

DOKUMENTATIONEN

14/2015

Checklists for surveying and assessing industrial plant handling materials and substances, which are hazardous to water

Nº 6

Split-Flows Wastewater

DOKUMENTATIONEN 14/2015

Advisory Assistance Programme (AAP) of the
Federal Ministry for the
Environment, Nature Conservation,
Building and Nuclear Safety

Checklists for surveying and assessing industrial plant handling materials and substances, which are hazardous to water

Nº 6

Split-Flows Wastewater

by

Gerhard Winkelmann-Oei (idea and conception)
Federal Environment Agency, Dessau (Germany)

Jörg Platkowski
R+D Industrie Consult, Adelebsen (Germany)


International Commission for the Protection of the Danube River (ICPDR),
Vienna (Austria)

On behalf of the Federal Environment Agency (Germany)

Imprint

Publisher:

Umweltbundesamt
Wörlitzer Platz 1
06844 Dessau-Roßlau
Tel: +49 340-2103-0
Fax: +49 340-2103-2285
info@umweltbundesamt.de
Internet: www.umweltbundesamt.de

 /umweltbundesamt.de
 /umweltbundesamt

Updated:

09/2014

Edited by:

III 2.3 Plant Safety
Gerhard Winkelmann-Oei

ISSN 2199-6571

Dessau-Roßlau, June 2015

This publication is financed by the German Federal Environment Ministry's Advisory Assistance Programme (AAP) for environmental protection in the countries of Central and Eastern Europe, the Caucasus and Central Asia and other countries neighbouring the European Union.

The responsibility for the content of this publication lies with the authors.

Recommendations of the International River Basin commission for split-flow wastewater

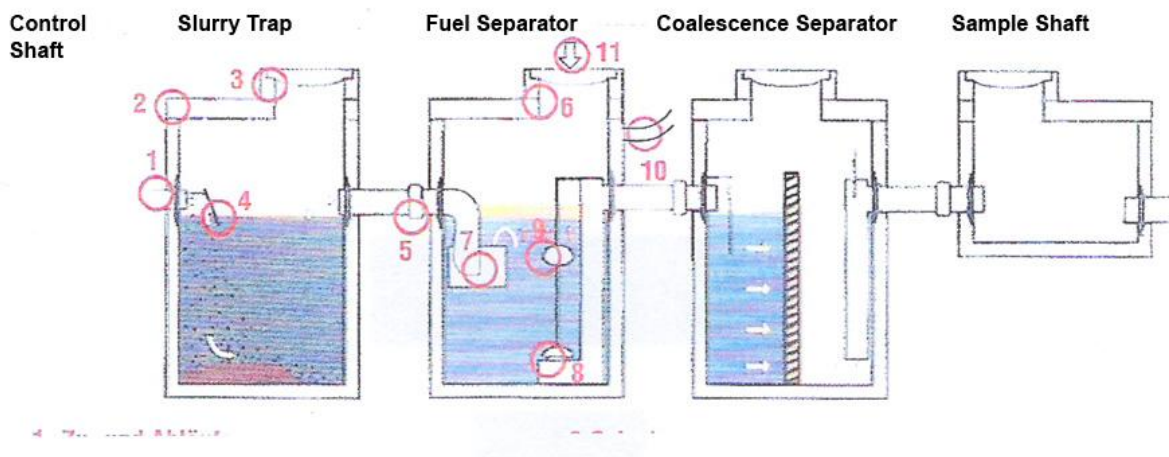
1. Accidentally contaminated split-flow wastewater must be identified early with such measures like monitoring. The monitoring must be done in conjunction with the necessary measures on protection.
2. If possible, accidentally contaminated split-flow wastewater should be contained as close as possible to the source of discharge and if necessary the sewer for their collection should only be for this purpose.
3. Accidentally contaminated split-flow wastewater should not be mixed with other wastewater.
4. It is necessary to stipulate, that substances which constitute a fire or explosion risk can not find their way into the wastewater system even when the system is protected against such dangers.
5. Suitable containment facilities of adequate size must be provided for accidentally contaminated split-flow wastewater. Such facilities must be tight and resistant to the spill for the expected duration of exposure.
6. Measures (e.g. holding ponds, re-circulation of wastewater) must be provided for preventing contamination of waters in the event of an accidental reduction in the purification capacity of the treatment plant.
7. The wastewater systems must be tight and resistant to the expected physical, chemical, thermal and biological stress.
8. For possible accidental contamination of split-flow wastewater, the internal and external countermeasures along with responsibility for informing and transfer of messages must be stipulated in the hazard control planning.
9. Ensure the safe disposal of accidentally contaminated split-flow wastewater.
10. The effectiveness of the technical and organisational measures taken must be guaranteed by regularly conducted checks.

Checklist for monitoring the implementation of the recommendations

0. Introduction

Split-flow wastewater are continuous and discontinuous industrial wastewater (like wastewater from production plants, auxiliary facilities and laboratories) as well as cooling and rainwater. As a matter of principle suitable technology (e.g. utilization of air cooling systems, water free vacuum systems etc.), environmentally friendly production processes and alternative production process should be considered to avoid wastewater when drawing up concept for wastewater systems. Open water cooling system should be avoided. If it is not possible to avoid generating wastewater or contaminating them, then a wastewater treating system is necessary to treat the wastewater, to purify it in such a way that it can be disposed for example, to the surface water through the sewage system.

Example of a wastewater treatment plant:



Low-density-liquid separating plant – LFA – for oily wastewater

- | | |
|---------------------|---|
| 1. In - and Outlet | 2. Connection of container wall/cover plate |
| 3. Shaft structure | 4. Baffle plate |
| 5. Pipe connections | 6. Connection of cover plate/Shaft structure |
| 7. Inlet set | 8. Automatic ends |
| 9. Swimmer | 10. Empty pipes for eventual installation of alarm device |
| 11. Super elevation | |

1. Monitoring contaminated split-flow wastewater

1.1 Which split-flow wastewater is available:

- Process wastewater

<input type="checkbox"/> Present	<input type="checkbox"/> Not applicable	<input type="checkbox"/> Not known
----------------------------------	---	------------------------------------
- Wastewater from the draining surfaces and containment facility of production plants

<input type="checkbox"/> Yes	<input type="checkbox"/> Not applicable	<input type="checkbox"/> Not known
------------------------------	---	------------------------------------
- Is the wastewater from the containment facility of storage unit and port of transshipment?

<input type="checkbox"/> Yes	<input type="checkbox"/> Not applicable	<input type="checkbox"/> Not known
------------------------------	---	------------------------------------
- Other contaminated wastewater

<input type="checkbox"/> Yes	<input type="checkbox"/> Not applicable	<input type="checkbox"/> Not known
------------------------------	---	------------------------------------

1.2 Can leakages from accidental releases lead to contamination of wastewater?

- | | | |
|------------------------------|-----------------------------|---|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Not applicable |
|------------------------------|-----------------------------|---|

1.3 Can these accidental contaminations be early detected using corresponding monitoring measures?

- | | | |
|---------------------------------|------------------------------------|---|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Not applicable |
| <input type="checkbox"/> Action | <input type="checkbox"/> No action | |

1.4 After detection of contamination caused by accidents: Are there any preventive measures planned to prevent negative effects of the release on ground or surface water after the pollution?

- | | | |
|---------------------------------|------------------------------------|---|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Not applicable |
| <input type="checkbox"/> Action | <input type="checkbox"/> No action | |

Remarks:

Examples of actions:

Short-term measures:

- Regular visual checks on the equipment, particularly those containment facilities for the storage and transshipment units which are connected to the wastewater system without shut-off valves.
- Sampling of wastewater flows from production facilities, or periodic sampling of the wastewater before being discharged into surface waters.

Medium-term measures:

- Containment facilities for the storage and transshipment facilities should be separated from the wastewater system with shut-off valves. Uncovered secondary containment belonging to the storage facilities should be drained by the operating personnel whenever necessary and if necessary be sent to a wastewater treatment plant.

Long-term measures:

- Split-flow wastewater from production plants which could be accidentally contaminated are to be continuously monitored by automatic sensors or systems, and in case of alarm, the acoustic and optical alarm signals should be transmitted to a central monitoring room.
- Monitoring the quality of the wastewater before discharging it to the surface water with automatic analysing equipment which automatically triggers off an alarm or emergency measures such as automatic activation of a shut-off device to interrupt the discharge of wastewater to the surface water.
- Providing retaining capacity to contain contaminated wastewater.
- Liquid from uncovered secondary containments should only be discharged indirectly to the wastewater system after being analysed with the aid of a pump.

Determination of the real risk

Is the sub-point of the recommendation implemented?

Yes

☐

RC=1

Partially

☐

RC=5

No

☐

RC=10

2. Containment at the point of discharge

1.4 2.1 Can accidentally contaminated split-flow wastewater possibly be contained at the point of discharge?

- | | | |
|------------------------------|-----------------------------|---|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Not applicable |
|------------------------------|-----------------------------|---|

1.5 2.2 Can the sewer for split-flow wastewater be separated if necessary?

- | | | |
|---------------------------------|------------------------------------|---|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Not applicable |
| <input type="checkbox"/> Action | <input type="checkbox"/> No action | |

Remarks:

Examples of actions:Short-term measures:

- Drainage facility of containment facilities (storage and transshipment) without shut-off devices should be designed with a simple shutting gadget to drain liquid when necessary. The shut-off valve of the drainage system should be closed during the process of transshipment.

Medium-term measures:

- Secondary containments and retention facilities for outdoor storages and transshipment facilities being drained through the wastewater system should be equipped with shut-off devices so that any water-polluting substances released can be contained.

Long-term measures:

- Equip facilities for split-flow wastewater of a production plant with shut-off which can be operated with an automatic system (see Paragraph 1).
- Build wastewater treatment plant to purify or treat wastewater.

Determination of the real risk

Is the sub-point of the recommendation implemented?

Yes

☐

RC=1

Partially

☐

RC=5

No

☐

RC=10

3. Preventing contaminated wastewater from being mixed with other wastewater

1.6 3.1 Is there the possibility of accidentally contaminated wastewater being mixed with other wastewater?

☐ Yes → 4.☐ No → 3.2☐ Not applicable

1.7 3.2 Can the mixing up of accidentally contaminated wastewater with other wastewater be adequately prevented in good time with some measures or at least limit the risk?

☐ Yes☐ No☐ Not applicable☐ Action☐ No action

Remarks:

Examples of actions:Short-term measures:

- Taking steps to temporarily interrupt or stop the discharge of wastewater to the sewer in case of accident or breakdown.

Medium-term measures:

- Installation of shut-off devices in case of accidental releases.
- Prevention of accidentally contaminated wastewater from being mixed with other wastewater by installing:
 - fast-closing shut-off devices,
 - Separate sewer for contaminated wastewater.

Determination of the real risk

Is the sub-point of the recommendation implemented?

Yes

☐

RC=1

Partially

☐

RC=5

No

☐

RC=10

4. Fire and explosion hazard

☐

relevant

☐

not relevant → 5

1.8 4.1 Substances with fire and explosion risks must be prevented from entering the drainage system. Are the preventive measures sufficient? (See also [Checklist No 1 “Substances”](#))

☐

Yes → 5

☐

No → 4.2

☐

Not applicable

1.9 4.2 Is the drainage system designed to handle substances with fire and explosion risks?

☐

Yes

☐

No

☐

Not applicable

☐

Action

☐

No action

Remarks:

Examples of actions:

Short-term measures:

- Replace unsuitable components of the drainage system.
- Take measures to prevent these dangerous substances from entering the drainage system.

Medium-term measures:

- Prevent these dangerous substances from entering the drainage system by containing them at the point of release (close the shut-off valve of the drainage system).

Long-term measures:

- To produce these sewers according to the appropriate standards:
 - Construct wastewater drainage systems pipes with non-flammable and corrosion-resistant material,
 - Construct wastewater drainage systems pipes and the sewer itself to resist pressure surge.
- Ensure there are no sources of ignition in the drainage systems and its piping.
- Avoid the mixture of substances which can lead to explosive reactions.

Determination of the real risk

Is the sub-point of the recommendation implemented?

Yes

☐

RC=1

No

☐

RC=10

5. Containing split-flow wastewater and tightness of containment systems

5.1. Are sufficiently dimensioned containment facilities for accidentally contaminated split-flow wastewater available?

☐

Yes

☐

No → 6.

☐

Not applicable

☐

Action

☐

No action

5.2. Can the retention facilities stay leak-proof for the long-term period of workload?

☐

Yes

☐

No

☐

Not applicable

☐

Action

☐

No action

5.3. Are the authorised personnell qualified to service this industrial plant?

- | | | |
|---------------------------------|------------------------------------|---|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Not applicable |
| <input type="checkbox"/> Action | <input type="checkbox"/> No action | |

5.4. Are there instructions on exploitation?

- | | | |
|---------------------------------|------------------------------------|---|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Not applicable |
| <input type="checkbox"/> Action | <input type="checkbox"/> No action | |

5.5. Were the control devices installed (for example: filling level indicator)?

- | | | |
|---------------------------------|------------------------------------|---|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Not applicable |
| <input type="checkbox"/> Action | <input type="checkbox"/> No action | |

5.6. At installation of the relevant emergency valves – apply higher requirements

5.6.1. Do these emergency valves, installed at the industrial plants, causing hazards, have independent energy supply, or any other additional preventive measures to ensure operations of the industrial plants in case of enegry supply failure at general grids?

- | | | |
|---------------------------------|------------------------------------|---|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Not applicable |
| <input type="checkbox"/> Action | <input type="checkbox"/> No action | |

5.6.2. Are these emergency valves ensure backward control?

- | | | |
|---------------------------------|------------------------------------|---|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Not applicable |
| <input type="checkbox"/> Action | <input type="checkbox"/> No action | |

5.7. Have these devices been clearly enough specified to retain waste water contaminated by accident?

- | | | |
|---------------------------------|------------------------------------|---|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Not applicable |
| <input type="checkbox"/> Action | <input type="checkbox"/> No action | |

Remarks:

Examples of actions:

Short-term measures:

- Construct temporary containments.
- Regular assessment of the tightness at short intervals, at least through visual inspections.
- Repair detected damages to the sealing.

Medium-term measures:

- Construction of containment. Use the highest wastewater flow-rate to design the containment systems.
- Specify the period for which the seals of a retention basin must be tight and resistant to accidentally contaminated wastewater.
- Specify measures for the treatment or disposal of accidentally contaminated wastewater.

Long-term measures:

- Installation of an automatic level monitoring system to monitor fluid levels in the containment basin.

Determination of the real risk

Is the sub-point of the recommendation implemented?

Yes

☐

RC=1

Partially

☐

RC=50

No

☐

RC=100

6. Operation and function of treatment plants

6.1 Can accidentally contaminated split-flow wastewater flow to an in-house plant or to other public treatment plants?

☐

Yes → 6.3

☐

No → 6.2

☐

Not applicable

6.2 Would the purification effort of an in-house or public treatment plant be affected if accidentally contaminated split-flow wastewaters are treated thereby contaminating the waters?

☐

Yes

☐

No

☐

Not applicable

6.3 Can contamination of surface waters by accidentally contaminated wastewater be prevented by, e.g., retention systems or wastewater recycling systems?

☐

Yes

☐

No

☐

Not applicable

☐

Action

☐

No action

Remarks:

Examples of actions:

Short-term measures:

- Regular and frequent checking of the treatment plant's efficiency by internal quality control of the wastewater before being discharged into surface waters or directly discharged through the public sewer system.
- Specify measures in conjunction with the operator of the treatment plant before any discharge into the public sewers.

Medium-term measures:

- Construction of containment facilities which are sufficiently tight and have enough containment capacity for this purpose.
- Equip the facilities with shut-off device to stop the discharge of wastewater into public wastewater facilities or surface waters.

Long-term measures:

- Installation of automatic and continuous monitoring devices so that the discharge of accidentally contaminated wastewater resulting from accidents can be prevented at all time.

- Improvement of production technology and technical systems to prevent the occurrence of breakdowns which could lead to wastewater contamination.

Determination of the real risk

Is the sub-point of the recommendation implemented?

Yes

☐

RC=1

Partially

☐

RC=5

No

☐

RC=10

7. Tightness and durability of the wastewater systems

7.1 Are the wastewater systems tight and resistant to the expected physical, chemical, thermal and biological stresses?

☐ Yes

☐ No

☐ Not applicable

☐ Action

☐ No action

Remarks:

Examples of actions:

Short-term measures:

- Inspection of the visible parts of the wastewater facilities (where possible) in regard to their internal and external condition.
- Repair or replacement of damaged parts.
- Inspection of the facility's documentation in regard to the resistance of the piping to the present composition of the wastewater.

Medium-term measures:

- Tightness test of the wastewater system. The testing is to be carried out section by section and should be documented.

Long-term measures:

- Replacement of unsuitable parts.
- Closing of unsuitable facilities.

Determination of the real risk

Is the sub-point of the recommendation implemented?

Yes

☐

RC=1

Partially

☐

RC=50

No

☐

RC=100

8. Disposal of wastewater contaminated by accidents

8.1. Is the safe treatment/disposal of accidentally contaminated wastewater guaranteed?

☐ Yes

☐ No

☐ Not applicable

☐ Action

☐ No action

Remarks:

8.2. Are external preventive measures specified in the danger prevention plan regarding the split-flow wastewater contaminated by incidents?

☐ Yes ☐ No ☐ Not applicable

8.3 Are the responsibilities determined on informing and reporting the planned danger prevention measures and activities regarding the split-flow wastewater contaminated by incidents?

☐ Yes ☐ No ☐ Not applicable
☐ Action ☐ No action

Remarks:

Examples of actions:

Short-term measures:

- Put the most important preventive measures to be taken in the case of an accident or breakdown in writing.
- Existing danger prevention plan documents should be updated.
- Determine and specify necessary measures in conjunction with external experts e.g. the fire brigade.
- Check the extent of availability of adequate in-house technical aid for danger prevention.
- Specify the necessary information to be reported and the content of such report in co-operation with the local authority responsible for such cases.

Medium-term measures:

- Development of internal alarm/danger prevention plans.
- Danger prevention drills for the staff involved.

Examples of actions:

Short-term measures:

- Assess possible methods of disposal.
- Specification of the necessary disposal measures.
- Name a member of the staff to take the responsibility for the disposal.

Determination of the real risk

Is the sub-point of the recommendation implemented?

Yes

☐

RC=1

Partially

☐

RC=5

No

☐

RC=10

9. Preventive measures and reporting responsibility

9.1. Are internal preventive measures specified in the danger prevention plan regarding the split-flow wastewater contaminated by incidents?

☐ Yes ☐ No ☐ Not applicable

Medium-term measures / Long-term measures:

- Acquisition of additional equipment for the disposal of accidentally contaminated wastewater resulting from accident, such as:
 - Containers for transport,
 - Mobile pumps,
 - Flexible tubes (hoses) for pumping and transporting the wastewater
 - Analytical equipment.

Determination of the real risk

Is the sub-point of the recommendation implemented?

Yes <input type="checkbox"/> RC=1	No <input type="checkbox"/> RC=10
---	---

10. Regular checks

10.1 Are there regular checks undertaken to prove the sufficiency of the organisational and technical measures?

<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Not applicable
<input type="checkbox"/> Action	<input type="checkbox"/> No action	

10.2. Are the wastewater pipelines checked for contamination?

<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Not applicable
<input type="checkbox"/> Action	<input type="checkbox"/> No action	

Remarks:

Examples of actions:

Short-term measures:

- Responsibilities and duties for carrying out inspections should be assigned to production plant staff.
- Training of production plant staff on how to carry out inspections.
- The scope of inspections should be determined
- The inspections should guarantee the following:
 - Is the monitoring of split-flow wastewater efficient.
 - Examination of the visible parts of the wastewater system (as far as possible) in regard to leakage, excessive corrosion or other defects.
 - Is the tightness of the wastewater system verified or has sufficient measures been taken to prove the tightness of the wastewater system.

Medium-term measures / Long-term measures:

- Training of plant staff to monitor the wastewater system safety.
- Involvement of external experts in the regular inspection of the wastewater system.

Determination of the real risk

Is the sub-point of the recommendation implemented?

Yes <input type="checkbox"/> RC=1	No <input type="checkbox"/> RC=10
---	---

Summery of the Checklist

Sub-point of the Recommendation	Possible Risk category	Risk categories
1	1 / 5 / 10	
2	1 / 5 / 10	
3	1 / 5 / 10	
4	1 / 10	
5	1 / 50 / 100	
6	1 / 5 / 10	
7	1 / 50 / 100	
8	1 / 5 / 10	
9	1 / 10	
10	1 / 10	

Average Risk of the Checklist (ARC)