## "摩耗"と"熱"に取組む、アーステクニカの鋳鋼・鋳鉄

"Wear" and "Heat" — Themes of the EARTHTECHNICA Cast Steel and Iron Story

| ₹1 <u>- B</u>      |                                      | 化 学 組 成 Chemical composition (%) |           |             | 機械的性質 Mechanical property |                            |                                   | ارا خد بخد            |                                |                   |
|--------------------|--------------------------------------|----------------------------------|-----------|-------------|---------------------------|----------------------------|-----------------------------------|-----------------------|--------------------------------|-------------------|
|                    | 記号<br>symbol                         |                                  | С         | Mn          | Cr                        | 特殊元素<br>Special<br>element | 引張強さ<br>Tensile strength<br>N∕mm² | 硬 さ<br>Hardness<br>Hs | 衝 撃 値<br>Impact value<br>J∕cm² | 溶接性<br>Weldabilit |
|                    | High-c                               | EH1                              | 2.50~3.50 | 0.40~1.20   | 24.0~32.0                 | _                          | ≧390                              | ≧80                   | ノッチレス<br>Notchless ≧ 1.9       | ×                 |
|                    |                                      | EH2                              | 2.50~3.50 | 0.50~2.30   | 18.0~26.0                 | _                          | ≧290                              | ≧84                   | ノッチレス<br>Notchless ≥ 1.9       | ×                 |
|                    |                                      | EH3                              | 2.40~2.90 | 0.40~1.10   | 24.0~29.0                 | 含Mo                        | ≧340                              | ≧65                   | ノッチレス<br>Notchless ≥ 3.9       | ×                 |
|                    |                                      | EH4A                             | 1.10~1.80 | 0.40~1.50   | 18.0~22.0                 | _                          | ≧490                              | ≧65                   | ノッチレス<br>Notchless ≥ 3.9       | ×                 |
|                    |                                      | EH4B                             | 1.10~1.80 | 0.40~1.50   | 18.0~22.0                 | 含Ni                        | ≧490                              | ≧65                   | ノッチレス<br>Notchless ≥ 4.2       | ×                 |
|                    |                                      | EH5                              | 2.60~3.60 | 0.30~1.50   | 14.0~18.0                 | 含Mo                        | ≧340                              | ≧84                   | ノッチレス<br>Notchless ≥ 2.4       | ×                 |
| 耐点                 |                                      | EH6                              | 2.80~3.30 | 0.30~1.50   | 18.0~25.0                 | 含Mo                        | ≧490                              | ≧80                   | ノッチレス<br>Notchless ≥ 2.9       | ×                 |
|                    |                                      | EH6S                             | 2.80~3.30 | 0.30~1.50   | 18.0~25.0                 | 含Mo他                       | ≧490                              | ≧89                   | ノッチレス<br>Notchless ≥ 2.9       | ×                 |
| 摩scast             |                                      | YC2                              | 2.70~3.20 | 0.30~1.10   | 23.0~27.0                 | _                          | ≧390                              | ≧79                   | ノッチレス<br>Notchless ≥ 2.4       | ×                 |
| 耗 鋳 鋼 pua Jeets ts |                                      | YC8                              | 3.20~3.60 | 0.40~1.10   | 14.0~18.0                 | 含Mo,V                      | ≧290                              | ≧87                   | ノッチレス<br>Notchless ≥ 1.9       | ×                 |
|                    | 高電                                   | EM1                              | 0.90~1.30 | 11.00~14.00 | 1.50~2.50                 | _                          | ≧740                              | ≧29                   |                                | 0                 |
|                    |                                      | EM2A                             | 1.00~1.50 | 15.0~24.0   | ≦1.50                     | -                          | ≧730                              | ≧29                   |                                | Δ                 |
| r cas              |                                      | EM3                              | 1.10~1.60 | 16.0~26.0   | ≦4.50                     |                            | ≧680                              | ≧32                   | Vノッチ<br>notch ≧ 30             | Δ                 |
| ry of              |                                      | EM4                              | 1.00~1.50 | 26.0~32.0   | ≦4.00                     |                            | ≧680                              | ≧32                   | Vノッチ<br>notch ≧ 30             | Δ                 |
| 结·sə               |                                      | EM5                              | 0.90~1.20 | 11.00~14.00 | _                         | _                          | ≧740                              | ≧26                   |                                | 0                 |
| 恭/ear              | <b>判</b>                             | EM6                              | 0.80~1.20 | 11.0~14.0   | 1.00~2.00                 | -                          | ≧730                              | ≧29                   |                                | 0                 |
| <b>₩</b>           | 低合金鋳鋼<br>leats tace alloy cast steen | EC1                              | 0.30~0.70 | 0.40~1.10   | 0.50~1.50                 | _                          | ≧1,170                            | ≧65                   | Uノッチ<br>notch ≧ 6.8            | ×                 |
|                    |                                      | EC2                              | 0.20~0.50 | 0.30~1.20   | 1.50~3.00                 | 含Mo                        | ≧980                              | ≧63                   | Uノッチ<br>notch ≧ 14.7           | ×                 |
|                    |                                      | EC3                              | 0.15~0.55 | 0.30~1.10   | 3.00~5.00                 | 含Mo                        | ≧780                              | ≧63                   | Uノッチ<br>notch ≧ 19.6           | ×                 |
|                    |                                      | EC4                              | 0.20~0.60 | 0.50~1.10   | 0.50~1.50                 | 含Mo                        | ≧780                              | ≧45                   | Uノッチ<br>notch ≥ 14.7           | ×                 |
|                    |                                      | EC5                              | 0.20~0.60 | 0.35~1.10   | 0.50~3.00                 | 含Mo他                       | ≧780                              | ≧67                   | Uノッチ<br>notch ≧ 9.8            | ×                 |
|                    |                                      | EC6                              | 0.20~0.50 | 0.50~1.50   | 3.00~5.00                 | 含Mo他                       | ≧1,000                            | ≧70                   | Uノッチ<br>notch ≧ 5.0            | ×                 |
|                    |                                      | EC7                              | 0.20~0.50 | 0.50~1.50   | 1.00~2.50                 | _                          | ≧980                              | ≧63                   | Uノッチ<br>notch $\geq$ 9.8       | ×                 |

高クロム鋳鉄・鋳鋼は、高硬度の炭化物によって優れた耐摩耗性 を有し、乾態・湿態にかかわらず、摺動摩耗および比較的軽~中程度 の破砕・摩砕に対して威力を発揮します。

EH5,EH6 は、数kgから3ton程度の大物部品(竪形ミル部品等)ま で、特殊元素の添加、特殊熱処理の施工によって、内部まで均一に 高い硬度を持たせることができます。

High-chrome cast iron and steel contain ultrahard carbides that provide outstanding wear resistance. This make them ideal materials for parts that are subject to wear from sliding, crushing in dry states as well as wet ones.

Products in the EH5 and EH6 can be used to make components of all sizes. from only a few kilograms to three tons in weight-vertical mill components, for example. Even distribution of hardness is achieved by the addition of special elements and heat treatment.

高マンガン鋳鋼は、その高靭性と衝撃による加工硬化性能によっ 高い耐摩耗性能を備えており、特に苛酷な条件下で使用される摩 耗部におすすめしています。

基本的な鋼種としてEM1がありますが、さらに耐摩耗性を向上させ たい場合には、高合金化したEM2A~EM4をおすすめしています。こ れらは強度を上げ、変形量を少なくして、耐摩耗性を高めたものです。

EM材の溶接は可能ですが、溶接の際は指定溶接棒・指定施工要 領を推奨いたします。

低合金鋳鋼は、熱処理によって軟鋼の6~7倍、高マンガン鋼の1.5 ~2.0倍という耐摩耗性を発揮します。しかも、各種の合金元素を添 加することによって焼入性を向上させ、内部まで硬度を均一にすること

EC5は、特殊元素を添加し、特殊熱処理を施すことによって、高硬 度と高靭性を兼ね備えた材質を実現したもので、主としてシュレッダ用 ハンマ部品に広く適用されています。

EC6は、炭素、クロムを多く含有させることによって、耐摩耗性をさ らに高めた材料で、主にセメントミル部品に適用されています。

High—manganese cast steel provides outstanding wear resistance as a result of its toughness and strain hardening by impact. It is most suitable for components that are subjected to harsh wear.

EM1 is the basic type of high—manganese cast steel, while even greater wear resistance is supplied by EM2A to EM4, which contain special elements. The higher wear resistance of these metals results in increased strength and a minimal degree of deformation.

It is recommended to use the specified welding rods and procedures to

Because of special heat treatment, low-alloy cast steel yields extremely high resistance against wear that is six or seven times greater than that of mild steel and one and a half or two times greater than that of highmanganese steel. Furthermore, quenching integrity can be increased to ensure even distribution of interior hardness by adding various alloy

EC5 is a unique material containing special elements. It is given heat treatment to yield high levels of both hardness and toughness. EC5 is used to make a variety of products, especially shredder hammers.

EC6, a material having higher wear resistance increased by adding a large amount of carbon and chromium, is mainly applied to the parts of

| _             | 記号            |           | 最高使用温度    |           |           |                                 |
|---------------|---------------|-----------|-----------|-----------|-----------|---------------------------------|
|               | symbol symbol | С         | Mn        | Cr        | Ni        | Maximum temperature of use (°C) |
| 熱 to Cr       | _             | 0.20~0.45 | 0.60~1.25 | 24.0~26.0 | 11.0~14.0 | 1,100                           |
| 鋳<br>鋼<br>鋼   | <u>-</u> ΝΠΙΟ | 0.35~0.70 | 0.60~1.25 | 13.0~17.0 | 33.0~37.0 | 1,150                           |
| 翻<br>Heat-res | E KH18        | 0.20~0.50 | 0.60~1.25 | 26.0~30.0 | 14.0~18.0 | 1,180                           |
| Ĭ             | KH22          | 0.35~0.45 | 0.60~1.25 | 23.0~27.0 | 19.0~22.0 | 1,150                           |

KH材は、安定したオーステナイト組織を有し、優れた高温強度 (クリープ強度)と耐酸化性を持った耐熱鋳鋼です。

KH15材はNiを多く含有し、繰返し熱衝撃にも強い材料です。また、 KH22材はコークスバケットのライナ等での実績があります。

The KH material is heat resistant cast steel having excellent high temperature strength (creep strength) and oxidation resistance.

The KH15 materials have repeated thermal shock resistance by adding a large amount of nickel.

In addition, the KH22 materials have been actually applied to liners for coke baskets etc.

| 耐 stee | . =1 B               | 化 学 組 成 Chemical composition (%) |           |           |                            | 機械的性質 Mechanical property         |                       |                                | 耐酸化性                                |
|--------|----------------------|----------------------------------|-----------|-----------|----------------------------|-----------------------------------|-----------------------|--------------------------------|-------------------------------------|
| 熱 is 高 | ast steel 記 号 symbol | С                                | Mn        | Cr        | 特殊元素<br>Special<br>element | 引張強さ<br>Tensile strength<br>N/mm² | 硬 さ<br>Hardness<br>Hs | 衝 撃 値<br>Impact value<br>J∕cm² | Non-oxdation<br>corrosion in<br>air |
| ist is | E HW1                | 1.20~1.50                        | 0.40~0.80 | 16.0~18.0 | 含Ni                        | ≧440                              | ≧55                   |                                |                                     |
| 摩 Ni 新 | E HW2                | 1.30~1.60                        | 0.40~0.80 | 27.0~30.0 | 含Ni                        | ≧490                              | ≧60                   |                                | ≧900°C                              |
| 鋳單鋼    | t HW3                | 1.60~2.00                        | 0.40~0.80 | 27.0~30.0 | 含Ni                        | ≧540                              | ≧65                   |                                | ≧1,100°C                            |
| 鋼 Hear | KH166                | 0.20~0.50                        | 13.0~18.0 | 13.0~18.0 | 含Ni                        | ≧680                              | ≧30                   | Uノッチ<br>notch ≧ 14.7           | ≧1,100°C                            |

HW材は、Crを18~30%含有させることによって高温での耐酸化 性に対応し、また炭素を多く含有させて熱間の強度と硬度を高めた耐 熱・耐摩耗鋼です。

耐熱性についてはHW2とHW3がほぼ等しく、HW1よりやや高くなっ ています。また、耐摩耗性についてはHW3が最も優れ、HW2、HW1 の順になります。KH166材は、とくに熱衝撃性に優れた耐熱・耐摩耗 鋳鋼で、高温で散水されることがあるような耐摩耗部材としても最適 です。

The HW materials are heat and wear resistant. They contain 18% to 30% of chromium to withstand oxidation at high temperatures, plus a large amount of carbon to increase strength and hardness under heat.

HW2 and HW3 are nearly equal in terms of heat resistance, while HW1 has a slightly higher heat resistance. HW3 has the highest wear resistance, followed by HW2 and HW1, respectively.

resistant components that are used for spraying high-temperature liquids.

KH166 is a heat-and wear-resistant cast steel that has outstanding

<sup>※</sup>機械的性質はY形供試材より採取した試験片による値 ※SIから従来単位への換算はN/mm2=MPa=0.101972kgf/mm2、J/cm2=0.101972kgf・m/cm2

<sup>※</sup>上記の規格は予告なしに変更する場合があります。

<sup>\*</sup>Mechanical properties are values of test pieces taken from Y-shaped samples.

<sup>\*</sup>Use the following equations to convert SI to conventional units: N/mm²=MPa=0.101972kgf/mm²、J/cm²=0.101972kgf m/cm²

Specifications are subject to change without notice.