

# Why many distillation systems waste 20-35% of their solvent!



How operators of existing distillation systems can  
**increase recovery rates, cut operating costs**  
and uncover **hidden efficiency losses**  
**in their processes.**





# What you will find in this report:

**1**

**Why many systems operate well below their potential**

**2**

**Which factors actually influence the recycling rate**

**3**

**How maintenance and operation improve solvent recovery**

**4**

**Which differences in system design determine performance**

**5**

**Which key metrics operators should monitor regularly**

**6**

**How a performance check reveals opportunities for optimisation**

# THE HIDDEN PROBLEM WITH MANY DISTILLATION SYSTEMS

Many companies already operate their **own distillation system** and therefore assume that their **solvent recovery** is already **optimised**. In practice, however, the picture is often different.

While modern systems can achieve **recovery rates** of up to **92-97%**, many existing systems consistently operate at only **60-70%**.

The consequences:

- Larger **volumes for disposal**
- Higher **energy costs** per litre of distillate
- Additional **logistical effort**
- **Hidden costs** that often go unnoticed

**Low recycling rates** are often accepted as **inevitable**.

Yet the **cause is often not the solvent** itself, but a combination of:

- System design
- Maintenance condition
- Operation
- Process settings
- Wear and tear

## **Conclusion:**

Many distillation systems operate below their potential, resulting in unnecessary costs.



# Common causes of low solvent recovery rates



**1** Irregular maintenance



**2** Operating errors



**3** Worn components



**4** System design



**5** Process settings

## 1. Irregular maintenance

Many operators only carry out maintenance when **problems appear**. Typical consequences include **dirty heat exchangers**, reduced **evaporation performance**, longer **batch times** and rising **energy consumption**.

## 2. Daily operating errors

Checks specified in the manual are often not carried out consistently. Typical examples include **inadequate cleaning**, incorrect **fill quantities**, incorrect **temperature settings**, and undetected signs of wear. Even **small deviations** can significantly affect the **recovery rate**.

## 3. System design

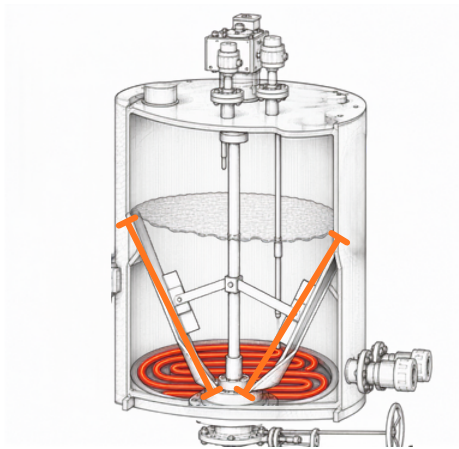
Not every distillation system offers the same physical conditions for high solvent recovery. One often underestimated factor is the **geometry of the distillation vessel**. Many systems available on the market have a conical vessel design, which can create disadvantages, particularly in terms of heat transfer.

## 4. Process settings

Many systems offer few adjustable settings, a low level of automation and insufficient process analysis and adjustment capabilities.

# When system design becomes a limitation

Not every distillation system offers the same physical conditions for high solvent recovery. One often underestimated factor is the design of the distillation **system itself**. Many older or simpler system concepts reach their technical limits, particularly when processing demanding solvent mixtures.



## Vessel geometry

Many systems on the market use **conical distillation vessels**. This design can lead to inherent disadvantages:

- High **energy losses** during distillation
- **Uneven heat distribution** across the heating surfaces
- **Declining distillation performance** as the fill level falls
- Longer batch times as a result

Especially at lower fill levels, these designs often reduce the **effective heating surface**.

The result is a **continuous decline in performance** during the batch.

## Inaccurate temperature readings

In some system designs, temperature measurement has relatively low accuracy and high hysteresis.

Possible effects:

- **Temperature fluctuations** of several degrees Celsius
- **Reduced distillation performance**
- **Unstable process control**
- Increased foaming
- **System overflow** under critical operating conditions
- More difficult control during refilling operations

Especially with demanding solvent mixtures, **precise temperature control** can be crucial for **product quality** and the **recovery rate**.

## Limited process monitoring and data availability

Existing systems often provide little process information. Most operators only have access to basic data such as heating time, vacuum time and batch duration.

This means key information is missing for:

- Productivity analyses
- Efficiency assessments
- Investigating the causes of performance fluctuations
- Optimising the recovery rate

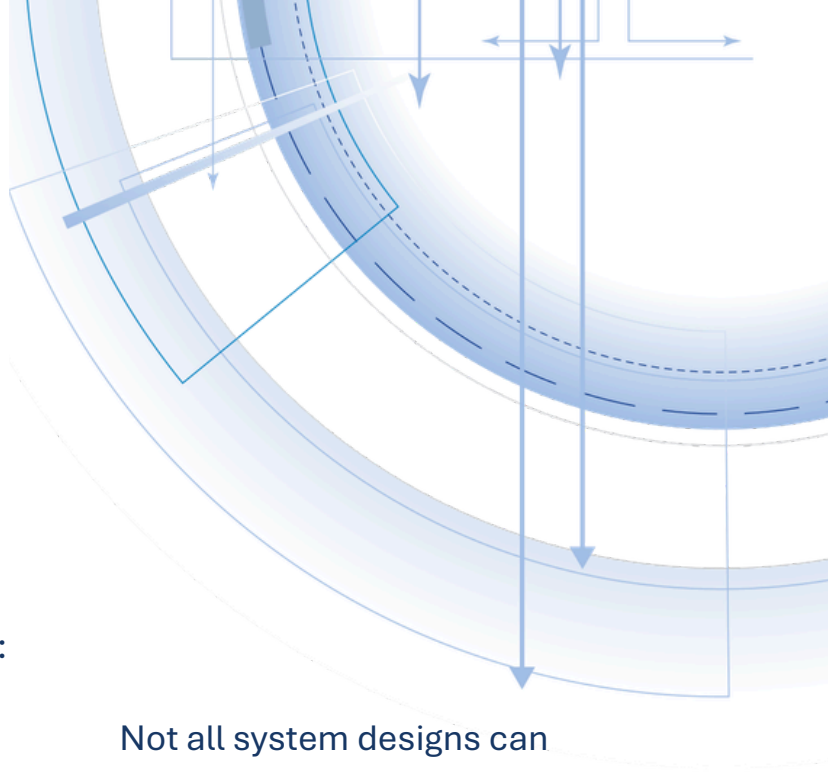
Without reliable process data, many operating losses remain invisible.

## Limited tolerance for variations in the feed material

In practice, solvent mixtures change continuously.

Typical influencing factors include:

- Varying solids content
- Different levels of contamination
- Water content
- Process residues



Not all system designs can reliably handle these fluctuations.

Possible consequences:

- Variable distillate quality
- Declining recovery rates
- Greater operating effort
- More frequent process interruptions

## Lack of discharge and residue monitoring

Simpler systems are often emptied without actively monitoring the amount of residue remaining.

This creates risks relating to:

- NC fires caused by dried residue on exposed heating surfaces
- Product losses
- Excessive residue volumes
- Inconsistent batch results
- Additional cleaning effort

## Special challenges with NC-containing solvent mixtures

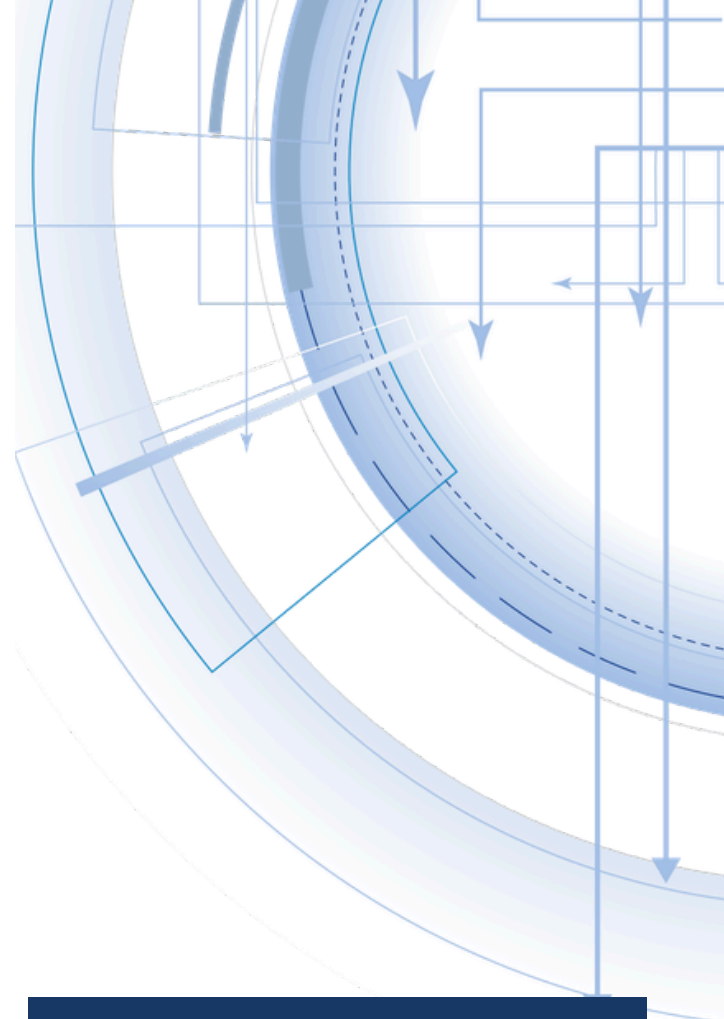
Design differences become particularly clear with sensitive solvent mixtures containing nitrocellulose (NC).

These materials place greater demands on:

- Temperature control
- Heat transfer
- Process stability
- Discharge design
- System control

While modern system designs can achieve high recovery rates even with these mixtures, older or less specialised systems often exhibit:

- Significantly lower distillation performance
- Reduced recycling rates
- Longer batch times
- Greater process instability



## Conclusion

Low recovery rates are not always caused by **maintenance or operating** issues. In many cases, the system design itself limits the performance that can be achieved. If recycling rates remain too low over time, the assessment should therefore cover both system operation and the design constraints of the installed system.

# WHICH KEY METRICS YOU SHOULD MONITOR REGULARLY

## Checklist

### Technical metrics

- Recovery rate
- Distillate quality
- Batch duration
- Energy consumption per batch
- Condensation performance

### Financial metrics

- Fresh solvent consumption
- Disposal costs
- Cost per litre of recovered solvent
- System availability

### Operational metrics

- Number of unplanned stoppages
- Maintenance effort
- Staff time
- Cleaning intervals

### PERFORMANCE CHECK FOR EXISTING SYSTEMS

Many operators do not know how much potential their existing system still has.

#### *Typical questions:*

What recovery rate is technically achievable?

What currently limits performance?

What role do maintenance and operation play?

Where do unnecessary losses occur?

Does optimisation make economic sense?

When is system replacement worthwhile?



# The alternative: Assess your distillation process



After a few years, many companies stop checking the performance of their own distillation solution. They often assume that efficiency and recovery rates remain roughly the same.

Carry out a performance check and seek advice if needed.

Together with you, we analyse:

- Current recovery rates
- Process data
- Financial implications
- Opportunities for optimisation

This provides a sound basis for deciding whether optimisation is enough, or whether modern systems

offer additional opportunities for savings.

Recovering and reusing a high proportion of solvent reduces the cost of purchases and disposal.

The result is **lower stock requirements, less storage space and less internal handling** of materials.



## Conclusion:

Understand the efficiency of your current distillation system and assess whether optimisation or more modern equipment could deliver additional savings.

# Example calculation: Printing company with 200 t of solvent/year

A typical printing company generates 200 tonnes of waste solvent per year. It has used the same distillation system for many years, and the equipment is ageing. In scenario A, residue disposal and fresh solvent purchases cost about €252,000.

If the same company uses a conventional distillation system (B) with a standard recovery rate, the same cost items still amount to €144,000.

| Scenario                                    | Recovery rate | Residue / loss | Residue disposal costs (€1.10/kg) | Fresh solvent purchase (€2.50/kg) | Total annual costs |
|---------------------------------------------|---------------|----------------|-----------------------------------|-----------------------------------|--------------------|
| A Older system (typical standard)           | 65%           | 70,000 kg      | €77,000                           | €175,000                          | <b>€252,000</b>    |
| <b>B Competitor systems</b> (good standard) | 80%           | 40,000 kg      | €44,000                           | €100,000                          | <b>€144,000</b>    |
| ROTOmaX by RENZMANN (best in class)         | 92%           | 16,000 kg      | €17,600                           | €40,000                           | <b>€57,600</b>     |

ROTOmaX reduces annual solvent and disposal costs by about **77%, or €194,400 per year**, compared with a typical older distillation system. Depending on the solvent used and its purchase price, the actual savings potential may be even higher.

#### Industry benchmark for recovery rates

- 60-70% = typical older systems
- 70-85% = acceptable
- 85-92% = good
- 92-97% = best in class

# Case study

## When your distillation system no longer runs efficiently



### What this case shows:

Despite an existing distillation system, IBCs quickly piled up at Plásticos del Segura.

Storage and handling became a problem, compounded by high costs for purchasing fresh solvent.

A modern distillation system quickly resolved the issue.

Plásticos del Segura (PDS Group) is a Spanish manufacturer of plastic packaging, headquartered in Murcia.

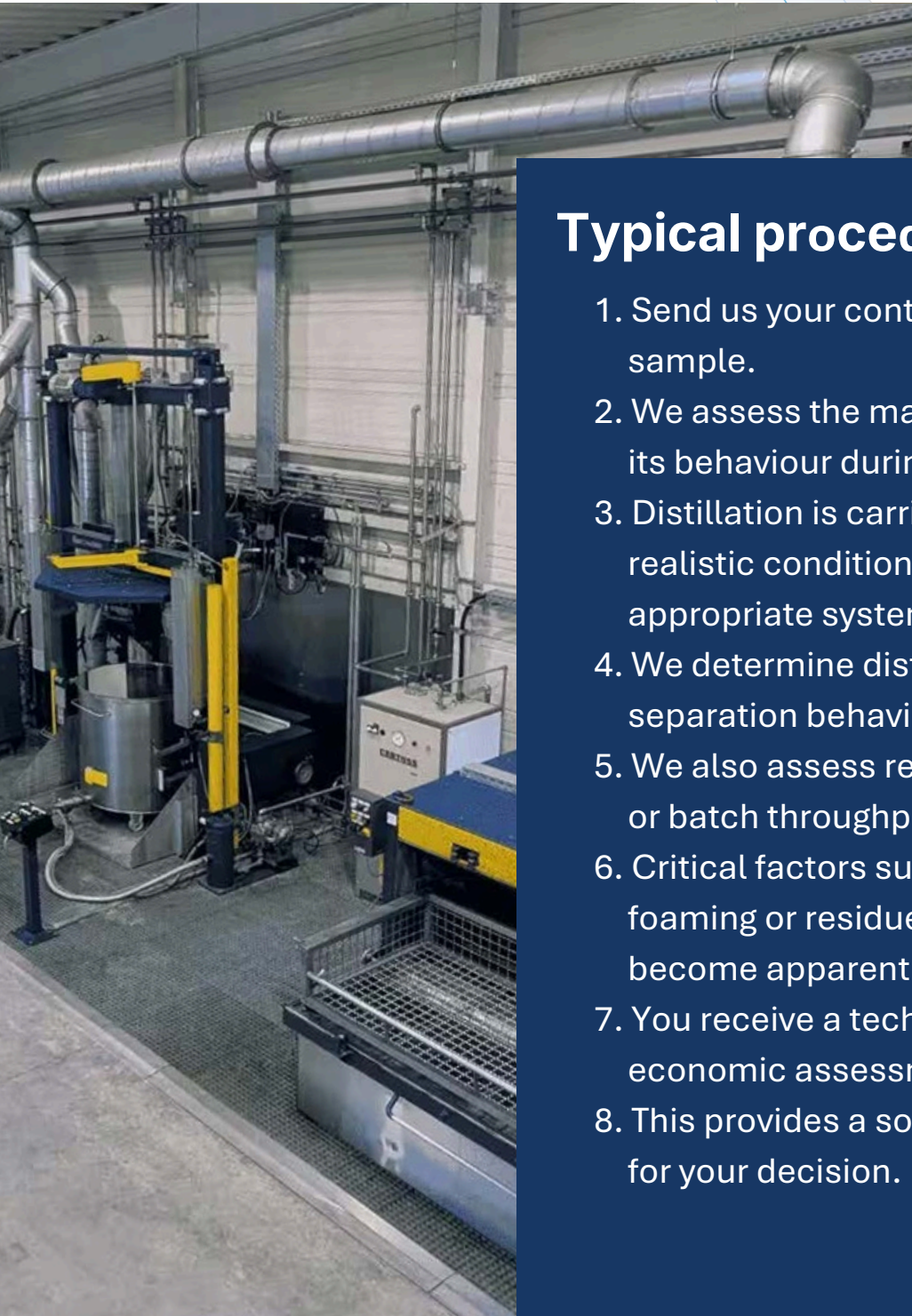
The company produces packaging solutions for the food industry and other sectors. Despite having a distillation system, IBCs containing contaminated solvent soon began to pile up.

*“Since commissioning the new distillation system a week ago, we have already been able to distil all the solvent generated in production by our six printing presses. At the same time, we have started distilling the surplus solvent that had accumulated over the previous months.”*

**Jose Maria Benitez • Director of Operations at Plásticos del Segura**

# Minimise risks - Test your solvent

At Renzmann, companies can have their contaminated solvents distilled and tested under realistic conditions. The aim is a reliable assessment of technical feasibility and economic viability.



## Typical procedure:

1. Send us your contaminated solvent sample.
2. We assess the material requirements and its behaviour during processing.
3. Distillation is carried out under realistic conditions using the appropriate system.
4. We determine distillate quality, separation behaviour and recovery rate.
5. We also assess realistic daily or batch throughput.
6. Critical factors such as water content, foaming or residues become apparent.
7. You receive a technical and economic assessment.
8. This provides a sound basis for your decision.



## Why does this matter for your decision?

For capital equipment in particular, relying on assumptions is risky. A trial using the actual feed material provides a much better basis for:

- Confidence in technical decisions
- Economic assessment
- Internal coordination between production, engineering and management
- Assessing the actual ROI potential

## Questions the trial answers

- What distillate quality is achievable with this specific material?
- What recovery rate is realistic?
- What volumes can be processed per day or per batch?
- What challenges arise from water content, foaming or residues?
- What would an appropriate system and process configuration look like at your facility?



# Real test results from the technical centre



## Case 2: The real lever is the feed material

A German paint and coatings manufacturer visited the technical centre for cleaning trials. It became clear that the company was processing well over 500 tonnes of solvent per year.

### What this case shows:

- High volumes alone do not tell the whole story of economic viability.
- Process-critical factors in the feed material can matter more than the service provider's price.
- A technical-centre trial reveals which factors need to be clarified before making an investment.

The trial showed that the material had a very high water content.

The key finding: Not every cost lever lies directly in the distillation system. In this case, the crucial first step was to specifically reduce the water content and create the conditions for economical in-house distillation.

We can also support you with advice and targeted analysis of your processes.

# What is ROTomaX?



ROTOmaX recovers contaminated solvents for immediate reuse in your facility. This reduces the need for fresh solvent and lowers disposal and operating costs.

## Features

Key features include a high recovery rate, a high level of automation, actual process data for analysis and documentation, and a machine design consistently focused on safety and process stability.

## Benefits

ROTOmaX makes solvents available for reuse sooner and stabilises internal processes,

while reducing the effort involved in handling, purchasing and disposal. You also gain greater transparency over your solvent cycle, reduce the daily workload for staff and become less dependent on external service providers.

## Applications

Typical applications include the printing and packaging printing industries, paint and coatings manufacturing, and related coating, adhesive and solvent-intensive production processes.



## Conclusion:

ROTOmaX addresses the issues that matter to operators every day: lower ongoing costs, less staff time, stable processes, greater transparency and a level of safety suited to a reliable production environment.

# Key metrics to support your decision

## Financial metrics

- Annual fresh solvent costs
- Annual disposal costs
- Total cost per tonne or process cycle
- Capital tied up in solvent stocks
- Approximate ROI timeframe

## Operational metrics

- Internal handling effort
- Storage space required
- Number of manual actions
- Staff time for operation, handling and documentation

## Quality and process metrics

- Achievable distillate quality
- Actual recovery rate
- Throughput per day or per batch
- Behaviour in the presence of foaming, water or solids

## Safety and compliance

- Documentable material flows
- Storage and handling requirements
- Traceability of residue volumes
- Contribution to the solvent balance
- Impact on internal safety and audit processes

# Next steps

## No-obligation trial

Book an appointment at our technical centre and have **your actual contaminated solvent distilled in a trial at our facility.**

Have your individual **savings potential and ROI calculated.**

Comprehensive advice from **a team of Renzmann specialists** is always included.



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