



**LIST**<sup>+</sup>



**Kneading - Mixing - Drying**

*Delivery of First  
Production Line  
with next generation of*

**LIST- Distillation Residue  
Recovery Technology**

# LIST Technology AG

has been for over 60 years a world leader for efficient and safe Distillation Residue Recovery Technology (DRR). DRR technology provides reliable environmental protection and maximum profit from your production.

Based on LIST long term experience and many years of fundamental development we proudly present the next generation of recovery technology featuring:

- > improved safety and environmental measurements
- > significant increased production output
- > stable and very robust process
- > lowest maintenance and long-lasting machine technology

The **new generation Twin Shaft KneaderReactor Technology** named AP Plus for Distillation Residue Recovery is based and replaces the successful LIST AP- (All Phases) KneaderReactor.

The advantages of the new LIST KneaderReactor as compared to competitive solid-bed-technologies are:

- Capacity increased by up to 50%
- Robust and flexible process for high and low throughputs reliably absorbing any feed fluctuations. Any unstable feed quantities neither block the machine nor impact quality
- Reduced wear due to lower torque, lowered RPM and significant lower dust formation
- Maintenance cycles doubled by widely eliminated dust formation thanks to
  - optimized solid processing
  - improved self-cleaning properties
  - minimized dead volume
- Product quality improved significantly. No impurities in the condensate due to dust-free processing reduces after-treatment costs
- Reliable Safety and Health protection thanks to decades of experience with both closed design of the Kneader-Reactor processes and auxiliary handling technology



First Production Line of the LIST AP Plus next generation DRR Technology.

## The LIST Distillation Residue Recovery Process: An Industrial Standard

The LIST Distillation Residue Recovery Process is based on fast thermal separation of concentrated residue stream and the continuous transition (by distillation or cooling) of remaining residues into pastes or granular solid tars.

These pastes or solids can be stored, land-filled or incinerated for power/steam generation. Applying the LIST Process it is possible to recover almost 100% value product from residue.

### Applications

Isocyanate Production

Chemical Ingredients

Paint or Lacquer residue

### Value Product

> Toluene Diisocyanate (TDI),  
Toluene diamine (TDA),  
Hexamethylendiisocyanate (HDI)

> Hydroquinone

> Solvents

## Application: Toluene Diisocyanate (TDI) Distillation Recovery Process

In the case of TDI separation by evaporation, the liquid distillation residue passes through a rubbery, viscous, pasty phase with a strong tendency to foam, caused by the decomposition and release of CO<sub>2</sub>. When the TDI content is below 15%, the residue starts to solidify and forms a solid hard crust and, after further drying, turns it into a solid granular material.

All phases starting from low viscous feed to highly viscous phases and subsequent granular phase can be handled in the same KneaderReactor. The condensates appearance is yellowish, almost clear. The final residue is an odorless, low-toxic granular solid. The typical final content of product in tars is less than 0.5% by weight. Throughputs are typically distillation column residue between 1000 – 3000 kg/h containing a TDI concentration in the range of 30 – 70%. Applications are not restricted to TDI ...

- LIST has developed and optimized the TDI distillation recovery process for 50 years
- Industry has realized more than 40 production lines with LIST Distillation Residue Recovery Technology
- LIST is the process leader worldwide for the TDI Distillation Residue Recovery Technology



# recovery

