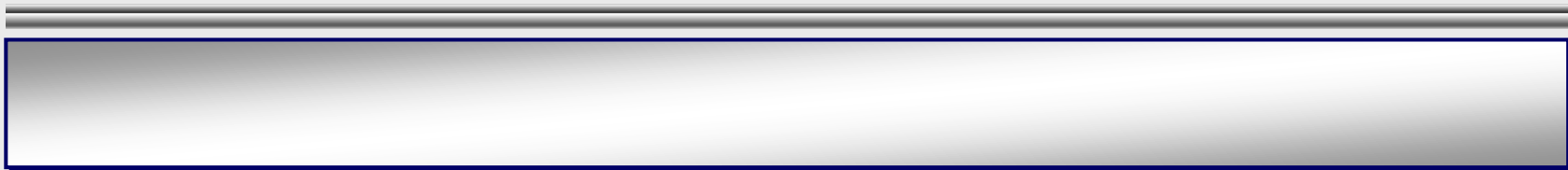


# Line Removal Presentation

Meeting "Nordisk  
Vägmarkerings-  
konferens" 24.1.2023



# WRMS

W Road Maintenance Service AB

# COMPANY INFO

## Business concept

WRMS – BEST VALUE FOR MONEY!!

*W Road Maintenance Services AB [WRMS]; provide solution for Road Contracting companies and Road Authorities within the business segments Road Marking, De-Marking and Road Friction improvement.*



WRMS

Home

Machine

Material

Others

Contracting

Airports

Contact



## CONTRACTED PARTNERS:



# A clever guy I spoke to recently said; "Noone repaints their house; without deep cleaning of Loose & flaking material - and dirty facade"



Måla om huset – så här gör du!



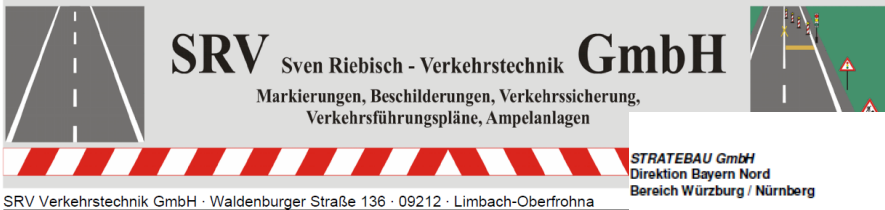
## Det viktiga underarbetet

Rengör fasaden nedifrån och uppåt med vatten och fasadtvättmedel.  
Skrapa och borsta därefter bort all lös färg.



# PeelJet ® Line Removal System

In Germany they understand this: BundesAmt is specifying HPWJ removal before application of new marking – several areas



**SRV** Sven Riebisch - Verkehrstechnik GmbH  
 Markierungen, Beschilderungen, Verkehrssicherung, Verkehrsführungspläne, Ampelanlagen

STRATEBAU GmbH  
 Direktion Bayern Nord  
 Bereich Würzburg / Nürnberg

SRV Verkehrstechnik GmbH · Waldenburger Straße 136 · 09212 · Limbach-Oberfrohna

PTV Planung Transport Verkehr AG Erfurt

Leistungsverzeichnis  
 Erneuerung der Fahrbahnmarkierung  
 Gewerbegebiet Arnstadt-Nord

Projekt: 207114  
 LV: 1

isbeschreibung Menge ME Einheitspreis in EUR Gesamtbetrag in EUR

STRATEBAU

Ausführung in 5 Straßen-  
 zügen im GVG

Preis  
 Leist

Bauvor  
 Projekt  
 Leistungsv

Bauvorhaben  
 ProjektNr.  
 Sehr geehrte Damen  
 und Herren,  
 Ihr Angebot bezieht  
 sich auf die  
 geplante Ausführung

Ordnungszahl

11

11.31

11.31.0003

**Fahrbahnmarkierungen**  
 Längsu. Quermarkierung entfernen  
 Durchgehende Breite 0,30 m  
 Plastik aufgelegt/Betondecke  
 Erneuerung d. Mark. ... Freitext ...  
 ... Freitext ...  
 Längsu. Quermarkierung entfernen.  
 Abgerechnet wird der entfernte Strich, bei Doppelstrichen zwei Striche.  
 Durchgehender Strich.  
 Strichbreite = 0,30 m.  
 Markierungsstoffart = Plastikmasse aufgelegt.  
 Betondecke  
 Entfernen für Erneuerung der Markierung.  
 Durch Wasserhochdruckstrahlen mit Anfräsen  
 Markierungsabfall mit Vakuumabsaugung oder  
 gleichwertigem Verfahren aufnehmen und der Verwertung nach Wahl des AN zuführen.

11.31.0009

Längsu. Quermarkierung entfernen  
 Durchgehende Breite 0,15 m  
 Plastik aufgelegt/Betondecke  
 Erneuerung d. Mark. ... Freitext ...  
 ... Freitext ...  
 Längsu. Quermarkierung entfernen.  
 Abgerechnet wird der entfernte Strich, bei Doppelstrichen zwei Striche.  
 Durchgehender Strich.  
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 Betondecke  
 Entfernen für Erneuerung der Markierung.  
 Durch Wasserhochdruckstrahlen mit Anfräsen  
 Markierungsabfall mit Vakuumabsaugung oder  
 gleichwertigem Verfahren aufnehmen und der Verwertung nach Wahl des AN zuführen.

153.000 m

Entfernen für Erneuerung der Markierung.  
 Durch Wasserhochdruckstrahlen mit Anfräsen  
 Markierungsabfall mit Vakuumabsaugung oder  
 gleichwertigem Verfahren aufnehmen und der Verwertung nach Wahl des AN zuführen.

Projekt 321067  
 0491-42-083  
 (im Anb. z. Ausschreibung)

Ordnungszahl	Menge	ME	Einheitspreis in €	Ges. Preis in €
0490-12-B-0-30	14.400,000	m		

Ordnungszahl	Menge	ME	Einheitspreis in €	Ges. Preis in €
0491-42-083	12.800,000	m		

Ordnungszahl	Menge	AE	EP
01.00.0002.	15.400,00	m	

Ordnungszahl	Menge	AE	EP
01.00.0003.	4.800,00	m	

Ordnungszahl	Menge	AE	EP
01.00.0003.	4.800,00	m	

Bauvorhaben: M-A 4, km 153.5 - 161.0 (Hermisd. Kreuz - Stadtroda), Markierung

# PeelJet ® Line Removal System

**They put emphasis on QUALITY in the durable marking – And prolonged economical lifetime**



# PeelJet ® Line Removal System

## Other Advices for when to remove Road Marking:

Change of Road Colors



Removal temporary markings from construction sites



Change of Road Architecture / Design



Too thick marking profile



Report 4150-2, Texas Department of Transportation, states (table 20): „Full removal of existing markings is required if, 1) markings are de-bonding from the pavement; 2) if the restripe and existing materials are not compatible (/Chemical deviation), or; 3) if the marking profile is too thick.“

**And -  
RECLAMATIONS**

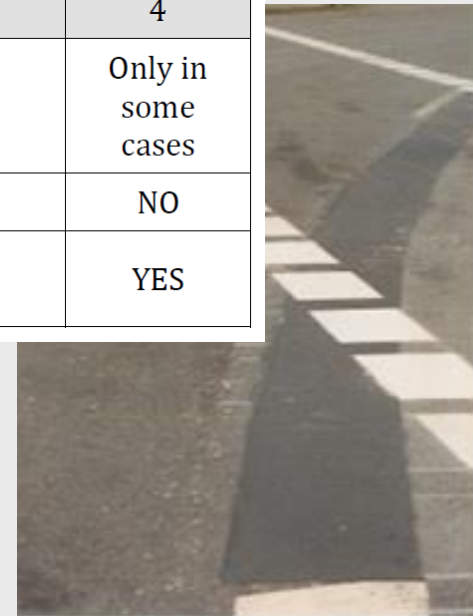
# PeelJet ® Line Removal System

**Another important statement in TR16958 is that overpainting (or "blackening") is only allowed as a temporary measurement.**

**Table 1 — Guidance for removal/masking procedures in different situations**

Situations for removal or masking			Removal/masking criteria			
			Removal		Masking	
Work needed	Road marking renewal is foreseen?		Totally	Partially	Only	After partial removal
			1	2	3	4
Permanent change on the road marking lay out	NOT	A	YES	Only in some cases	NO	Only in some cases
Preparation of the substrate	YES	B	YES	YES	NO	NO
Hiding road marking on temporary basis	YES or NOT	C	YES	YES with masking	YES	YES

***Overpainted material (and glass beads) will eventually come up from the wearing of top layer***



# PeelJet ® Line Removal System

This is one example that WRMS call "the LYNX Effect" – overpainting of yellow – upon road marking color change



**Lynx Marking**



# PeelJet ® Line Removal System

**Finally – Total (or partial) removal of line shall be executed when road marking thickness (multilayer) exceeds 6 mm thickness. (Such thickness is considered to be dangerous).**

FprCEN/TR 16958:2016

B.2 Existing multilayer road markings not fulfilling with the essential requirements (EN 1436) may be renewed with a new layer whenever the resulting thickness of the whole multilayer system does not exceed 6 000 microns. If this thickness is exceeded they shall be partially removed. The resulting surface shall be compatible (chemically) with the new material; otherwise the existing road marking should be totally removed or treated with a primer.

Existing structured road markings which have to be renewed with another structured pattern shall be fully or partially removed. The thickness extent will depend on the patterns of the existing and the renewed structure.

**In Sweden it is 4 mm  
Norway?? Finland??  
Denmark??**



**Next question is:**

**HOW**

**To remove the road  
marking**

**All known standards, including CEN-TR16958 emphasizes their work on quality in removal (Minimized surface contrast); and Environmental aspects**

ZTV-M13

**Demarkierung** German standard

Nur bei Bedarf (in den Anschlussbereichen der einzelnen Baufelder). Die **Deckschicht soll möglichst wenig beschädigt werden**. Demarkierte Flächen, die nicht wieder übermarkiert werden, dürfen bei der Griffigkeit und Helligkeit **keine wesentlichen Unterschiede** zu der sie umgebenden Fläche und auch keine gravierenden Beschädigungen aufweisen.

NZRF  
LINE REMOVAL  
GUIDE

Rev 2  
February 2011



FprCEN/TR 16958:2016 (E)

## 6 Performance requirements

### 6.1 Removal

#### 6.1.1 General

The main target of the work is that the quality of the removal shall minimize the risk for confusion and hazard for the drivers considering visual aspects and changes on surface properties.

#### 5.1 Supporting Principles

1. Where line markings are removed permanently, that this is done in such a way that the chance of the motorist being confused as to position on the carriageway, particularly in wet weather and poor lighting conditions is minimised. Widening and softening the edges of existing markings may do this.
2. When arrows, letters or figures (for example speed limit symbols) are to be removed permanently (or temporarily "blacked out") that this be done in a rectangle or square pattern in such a way to minimise the motorist being confused, particularly in wet weather and poor lighting conditions is minimised.
3. Where permanent overlays or void concealment is used, the overlaid material is to be blended and / or shaped to minimise the difference in height and appearance
4. Unwanted markings are to be removed permanently, not "blacked out".
5. **The line removal method(s) must not adversely affect or compromise the integrity of the pavement surface.**
6. Prior to the commencement of work, the clients representative must approve the proposed method and determine acceptability standards
7. All line removal works must be carried out in accordance with the ordinances, statutes and laws relevant to the various jurisdictions.
8. All line removal works must be carried out in such a manner as to not endanger the health, safety or amenity of employees or the public in general.

## PeelJet ® Line Removal System

**This means Mechanical Grinding is turning to become historical solution**



# PeelJet ® Line Removal System

**The whole idea is to go from this situation.....**



**.....To this situation**

**(Picture Battice (BE) 13 March 2011; 2 month after removal with Multiple Nozzle Disc configurations)**



# PeelJet ® Line Removal System

**High Pressure Water Jetting Technologies are clearly better than any metallic technology.**

**Sand Blasting is good from removal results – but not good from workers environment prospective.**

**Any technology using chemical substracts are disqualified on basis of environmental aspects.**

TECHNICAL REPORT    RAPPORT TECHNIQUE    TECHNISCHER BERICHT

ICS 93.080.20

FprCEN/TR 16958

ICS 93.080.20

Road marking materials - Conditions for removing/masking road markings

FprCEN/TR 16958:2016 (E)

## 6 Performance requirements

### 6.1 Removal

#### 6.1.1 General

The main target of the work is that the quality of the removal shall minimize the risk for confusion and hazard for the drivers considering visual aspects and changes on surface properties.

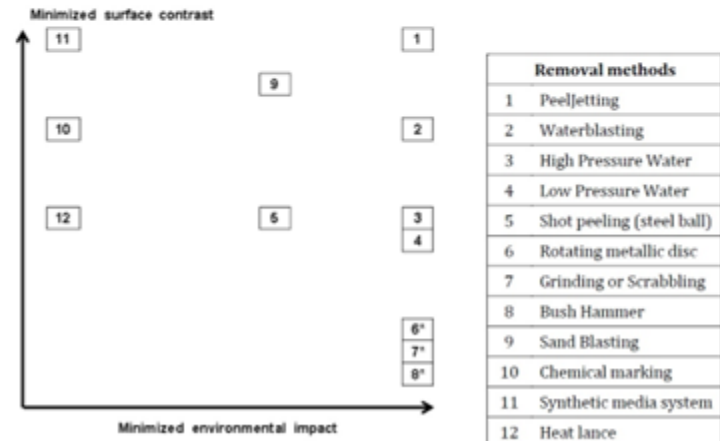
Visual aspects: After removal the resulting phantom lines shall not be visible at night or day, so that there will be some limits for:

- retroreflection and luminance;
- luminance contrast with the adjacent pavement surface (minimized "Phantom lines");
- remaining road marking.

NOTE 1 Normally the luminance deviation will be automatically evened out; by the normal dirt pick up and wearing from traffic. This will happen in a fairly short period of time (approximately 2 months depending on the ADT). However - if the initial values from the luminance deviation (contrast) are unacceptable; the contrast can be adjusted by a sprayable, coloured, bitumen.

NOTE 2 The use of aggressive (Metallic) removal technologies, may require to "seal" the surface with some Sealing or masking material.

Table 2 — List of removal methods all types of pavement and all types of road marking materials

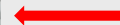


# PeelJet ® Line Removal System

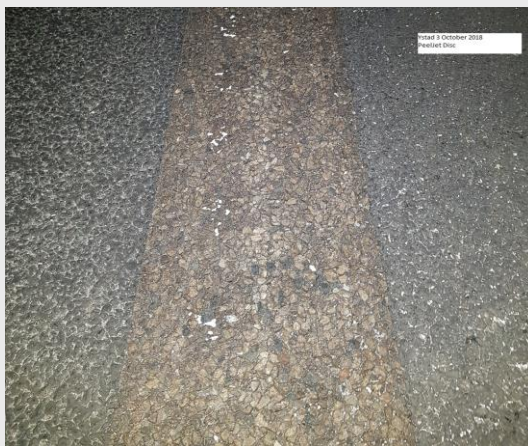
**Any contractor in the road marking business understands and accepts that WaterJetting is better than Metallic technologies (which also the TR 16958 chart expresses)**



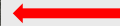
Grinding



Shot  
Blasting



PeelJet  
(Multiple Nozzle  
Disc Configuration)



Water  
Blasting  
(Propeller based  
technology)



**But only the experts understand that there is also a difference in between water and water**

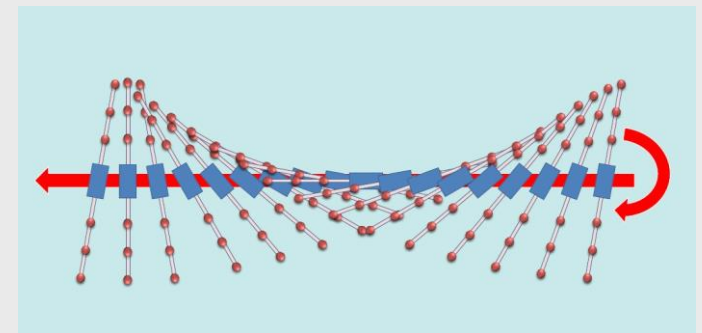
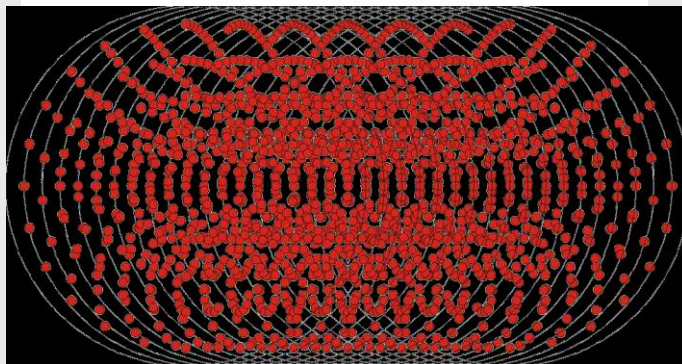
# PeelJet ® Line Removal System

**Lets forget about the metallic technologies; and focus on water.**

**FprCEN/TR 16958 defines:**

PeelJet systems are a family name for all technologies with Multiple Nozzle Disc configuration:

Water Blasting Technologies are a family name for all technologies with Propeller Based technology:



**Any careless operator can damage a surface – but pro definition; coming from the removal pattern – PeelJet systems gives a more exact and a more precise removal - and also less impact on the surface**



# PeelJet ® Line Removal System

## - *Shadow lines*

*"The line removal method(s) must not adversely affect or compromise the integrity of the pavement surface".*

## **Battice 2011 on removal and after 2 months**



**There will always be a shadow line. The challenge is to MINIMIZE the surface impact/the phantom line!!**

# PeelJet ® Line Removal System

- *Shadow lines*

## Estonia 2016 and 2017

### 10 months



## Poland 2013 initial values – propeller and PeelJet

WaterBlasting - Leave material - cutting deeper



PeelJetting - 100% removal - no surface damage

Same  
Jobsite  
A1  
Gdansk  
Poland



# Highway Englands Comparison Project, Bristol 6-8 October 2020

## Comparison project

### WaterJetting Technologies

#### M5, Bristol



## Place and date

Project was organised over three nights at M5, Bristol (Porstbury) - close to Junction 19, Bristol, BS20 7GX.



Project was executed over three nights - 6, 7 and 8 October 2020.



# Highway Englands Comparison Project, Bristol 6-8 October 2020

## REMOVAL COLD SPRAY PLASTIC LINE

Comparison of CSP line is example line - but is representing all observed materials/thicknesses in terms of quality/speed and other parameters - with two deviations. 1) Technology 2 used Milling for durable markings 2) Chemical softening agent was NOT used on Thermoplastics (does not work)

Grading system: Key parameters for investor, SPEED, QUALITY & COMPLETE REMOVAL - rating 1-10, where 10 is best: **HIGHEST TOTAL = BEST PERFORMING TECHNOLOGY**  
 Other parameters - rating 1-5 where 5 is best  
 When one section contains several parameters - the total average value of the section is calculated

B L O C K 1 (most relevant parameters)

B L O C K 2 (Other important parameters)

	Thames Hydro Blasting	Volkman Rossbach - Traffic Lines	WJ - Stripe Hog	TL - PeelJet	RoWi
<b>Section 1</b>					
<u>Speed/seconds to remove line</u>					
Seconds	18	32	48	19	21
Remark		With chemicals			With chemicals
Grade	10	3	1	8	6
<u>Quality in removal (optical inspection)</u>					
Imbeadment ratio >50%	Y	N	Y	Y	Y
Grade	10	4	8	10	6
<b>Section 2</b>					
<u>Quality in removal (Sand patch method)</u>					
Deviation before/after	+0,83	+0,04	+0,29	+0,35	+0,51
Comment	Impossible value! Macrotexture can not be less after the removal. H.E. rating is 1 (best)	Impossible value! Macrotexture can not be less after the removal. H.E. rating is 5 (worst)	Impossible value! Macrotexture can not be less after the removal. H.E. rating is 4 (bad)	Impossible value! Macrotexture can not be less after the removal. H.E. rating is 3 (middle)	Impossible value! Macrotexture can not be less after the removal. H.E. rating is 2 (good)
<b>Section 3</b>					
<u>Complete/Partial removal</u>					
Complete/Partial (>95%)	C	P	C	C	C
Grade	10	5	10	10	10
<b>Section 1</b>					
<u>Safety for workers</u>					
High/Medium/Low	L	M	L	H	H
Motivation	Worker on small satellite in traffic	Applicator of chemical on road	Worker on small satellite in traffic	No worker on road	No worker on road
Grade	1	3	1	5	5
<u>Safety/Quality in technology</u>					
High/Medium/Low	L	H	M	H	H
Motivation	HP Hose over head of operator	German engineering	American Engineering	German engineering	Netherland engineering
Grade	2	4	3	5	4
<b>Section 2</b>					
<u>Noice of system</u>					
High/Medium/Low	L	H	H	L	H
Grade	4	2	1	5	3
<b>Section 3</b>					
<u>Installation/wind up time</u>					
Long/Medium/Short	L	M	L	S	S
Remark	Offloading and install satellite	Softening agent 20 minutes	Offloading and install satellite	No installation/wind up time	No installation/wind up time
Grade	4	7	4	10	10
<b>Section 4</b>					
<u>Flexibility/Also suitable for city work</u>					
Good/Medium/Not good	G	NG	G	M	NG
Remark	3 axle Mothership	3 axle M.S.+3 axle trailer	3 axle Mothership	4 axle - but manouverable	3+3 Axle semitrailer
Grade	5	1	5	4	1
<b>Section 5</b>					
<u>Number vehicles involved</u>					
Numbers	3	2	2	1	2
Remark	Mothership, Satellite, Trailer	Operating unit + trailer	Mothership, Satellite	One unit only	Mothership+spray unit chemical
Grade	1	3	2	5	4
<u>Number persons involved</u>					
Numbers	2	1 (+1)	2	1	2
Grade	2	4	2	5	2
<b>Section 6</b>					
<u>Chemical softening agent</u>					
Y/N	N	Y	N	N	Y
Grade	4	2	4	4	2
<b>Section 7</b>					
<u>Milling machine</u>					
Y/N	N	N	Y	N	N
Remark			Not used for CSP		
Grade	4	4	2	4	4
<b>Overall economy, safety and quality</b>	<b>57</b>	<b>42</b>	<b>43</b>	<b>75</b>	<b>57</b>
<b>Extract: Speed, Simplicity and Quality Ratio</b>	<b>24</b>	<b>14</b>	<b>13</b>	<b>28</b>	<b>22</b>

WRMS W Road Maintenance Service AB

**WRMS**

W Road Maintenance Service AB



**Market outlook**

**(Especially Nordic, Baltic & Poland)**

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# PeelJet ® Line Removal System

## Market outlook

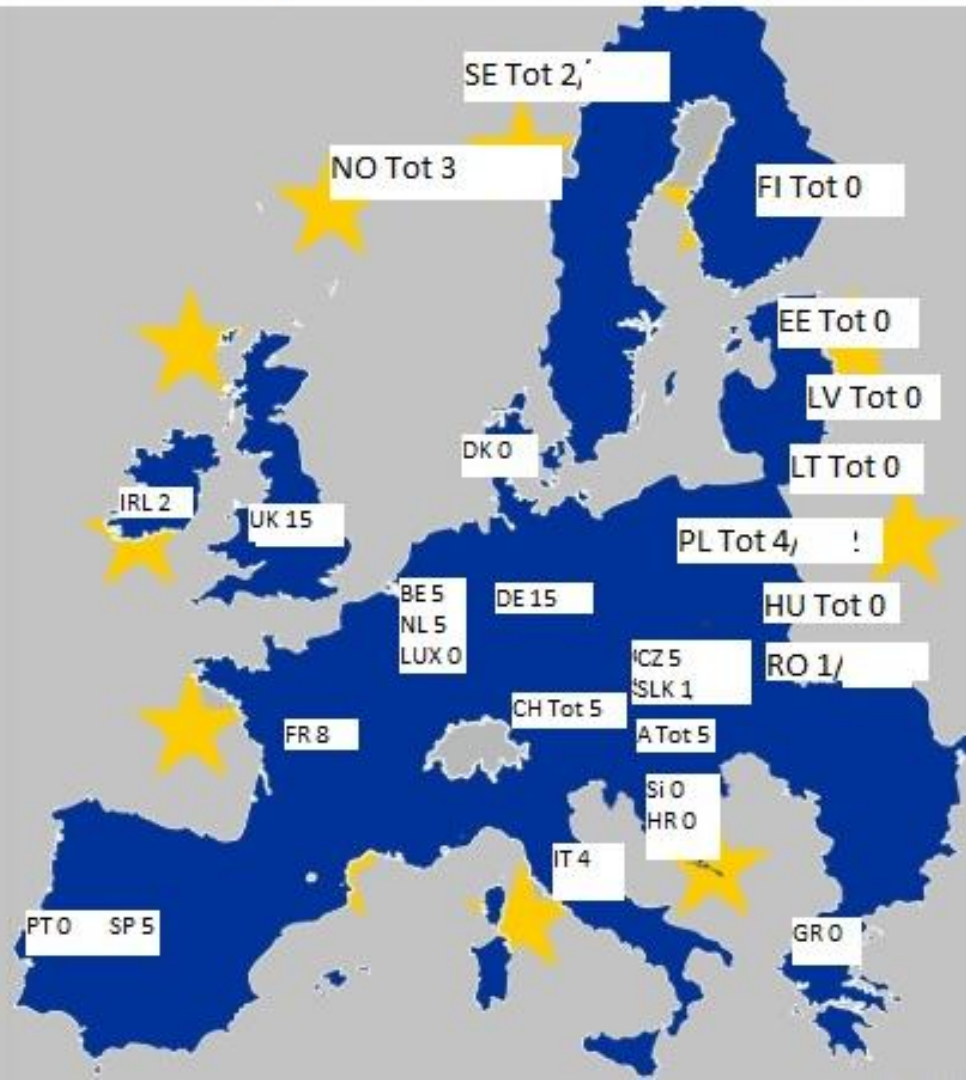
From 1998 the market has moved from almost zero to now ~100 units in Europe.

1/3'rd of these are PeelJet; 1/3'rd is American and 1/3'rd is "others"

Average square meter pro machine is 100.000 sqm yearly; meaning 10 MIO sqm removal yearly – and increasing. (External contracting may confuse the market volumes).

All professional authorities understands the relevance of exchanging metallic volumes to WaterJetting.

Total of 85 Line removal machines in Europe - and some 15 airport machines in addition



# PeelJet ® Line Removal System

## - *Special conditions in Nordic countries*

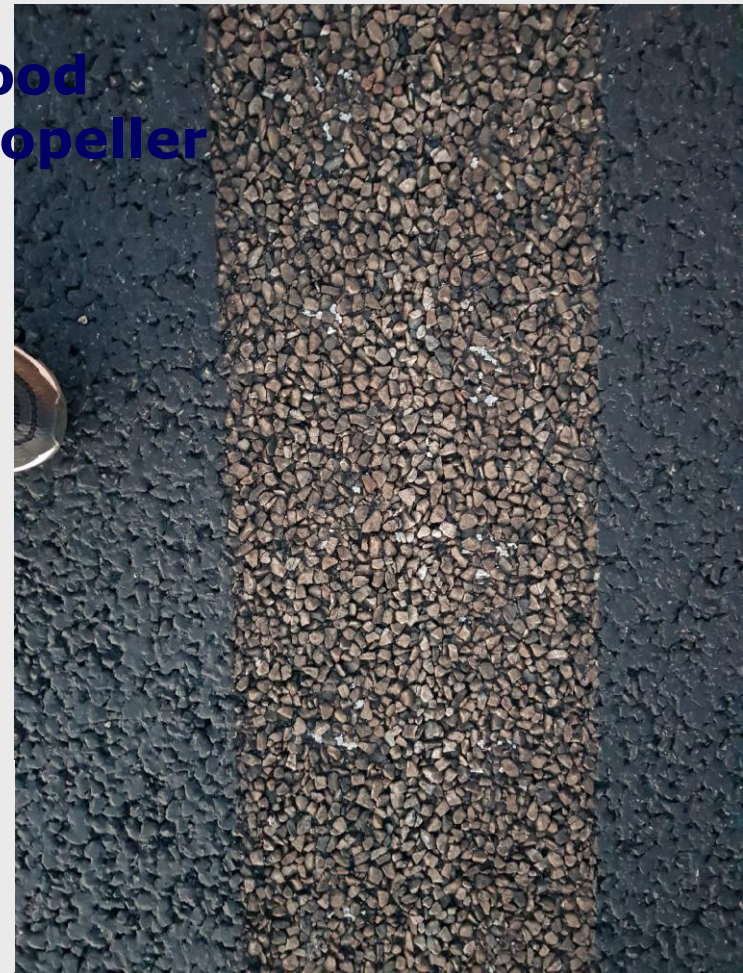
These pictures from Ystad 2018 - initial values – propeller and PeelJet – shows the special challenges we have in Nordic countries.

Material very rich on rubber in combination with bitumen which must be able to move on the temperature differences – creates extraordinary challenges on the Scandinavian markets.

**PeelJet**



**Good  
propeller**



# Outlook Nordic and Baltic Markets, and Poland

## - Sweden



WRMS MARKET VOLUME ESTIMATE (today): Total 3,0 MIO EUR / W.J. 1,5 MIO EUR

## - Norway

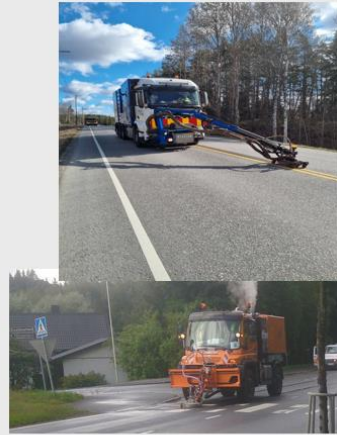


WRMS MARKET VOLUME ESTIMATE (today): Total 3,0 MIO EUR / W.J. 1,5 MIO EUR

## - Finland



WRMS MARKET VOLUME ESTIMATE (today): Total 2,0 MIO EUR / W.J. 1,0 MIO EUR



## - Denmark



WRMS MARKET VOLUME ESTIMATE (today): Total 1,5 MIO EUR / W.J. 0,2 MIO EUR



## - Estonia



WRMS MARKET VOLUME ESTIMATE (today): Total 2,0 MIO EUR / W.J. 0,8 MIO EUR

## - Poland



WRMS MARKET VOLUME ESTIMATE (today): Total 2,5 MIO EUR / W.J. 1,5 MIO EUR

## - Iceland

There is a clear interest in Iceland for WaterJetting technology.



# PeelJet ® Proven technology - References

## Example schedule from European job-sites

### Belgium



Brussel, removal Thermoplastic from SMA 1700 µ, full line

### Czech



New ring road of Prague, removal concrete film, 33 cm disc

### France



Orleans (South Paris), removal multilayer H.S.P./Paint from very soft SMA 800-1500 µ, full line

### Germany



Niederaula, removal Tape/Folie from concrete, 3M Type II 30 cm

### Luxemburg



Luxemburg, removal Cold Plastic, Ribline from strong SMA, 10000/4000 µ

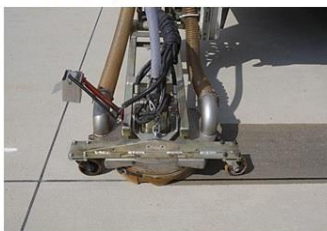
### Norway



Bergen, removal Thermoplastic, full line from poor SMA, 1500 µ



Battice, removal yellow HS paint from construction site, SMA, 600 µ



### Estonia



Eisenach, removal Cold Plastic Agglomerate from concrete, ~2000 µ



St Petersburg, removal Thermoplastic / Paint multilayer, from poor SMA, 2000 µ

### Russia



### Poland



Rzepin (A2), removal Concrete film from concrete, 300 µ, full line

### Ireland



Kilkenny – TP 700 µ

### Sweden



Kumla, removal Thermoplastic Full Line, from soft SMA, 2000 µ – 250 LM/hrs / + Agglo

### Switzerland



Emmen, removal Cold Plastic from very poor SMA, 1250 µ, full line

### United Kingdom



Oxford, removal Hot Spray Plastic, Full line, from poor SMA, 400 µ & Cambridge – removal Thermo Plastic, Hatches, from OPA 1000 µ

### Italy



Gdynia, removal Thermoplastic Agglomerate



Kilkenny – TP Hatches 1500 µ

Gothenburg, removal Thermoplastic Agglomerate, Chess, from very soft bitumen, 2000 µ



Jönköping, removal Thermoplastic Full



Emmen, removal Paint WB, Interrupted from poor SMA 300 µ

### Netherlands

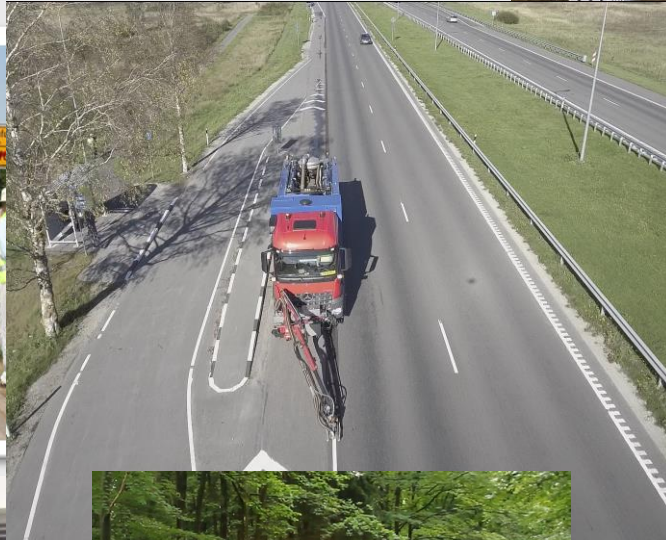


Zwolle – TP 500µ

### - Finland



We thank you for interest and professional approach to new technologies. We thank for your attention.  
**ANY QUESTIONS??**



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