of A-pressure hoses. This has been known for some time, but they have not been used on a large scale in Germany to date. The volunteer fire brigade in Eggenstein-Leopoldshafen (Karlsruhe district in Baden-Württemberg) has introduced this system in the form of a roller container; the system was developed to its practical application stage and subsequently tested by Fladt Engineering (Kehl). Fladt Engineering is responsible for consultancy, design and sales in Germany. The roller container was manufactured by Brändle (Wängi/Switzerland).

When A-pressure hoses (DN 110) are used for water delivery, a significantly longer distance can be covered based on the same parameters as for water delivery using B-pressure hoses (outlet pressure 10 bar, inlet pressure of the booster pump 1.5 bar). The friction loss in an A-pressure hose per 100 metres of hose line with a flow rate of 1,000 l/min is 0.27 bar, with 1,500 l/min it is 0.5 bar, with 2,000 l/min 0.68 bar and with 3,000 l/min it is 1.48 bar. This means that the distance between two firefighting pumps on level ground can be planned as follows:

> Flow rate 1,000 l/min: 3,148 metres;
> Flow rate 1,500 l/min: 1,700 metres;
> Flow rate 2,000 l/min: 1,250 metres;
> Flow rate 3,000 l/min: 574 metres.

In this case, however, two PFPN 10-1500 portable firefighting pumps are required in order to achieve the corresponding flow rate.

The variant with a flow rate of 1,500 l/min at 10 bar is definitely the interesting alternative to the B-pressure hose delivery line: this is because only one A-pressure hose delivery line and two PFPN 10-1500 portable firefighting pumps (extraction and firefighting pump) are required to cover a distance of 1,700 metres – twice as much firefighting water can be delivered over a distance more than twice as long as that using a B-line with less material and fewer personnel! The Eggenstein-Leopoldshafen fire brigade and Fladt Engineering have tested the concept in practice. The theoretical values have not only been confirmed, but even exceeded in the practical test. With a delivery rate of 1,500 l/min at 10 bar, a distance of 2,000 metres was covered on level ground. The time required to fill the pipe was 13 minutes. The other tests also exceeded the theoretical calculations.

However, the geodetic suction head of the portable pumps must be taken into consideration. In the case of the PFPN 10-1500, this is three metres with a flow rate of 1,500 l/min. If the suction head is greater, either the flow rate js reduced (e.g. to 750 l/min with a

suction head of 7.5 m) or the portable firefighting pumps have to be supplied with water from the high-performance TP 8/1 electric submersible pumps.

"Water delivery" roller container with A-pressure hose

Since 2020, Fladt Engineering has been the German representative of the Swiss vehicle manufacturer Brändle for hose laying systems. Tony Brändle AG, which was founded in 1946, has already delivered more than 100 hose laying systems, but in Germany only the Eggenstein-Leopoldshafen volunteer fire brigade has used the system with A-pressure hoses to date. The Leopoldshafen fire department of the municipality with 17,000 inhabitants had been operating (used) swap body vehicles since the beginning of the 2000s, which at that time, among other things, replaced an oil spill equipment vehicle. When the SW 2000 demountable hose pod, which had been built in 1989, was due for replacement, the fire brigade started thinking about a new water delivery concept, not only for them to use in their own municipality, but also to provide more benefits and new deployment options to the surrounding communities and the district as a whole, because. the use of the SW 2000 outside the municipality had declined more and more over the years due to the commissioning of equipment vehicles with demountable "hose" roller containers.

Together with Fladt Engineering, a new operational concept with A-pressure hoses was developed that could be used quickly and easily and would fit seamlessly into the vehicles, equipment and tactics used by the municipal fire brigades. The delivery of firefighting water using A-pressure hoses offers significantly higher flow rates and requires feqwer personnel. As a result of the benefits, the procurement of the roller container was also funded by the state of Baden-Württemberg.

The roller container with a total permissible weight of 12,000 kilograms and a length of 6,900 millimetres was manufactured by the Brändle company. It represents the company's standardised hose laying system, with A-pressure hoses now being used. Twenty-five lengths of A-hose, each weighing 55 kilograms and 40 metres long, are stored in bays in hose boxes on each side of the roller container. The hoses are laid with no supervision at a speed of up to 50 km/h. The pressure hose simply runs out of the hose box, with the

What the press says (continued from p 17)

Extract from **BRANDSchutz** German Fire Brigade Newspaper 6/22, Technoloy/Interschutz, Text and pictures Jochen Thorns)

delivery line laid either from the middle of the vehicle, i.e. in the middle of the route taken by the vehicle, or on the left or right-hand side (i.e. along the edge of the route) with no modifications to the vehicle required. For this purpose, large plastic rollers are mounted at the rear of the roller container on each side of the folding tail lift, which guide the hose either to the left or to the right. With this type of laying, however, the speed should not exceed 30 km/h. The hose is then laid in a very orderly fashion – even in curves – so that manually rearranging the hose line is usually not necessary.

Monitoring by fire brigade personnel is not necessary either. However, a camera is provided for this purpose if required, allowing the machine operator to monitor the operation. A second camera mounted at the forward end of the roller container is used to monitor the recovery of the hose from the front, if this option is required. Recovery of A-pressure hoses normally takes place when the hoses are wet. For this reason, a stainless steel recovery chute is mounted at the rear end of the roller container to guide the hose to the maintenance-free intake belt, which draws the pressure hoses into the hose box. The intake belt is operated by a fire fighter running behind the vehicle using a pendant control station, which also enables him to control the belt speed.

The hose intake belt is designed for universal mounting, allowing the hose laying system to be used on vehicles, trailers, roller containers and even on trolleys. Fladt Engineering will be presenting a solution for trolleys at INTERSCHUTZ.

The two equipment compartments in the roller container, among other things, are used to store the valves and fittings required, traffic warning signs and two folding containers, each with a capacity of 5,000 litres. In the rear equipment compartment, which is closed with a fold-away Dhollandia tail lift (lift capacity 1,500 kilograms), inserted between the two hose boxes, are two "Portable pump" trolleys, each of which contains a PFPN 10-1500 portable fire-fighting pump complete with accessories, and a trolley with 500 metres of B-pressure hose. Additional features of the Eggenstein-Leopoldshafen fire brigade's roller container are a sliding roof, which can be easily opened, and scene lights, which are switched on automatically when an equipment compartment is opened. The roller container and the hose laying system will be presented at INTERSCHUTZ 2022.

What the press says

Extract from **BRANDSchutz** German Fire Brigade Newspaper 12/20, Industry and Business, Text and images Jochen Thorns)

The hose laying system used by the Matzingen-Stettfurt fire brigade on a 3.5 t Brühlmann trailer. The multi-purpose vehicle mounted on an MB Sprinter 319 CDI 4 × 4 was also delivered by Brändle in 2020. (Photos: J. Thorns)

Fast, simple and flexible: hose laying system from Brändle

JOCHEN THORNS, Stuttgart

Water supply over long distances - for many fire brigade personnel, this is a rather unpopular topic. Although the laying of a B-line using a hose layer unit or a "logistics" equipment pod and trolleys is usually done comparatively quickly, the recovery and cleaning of the hose line, however, becomes a personnel challenge. Quite apart from that, B-hoses, in view of the coefficient of friction and thus the pressure loss, are not ideal. The more suitable F-hoses used in HFS water supply systems are heavy, unwieldy and often only available for pumping water over distances of less than two kilometres. In addition, due to the limited distribution of HFS water supply systems, there are often longer distances to cover and thus long response times, which is a hindrance to rapid deployment over a large area.

A solution for this problem is offered by the Swiss vehicle manufacturer Tony Brändle AG (www. braendle.ch): the so-called hose layer units (known in Germany as hose laying systems). The hose layer units as such are not new, but are being-constantly optimised. Even so, the systems have hardly been used in Germany to date. What is new, however, is that, with Fladt Engineering GmbH from Kehl in Baden (www.fladt- engineering.de), Brändle now has a German representative, representing the hose laying systems in particular, but also all other Brändle products on the German market.

Founded in 1946, the Brändle family-run business, which even today continues to operate as a joint-stock company, has been building fire fighting vehicles since the 1960s - since 1969 also under its own name. Brändle sees itself as a manufacturer of firefighting vehicles: the 75 or so employees build some 80 firefighting vehicles annually, mainly for the Swiss market, with special and unusual customer requirements repeatedly becoming the focus of the solution.

Brändle's senior technical expert Fredy Röthenmund is considered to be the developer of the Brändle hose laying system. The hose box and the stainless steel recovery chute at the rear are clearly visible.

Consultancy | Contact

We would be delighted to advise you on any questions you may have relating to the system and products during your planning phase and recommend the solution that meets your local needs.

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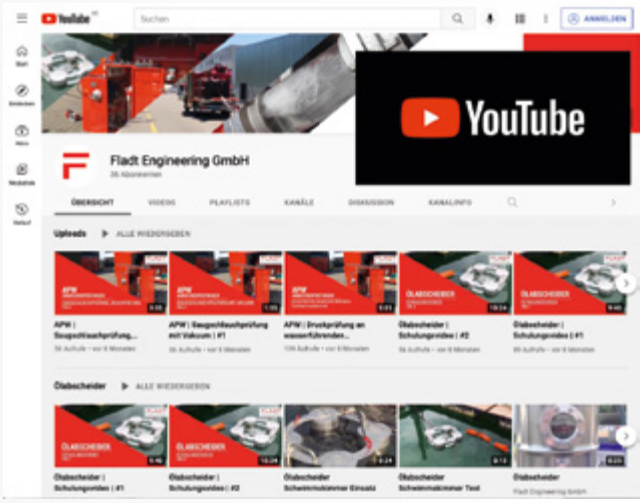

On our YOUTUBE Channel you will find explanatory and demonstration videos. New videos are constantly being uploaded:
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Video chat consultancy service

We also offer you the possibility of a consultancy session via video chat – simply arrange a video chat appointment (at info@fladt-engineering.de or phone +49 78 51.95 66 98-0).

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