Characteristics of Evonik Adjuvants
Tank mix adjuvants presented:

BREAK-THRU® S 240
BREAK-THRU® S 233
BREAK-THRU® VIBRANT
BREAK-THRU® ADVANCE
BREAK-THRU® UNION

BREAK-THRU® S 240
(Super-Spreader)

- Trisiloxane based surfactants
- Chemistry which causes extreme low surface tension of aqueous solutions combined with superspreading of droplets (>50 times droplet diameter increase)
- Stomatal flooding and improved penetration through cuticular layers increase uptake of crop protection agents
- Increased rainfastness
- Only chemistry where reduction of spray volumes by 30–50% is possible
- Only chemistry which compensates disadvantages of anti-drift nozzle types which produce larger droplets
- Can be combined with most a.i., contact and systemic pesticides
- Increases coverage of insects and thus improves knock-down
- Wide crop use range
- Can be incorporated into liquid and solid formulations
- Robust product working at a wide range of water volumes with dose rates of 100–300 ml/ha; excellent wetting effects at 50–100 ml/ha
- More than 15 years commercialized in more than 50 countries worldwide
- Registered in most of the economically important countries
- Tox classification Xn, N
- Available in bulk and in resale sizes
- Approved under EPA 40 CFR 180.910
**BREAK-THRU® S 233**
(Super Penetrant)

- Evonik patented trisiloxane surfactant
- This organosilicone gives the same dramatic reduction of surface tension known for super spreaders, but causes no spreading of the spray mixture. Hence, it maximizes uptake through the cuticula
- A low-spreading adjuvant improving deposition, fast up-take
- No influence on droplet size
- Very robust product with glyphosate and several other herbicides – at dose of 100–150 ml/ha
- Improves penetration of systemic fungicides, insecticides at dose rates of 200 ml/ha
- Improves rainfastness of herbicides, fungicides, insecticides
- Mainly tank-mix adjuvant but is also used as an additive in some formulations
- Excellent with non-selective herbicides but also with selective herbicides in maize and cereals, as with all systemic fungicides in cereals & potatoes, fruits, vegetables
- European tox classification: Xn (harmful); benign to environment
- Registered or in registration process in California and in several European and African countries
- Available in bulk
- Approved under EPA 40 CF 180.910

**BREAK-THRU® VIBRANT**
(Deposition Aid)

- Special alkoxyilated alcohol
- Does not form micelles, hence it is a very fast surfactant
- Generates very little foam
- Independent of the nozzle type, BREAK-THRU® VIBRANT is a super deposition aid. For example, it showed up to 3 fold increase of spray deposition when compared to spray solution without adjuvant
- Appears to have superior activity on grasses (grass weeds with herbicides, and cereal and rice fungicides and insecticides); action on broad leaves also good
- Can reduce drift with XR nozzles
- At concentrations exceeding 0.1 %, it forms a turbid dispersion in water
- Recommended dose rate is at about 200–400 ml/ha for all pesticides
- Under European rules: no hazardous classification
- Available in bulk
BREAK-THRU® ADVANCE  
(Benign adjuvant with two modes of action)

- Surfactant blend consisting of 100% siloxane chemistry
- Has two modes of action (one part has impact on the aqueous phase, and the other part on the oil phase and on a.i.)
- ADVANCE is at least as effective as BREAK-THRU® S 240
- Both components improve biological efficacy of pesticides
- When added to water, the product turns the water opaque
- Does not affect spray droplet size
- Does not foam and in some systems it acts as a foam suppressant.
- Acceptable spreading of water droplets & reduction of surface tension
- Spreading sufficient to avoid spray spots formed on flowers and fruits
- Provides same degree of rainfastness as BREAK-THRU® S 240
- Aimed mainly for the fruit and vegetable segment with fungicides & insecticides out-doors and under protected conditions (greenhouse)
- ADVANCE did not cause phytotoxic symptoms on plants
- Wide crop use range
- With systemic products (fungicides, insecticides), dose rate is 200 ml/ha
- With contact fungicides use 200–250 ml/ha
- No hazardous symbol anticipated; concerning European rules: toxicologically benign

BREAK-THRU® UNION  
(Spreader – Sticker)

- Increased wetting/adhesion combined with good spreading
- Increased droplet size – hence, reduced drift potential
- Improved rainfastness of contact actives
- Equally useful for both contact and systemic pesticides:
  - Fungicides for  
    - grapes (downy mildew and Botrytis)  
    - potatoes (late blight)  
    - ornamentals  
    - cereals foliar & grain diseases  
  - Insecticides for  
    - Oil seed rape beetles  
    - Fruits & vegetables  
    - Ornamentals
- Dose Rates
  - In grapes, potatoes, vegetables, cereal fusariasis and ornamentals, 400–500 ml/ha
  - Broad acre (cereal diseases and with herbicides), 200–250 ml/ha
- No hazardous symbol anticipated; concerning European rules: toxicologically benign
**BREAK-THRU® adjuvant differentiation possible through various effects**

<table>
<thead>
<tr>
<th>Product effects</th>
<th>BREAK-THRU® S 240</th>
<th>BREAK-THRU® S 233</th>
<th>BREAK-THRU® Vibrant</th>
<th>BREAK-THRU® Advance</th>
<th>BREAK-THRU® Union</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-Foam</td>
<td>- / -</td>
<td>- / -</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Anti-Drift</td>
<td>- / 0</td>
<td>- / 0</td>
<td>+ / ++</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td>Adhesion</td>
<td>+ / ++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Rainfastness</td>
<td>++</td>
<td>++</td>
<td>0 / -</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Penetration Time</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Spreading</td>
<td>+++</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Stomata Flooding</td>
<td>+++</td>
<td>+</td>
<td>+</td>
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</tr>
<tr>
<td>Wax Solubilization</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Membrane Penetration</td>
<td>+</td>
<td>++</td>
<td>0</td>
<td>+++</td>
<td>0 / +</td>
</tr>
<tr>
<td>Uptake / Transport</td>
<td>++</td>
<td>+++</td>
<td>+</td>
<td>++ (SL)</td>
<td>+</td>
</tr>
</tbody>
</table>

-- very bad; +++ very good; 0 no effect
Symbols in black based on available data
Symbols in red are estimates

1 Membrane penetration was concluded from chemical characteristics
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