Bayer's WS Technologies

# Fluidized service. Downflow regeneration.

The proven packed bed technology for more than 30 years.



A Bayer Company

LEWATIT<sup>®</sup> - THE BETTER CHANGE



1.WS Process

RAW WATER

Service

OUTLET

Regeneration

2.VWS Process

INFLUENT

EFFLUENT

REGENERANT SOLUTION: NaCI HCI/H:SO, NaOH NaOH 5 SYSTEMS. MULTIPLE SOLUTIONS. ANY NEED.

### UNSURPASSED QUALITY AND INNOVATION

The quality of Bayer's Lewatit resins has been recognized worldwide for decades. Our customers' desire for quality and innovation drove the development of all five **WS** system types.

With five different systems to choose from and a complete line of Lewatit Monoplus resins, Bayer's complete offering provides solutions to meet the needs of any application.

1. **WS** Process offers upflow service and downflow regeneration to optimize performance. The Fluidized Bed (**WS**) process uses a single compartment with upper and lower nozzle plates that are filled with one type of Lewatit resin.

2. **VWS Process** utilizes a dual compartment **WS** system, which separates the two vertical chambers with an intermediate nozzle plate. This permits the use of both weakly and strongly dissociated Lewatit ion exchange resin in the same column without risk of mixing.

### **BAYER...** INDUSTRY LEADER IN PACKED BED TECHNOLOGY

Thousands of plants in the U.S. and around the world use Bayer's downflow countercurrent regeneration technology. Why? Because after examining other packed bed technologies, customers are realizing the significant productivity and economic benefits of using this technology versus all others.

Customers also choose Bayer because no one else can match our track record of more than 30 years of savings in water and regenerants. And, no one else can deliver the total savings for their customers in water and regenerant costs.

That's why leading manufacturers of Ion Exchange Systems are using Bayer's proven packed bed technology for their systems around the world.





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Since the early 1960's, Bayer has led the development effort behind modern "packed bed" countercurrent technology. Bayer's upflow exhaustion/ downflow regeneration concept led to the first patent in this field for the *WS* or "fluidized bed" process. Three patents followed for the *Liftbed*, *Rinsebed*, and *Mutistep* systems. These systems, collectively known as *WS Technologies*, are the true benchmarks for all other packed bed processes. Bayer's experience, combined with that of its selected OEM partners gives *WS* a significant advantage over competitive packed bed technologies.



3. Liftbed Process is recommended for large systems with complex pretreatment, high suspended solids loading or where throughput fluctuates considerably. It contains two compartments that are filled with strongly dissociated resins. The unique Liftbed design can be backwashed after every cycle and does not require a separate backwash vessel.

4. *Rinsebed Process* is ideal for low-flow systems with variable influent quality. Separate backwash vessels or demineralized water storage tanks are not required, because the system can be fully backwashed after every cycle and produces its own demineralized rinse water.

5. *Multistep Process* allows Lewatit ion exchange resins with various functions to be accommodated in a single unit. The system can be used in place of polishing mixed beds.

Quality and innovation were also the driving forces behind the development of our new line of Lewatit Monoplus<sup>™</sup> uniform particle size (UPS) resins, and the commitment can be clearly seen in Bayer AG's new, state-of-the-art production facility. Now, with the addition of the new Lewatit Monoplus<sup>™</sup> resin productionfacility, Bayer is the largest producer of monodispersed (UPS) resins in the world.



### THE COMPARATIVE ADVANTAGES OF BAYER/LEWATIT WS "PACKED BED" TECHNOLOGY

Experience, quality, and innovation are important criteria when one compares the merits of various technology suppliers. At the end of the day, however, one must compare the merits of the individual technologies and make decisions based on sound technical evaluations. In the field of packed beds, Bayer has been evaluating these merits for more than thirty years.

During the development of the **WS** system, Bayer evaluated the existing countercurrent (CCR) technologies and various packed bed design alternatives. Technologies like upflow regeneration were rejected immediately. Here's why:

### **1. UPFLOW REGENERATION**

- There is no question that effective regeneration is the key to well-operated demineralization systems. Water-block, air-block, and split-flow systems all suffer from needlessly complicated upflow regeneration sequences.
- Upflow regenerated packed beds complicate the process further with rapid packing and high regenerant flow rates. Free space must be kept to an absolute minimum to reduce fluidization during the upflow regeneration, and any flow interruption during the regeneration cycle results in poor demineralized water quality during the next full cycle. As a result, upflow is significantly less efficient than downflow regeneration with respect to chemical consumption.
- The poor rinsing characteristics of upflow regeneration significantly increases wastewater volumes. The complexity and poor rinsing characteristics of upflow regeneration significantly outweigh the perceived advantages of downflow service packed beds. This was true in the 1960's, and remains true today.

### 2. "PACKED BED" FILTRATION AND BACKWASHING

 Solid carryover is not a good thing in conventional cocurrent demineralizers. Microbiological contamination and/or accumulated resin attrition is even worse. That is why large freeboards and high backwash flow rates are incorporated in the cocurrent design. The notion that any packed bed with less than 1% free space can be used to filter entrained suspended solids and still function effectively over time is not a reasonable one.

• The initial high "cleansing" flow rate of an upflow regeneration system is required to insure reasonable regeneration. This high flow rate is a limitation to an upflow regeneration system and is not a special feature incorporated to remove suspended solids.

### 3. SERVICE INTERRUPTION/TURN-DOWN

- Virtually all modern, demineralization systems incorporate a recycle rinse to save demineralized water. All technology suppliers recommend it. This recycle rinse overcomes the limited shortcoming of reduced effluent quality in the event that a service interruption occurs in an upflow service packed bed. In fact, a service interruption during upflow service is significantly less problematic (particularly during the first half of the cycle) than a flow interruption during any portion of an upflow regeneration sequence, even if a recycle rinse is not employed.
- The idea that an upflow service packed bed cannot tolerate high turndown ratios is simply not accurate. If it were, the remarkably high turndown ratio one sees from service to regeneration in an upflow regeneration system would cause significant problems.

### 4. Layered beds

- In addition to internal filtration/backwashing capabilities and an insensitivity to service interruptions or turndowns, upflow regenerated packed bed suppliers claim to offer true layered bed capability. These suppliers suggest that layered beds without significant free space will separate perfectly and will never require backwashing. Historically, however layered bed systems have been difficult to separate, even with adequate free space and long backwash/separation sequences.
- Weak and strong resin combinations often improve performance. Bayer knew this, but also knew that layered beds were not the best approach. As a result, it pioneered multi-compartment operation and the *VWS* system, a significant improvement over layered beds and multiple column systems.





## BAYER'S SYSTEMS HAVE ADVANTAGES

Overall, **WS Technologies** offer significant process, economical, technical, and environmental advantages over all other packed bed technologies. With five system types and thousands of systems in operation, Bayer and its licensees offer multiple solutions and an unsurpassed level of experience.

### Improves Ion Exchange <u>Process</u> Provides <u>Technical</u> Superiority

### PROCESS

- Lewatit Monoplus resins specifically designed for trouble-free performance
- Full use of resin capacity
- Short regeneration and rinse times, minimized regenerant requirements
- Minimal pressure losses & channeling
  Low mechanical stress, minimal
- attrition of resin beads
  Automatic distribution and compen-
- Automatic distribution and compensation of water flow
- Floating layer of inert material (Lewatit IN 42) protects distribution system and optimizes regenerant distribution
- Exceptionally high-quality effluent
- Strongly and weakly dissociated ion exchange resins can be combined in one unit without the risk of mixing

### Makes Better <u>Economic</u> Sense Increases <u>Environmental</u> Safety

### Economic

- Space saving and energy-saving construction
- Low regenerant and rinsewater requirements
- No additional pump needed to raise resin bed

### TECHNICAL

- Simple design and automation
- Integrity of the fine polishing layer
- No reclassification of the fine polishing layer

### ENVIRONMENTAL

- Low regenerant disposal
- Minimal water consumption (>95% recovery)
- Simple neutralization of effluent

### SERVICE YOU CAN COUNT ON

Bayer's support team for downflow regeneration systems is unparalleled in the industry. Bayer's technical experience and patented processes are constantly at work solving problems everyday — in industry applications throughout the world. And as a true technology leader, Bayer knows what it takes to keep pace with customer needs.

For more information, call, write or fax us. Visit our web sites at: www.ion-exchange.com

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