“Wear Plates” is the general name given to a low carbon steel which coated on the surface with high abrasive wear resistant metallic materials. Kobatek® ABRAMAX® wear plates are especially developed for applications where high abrasion and low or moderate impact resistance required.

As a result of our experience and knowledge about Repair and Maintenance welding, Kaynak Teknigi Sanayi ve Ticaret A.Ş. offer to the users Kobatek® ABRAMAX® wear plates which are classified in 4 groups:

ABRAMAX® STANDARD
ABRAMAX® PLUS
ABRAMAX® FLEX
ABRAMAX® PRESTIGE

CEMENT INDUSTRY
- Fans & Fan Casing
- Fans & Fan Casing
- Cyclones & Separators
- Clinker Transportation Pipe Lines
- Mixer Linings
- Mill Linings
- Baffle Plates
- De-dusting Plants

MINING INDUSTRY
- Buckets
- Chutes
- Front-End Loaders
- Crusher Linings
- Conveyor Systems
- Channels
- Slides

STEEL INDUSTRY
- Chutes
- Channels
- Blast Furnace Gas Systems
- Bunkers
- Broach Rams
- Sintering Systems

POWER STATIONS
- Coal Bunkers
- Fans
- Pipelines
- Mill Linings
- Slag Removal Systems
- Transfer Chutes
- Chain Conveyors

PULP AND PAPER
- Fans
- Transportation Channels
- Pipelines
- Cyclones
- Barking Drums
- Mixing Equipment

MIXER-USING INDUSTRIES
- Foundries
- Concrete Block Industry
- Ready-Mixed Concrete
- Asphalt Industry
- Recycling Industry
The definition of abrasive wear is, the type of wear occurs due to the hard particles flow along a solid surface. Abrasion is the most common form of wear. It is caused by non-metallic materials such as sand, oxides or small sized particles moving over a metal part. The worn surface can be recognized by its polished appearance or very fine scratches in the flow direction of particles. Hardness, shape, size and velocity of abrasive particle, service temperature, applied force and type of abraded material determines the severity and intensity of abrasive wear. The effect of abrasive wear may be seen most particularly in the cement, mining, mineral processing and earthmoving industries and also in the environment with sand, rock, minerals etc., Kobatek® ABRAMAX® wear plates especially designed against abrasive wear. Service life of critical components such as chute liners, front-end bucket loader liners, excavators, trucks and separator blades, will be much longer with Kobatek® ABRAMAX® wear plate.

Microstructure comparison of deformed region according to ASTM G65 abrasion test and undeformed regions is shown in the below picture. As it is seen, hexagonal shaped chromium carbide structures act as barrier and prevent the wear.

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDARD</td>
<td>Chromium Carbide</td>
<td>—</td>
<td>++++</td>
<td>55-60</td>
<td>57-62</td>
<td>Moderate</td>
<td>350-400</td>
<td>Good</td>
</tr>
<tr>
<td>PLUS</td>
<td>Chromium Carbide</td>
<td>Mo, B</td>
<td>++++</td>
<td>55-60</td>
<td>57-62</td>
<td>Moderate</td>
<td>500-550</td>
<td>Good</td>
</tr>
<tr>
<td>FLEX</td>
<td>Chromium Carbide</td>
<td>B, Mn</td>
<td>+++</td>
<td>50-55</td>
<td>52-57</td>
<td>Good</td>
<td>350-400</td>
<td>Good</td>
</tr>
<tr>
<td>PRESTIGE</td>
<td>Niobium Carbide + Chromium Carbide</td>
<td>Nb, B, Mo</td>
<td>++++</td>
<td>60-65</td>
<td>62-67</td>
<td>Moderate</td>
<td>550-600</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

1) Chemical composition, hardness and microstructure properties of ABRAMAX® Standard, Plus and Flex wear plates are associated with Fe14 from EN 14700 standard (Classification of welding electrodes for hard-surfacing), while ABRAMAX® Prestige is associated with Fe15.

2) Abrasion Resistance Tests are made by our expert engineers in accredited laboratories of Sakarya University in accordance with ASTM G65 procedure-A standard.

3) Hardness Measurements are made in our Quality Laboratories according to EN ISO 6508-1 (HRC: Rockwell-C Hardness Test Standard).

4) The specified values refer to standard applications; in case of special conditions it must be agreed with technical department of Askaynak.

Distribution chart of wear types faced in industries

<table>
<thead>
<tr>
<th>Abrasive Wear</th>
<th>Adhesive Wear</th>
<th>Erosive Wear</th>
<th>Corrosive Wear and Combination of Other Wear Types</th>
</tr>
</thead>
</table>

|%64 |%15 |%8 |%12 |
**ABRAMAX® STANDARD**

Standard wear plate with chromium carbide structure which provides high abrasive wear resistance and moderate impact resistance. The resistance to abrasion and erosion is obtained by the high chromium carbide concentration, grain size of the carbides and in addition to that toughness and hardness of the matrix.

Hardness: 55-60 HRC (1 pass)

Hardness: 57-62 HRC (2 pass)

Working Temperature: 350-400°C

**ABRAMAX® PLUS**

ABramax Plus wear plate alloyed with Molybdenum (Mo) provides high resistance to severe abrasion and moderate impact. The addition of Molybdenum (Mo) increases the matrix strength of chromium carbide structure. Especially advised for the working environments where high temperature and severe abrasion occur. ABRAMAX® PLUS wear plate increases the lifetime and decreases the operating costs.

Hardness: 55-60 HRC (1 pass)

Hardness: 57-62 HRC (2 pass)

Working Temperature: 500-550°C

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**Microstructure**

Primary chromium carbides can be seen clearly in every region of the hardfacing structure of ABRAMAX® STANDARD wear plate.

Higher chromium carbide density in all regions and more resistant matrix can be seen from the analysis of the microstructure obtained by ABRAMAX® PLUS wear plate.

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<table>
<thead>
<tr>
<th>Product</th>
<th>C</th>
<th>Si</th>
<th>Mn</th>
<th>Cr</th>
<th>Fe</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDARD</td>
<td>3.5-4.5</td>
<td>1.0</td>
<td>0.5</td>
<td>25-30</td>
<td>Rest</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product</th>
<th>C</th>
<th>Si</th>
<th>Mn</th>
<th>Cr</th>
<th>Mo</th>
<th>Fe</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLUS</td>
<td>3.5-4.5</td>
<td>0.8</td>
<td>0.5</td>
<td>27-32</td>
<td>1.0</td>
<td>Rest</td>
<td>&lt; 0.4</td>
</tr>
</tbody>
</table>
Kobatek® ABRAMAX® Wear Plates

ABRAMAX® FLEX
Together with the abrasive wear resistance, ABRAMAX® FLEX wear plate is especially suitable for forming and bending applications down to minimum 150 mm diameter. Highly advised for pipes, pipe elbows and fan blades where severe impact and moderate wear resistance are needed.

Hardness: 50-55 HRC (1 pass)
Hardness: 52-57 HRC (2 pass)
Working Temperature: 350-400°C

**Microstructure**

Microstructure of ABRAMAX® FLEX wear plate is suitable for special application which required bending operation.

![Microstructure Image]

ABRAMAX® PRESTIGE
ABRAMAX® PRESTIGE wear plate has complex carbides to provide the highest abrasion resistance. Most qualified solution which can be used safely where severe abrasion and erosion occurs. It is suitable for working temperatures up to 600°C due to the high carbide concentration occurred by Niobium Carbide (NbC) and Molybdenum (Mo).

Hardness: 60-65 HRC (1 pass)
Hardness: 62-67 HRC (2 pass)
Working Temperature: 550-600°C

**Microstructure**

ABRAMAX® PRESTIGE wear plate contains highest primary carbide concentration, in all regions of the microstructure. Complex carbides increase the abrasive wear resistance dramatically by the existence of Niobium Carbides.

![Microstructure Image]
<table>
<thead>
<tr>
<th>Application Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUCKET</td>
</tr>
<tr>
<td>DRAGLINE BUCKET</td>
</tr>
<tr>
<td>PIPE</td>
</tr>
<tr>
<td>FAN BLADE</td>
</tr>
<tr>
<td>TRUCK</td>
</tr>
<tr>
<td>BUNKER, HOPPER</td>
</tr>
<tr>
<td>SCREW CONVEYOR</td>
</tr>
<tr>
<td>CYCLONE</td>
</tr>
</tbody>
</table>
Chemical analysis, microstructure and hardness of Kobatek® ABRAMAX® wear plates limit the usage of conventional machining methods. Plate edges and corners can be machined by grinding, however it can not be cutted by oxy-fuel cutting technic because of high chromium content. Generally, the most preferred cutting method is plasma arc cutting technic. By applying plasma arc cutting, perfect results can be obtained due to quality and cleaning.

The wear-resistant hardfacing layer can also be removed locally by using air carbon arc technic. Kobatek® ABRAMAX® wear plates can be welded to each other by Kobatek® 352 covered electrodes. During this operation, the welded joint must be located on mild steel base metal surface. On the welded joint, the hardfacing application should be applied by Kobatek® 578 covered electrode.

**Nominal Plate Dimensions - Joining Technics**

<table>
<thead>
<tr>
<th>MAIN PLATE</th>
<th>HARDFACING LAYER</th>
<th>TOTAL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 mm</td>
<td>3 mm</td>
<td>8 mm</td>
</tr>
<tr>
<td>6 mm</td>
<td>4 mm</td>
<td>10 mm</td>
</tr>
<tr>
<td>8 mm</td>
<td>4 mm</td>
<td>12 mm</td>
</tr>
<tr>
<td>8 mm</td>
<td>6 mm</td>
<td>14 mm</td>
</tr>
<tr>
<td>10 mm</td>
<td>5 mm</td>
<td>15 mm</td>
</tr>
<tr>
<td>10 mm</td>
<td>6 mm</td>
<td>16 mm</td>
</tr>
<tr>
<td>20 mm</td>
<td>10 mm</td>
<td>30 mm</td>
</tr>
</tbody>
</table>

Custom design sizes can be made. Different thicknesses can be produced.