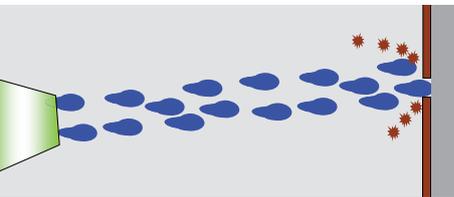


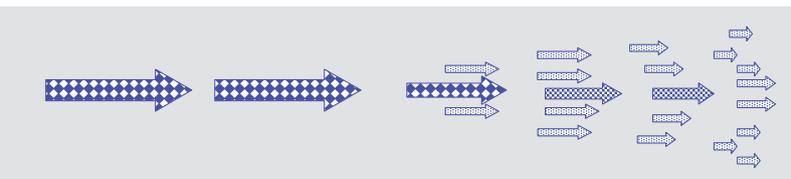
How to choose a good tank cleaning nozzle

Cleaning effects

Impact has a good cleaning effect especially at short distances. Soil is removed due to high kinetic energy of the droplets coming from the nozzle. Therefore big droplets that travel with a high speed are required. This can be used for removing soil which is difficult to remove and cannot be dissolved in the cleaning medium.



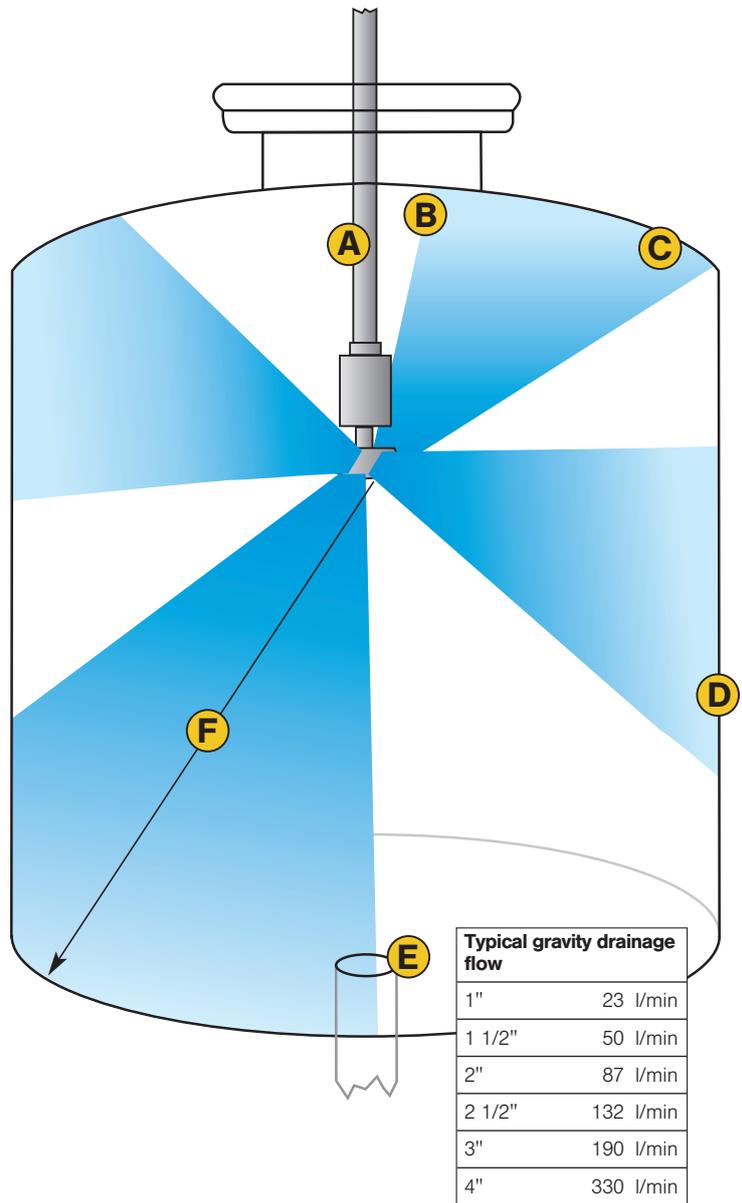
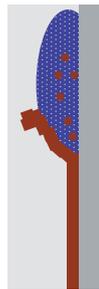
But the cleaning effect by impact is reduced when the droplets have to travel longer distances before hitting the tank wall. This is because they lose speed and tend to disintegrate into smaller droplets. Any obstacle between tank cleaning nozzle and tank wall reduces the impact behind to zero (see spray shadow)



A **free falling film** is created by the liquid when it runs down a tank wall. When the film is thick enough there are turbulences inside it which create shear forces that are able to clean

medium to easy removable soil. This is not so sensitive against spray shadows.

The **chemical cleaning effect** takes part in almost all tank cleaning applications because either the soil is dissolved in the cleaning medium or the bonding between soil and tank surface is reduced.



Typical applications

- A** - Position the tank cleaning nozzle(s) at the center of the tank, roughly one-quarter of the distance from top to bottom.
- B** - Nozzles invariably leave an unsprayed shadow area directly overhead, the size of which varies according to the type of nozzle and the piping.
- C** - The distance between the top of the tank and the nozzle should amount to approximately one-quarter of the nozzle's action radius. Size your unit to ensure sufficient flow to the top part of the tank wall.
- D** - The film of liquid grows thicker toward the bottom of the tank, where the washing effect is the most pronounced.
- E** - Standing water reduces impact and allows solids to accumulate. Make sure that the drain can handle whatever you put into the tank.
- F** - The longest spray distance is from the nozzle to the bottom corner, so the nozzle should be sized for this »effective washing distance«.

All pressure data are stated in terms of differential pressure directly at the nozzle, so be sure to take the line-pressure drop into account.

Support for application and operation

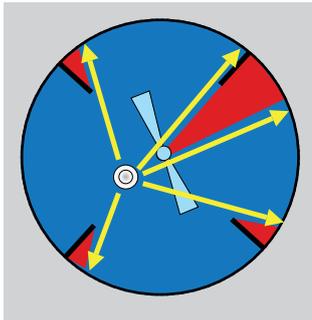
Spray shadows

With baffles and agitator, a single cleaning device can't effectively clean the whole interior of the reactor vessel. With a single cleaning device, the baffles and agitator give raise to shadow areas and obstruct direct impingement of the cleaning nozzle fluid sprays on these tank areas.

"LINE OF SIGHT"

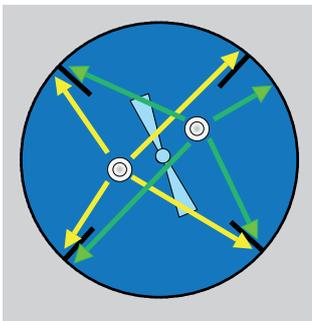
The limitation of any spray nozzle is that it cannot effectively impact on a surface that cannot be seen from the nozzle's position

Single tank cleaning unit



Multiple spray sources are needed to compensate for the shadowing effect to provide complete spray coverage.

Two tank cleaning units



As rule, the number of cleaning nozzles should correspond with the number of baffles.

Installation height influencing Impact angle

Generally the best cleaning result is achieved when the cleaning liquid hits the tank wall perpendicularly.

Nozzles too close to the ceiling will cause the impact of the spray to deflect off the curved tank ceiling cleaning efficiency is lost. This leads o residual soil in the "problem areas"

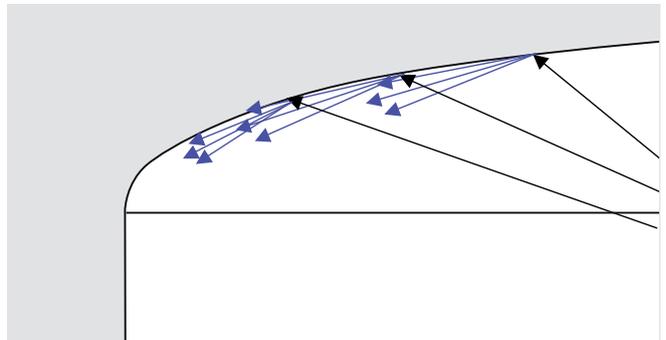
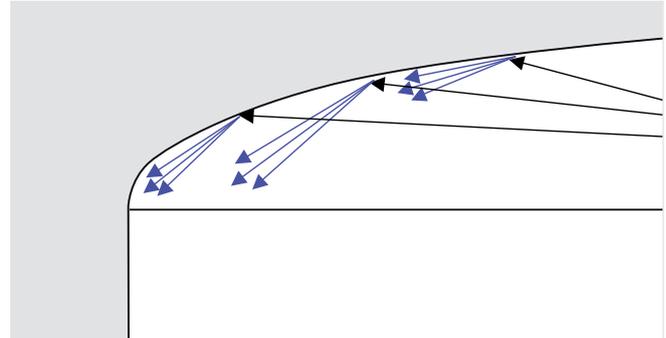
Spray follows ceiling

Mounted lower in the tank, the nozzles impact more effectively and the wash tends to run down the ceiling for better wet-out of the surfaces to be cleaned.

Distance

The position of the tank cleaning device is also determined by the effective throw length of the cleaning device. Each spray has a certain range in which the removal of the corresponding soil is effective. The range is usually given by the manufacturer and divided into cleaning and rinsing distance. If the tank is bigger than the throw length of the chosen tank cleaning device it is necessary to use two or more of them.

In vertical tanks with a cone/dome, the tank cleaning machine must be installed on a down pipe of about $0,23 \times$ tank diameter D (m). In this case, the down pipe length creates a corner of about 25° between the tank dome and the largest horizontally cleaning radius.



Remark:
Planning to locate a Spray device in a tank no matter how thorough it is done can never give a guarantee that the CIP process is performed well. A trial will be always unavoidable.

How to choose a good tank cleaning nozzle

The following step-by-step rundown will help you define your cleaning task and get the most out of our corresponding products.

Begin by analyzing your cleaning task:

- How large is the tank in terms of size and interior surface area?
 - Where is the dirt located; how bad is it; and what is its nature?
 - Which method of cleaning is required: strong blasts of cleaner or repetitive rinsing?
 - What kind of cleaning chemicals are you using?
 - Are there any internal obstacles (e.g., mixing vanes)?
- [More information on page 4.](#)



In defining your tank cleaning nozzle installation, be sure to observe the following three parameters:

1) Rinsing effect – a function of flow rate

Ascertain the requisite liquid flow rate by trial and error as a function of the applied pressure.

- All points of relevance should be turbulently circumswept/rinsed by an adequately thick film of cleaning liquid.
- In comparison with rotational cleaners, static spray balls require roughly twice as much liquid flow.
- Remember: Your drain must be able to handle whatever you're putting in the tank.

→ [More information on page 3](#)

2) Force of impact – helps strip off crusty dirt

The force of impact depends on:

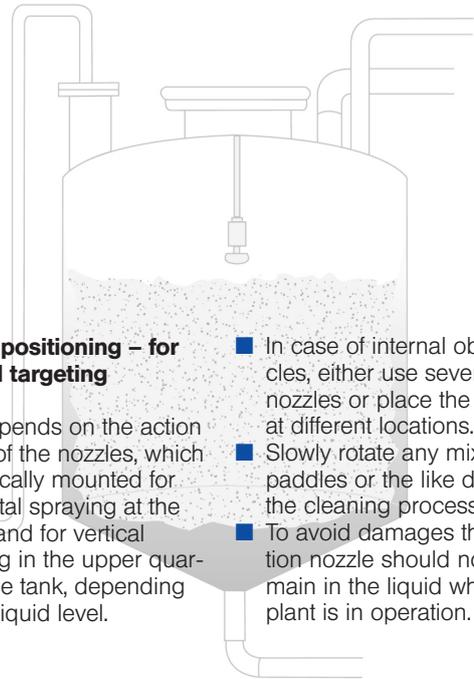
- ...adherence to the optimal operating pressure range for the type of nozzle in use;
- ...the right action radius and volumetric flow for the size of tank in question;
- ...concentration of the spray jets on the most badly soiled areas, e.g., 270° up or down

The higher the pressure, the smaller the droplet size. Consequently, more flow is better than more pressure.

3) Proper positioning – for optimal targeting

- This depends on the action radius of the nozzles, which are typically mounted for horizontal spraying at the center and for vertical spraying in the upper quarter of the tank, depending on the liquid level.

- In case of internal obstacles, either use several nozzles or place the nozzle at different locations.
- Slowly rotate any mixing paddles or the like during the cleaning process.
- To avoid damages the rotation nozzle should not remain in the liquid while the plant is in operation.



Check with your local Lechler nozzle-application advisor about the requirements for your particular application. The "Questionnaire tank cleaning nozzles" on pages 26 and 27 helps you to establish the important parameters.