Litlahorn ehf

Aggregates for concrete, claddinng and decorative purposes.

Mining and harbor facilities in Stokksnes, east Iceland

November 2009

Litlahorn

Contents

INTRODUCTION

Litlahorn ehf is a small, private owned company in Hornafjörður, east coas Iceland. The company was established in 1972 and has through the years supplied the neigbourhood of the town Hornafjörður with concrete aggregates and different kind of gravel for filling etc.

The main source of material which Litlahorn supplies is the Stokksnes beach mine, which is a 10 km long, 2 km wide sand and gravel rib in the east coast of the Hornafjörður inlet. The rib consists of material which has been carried by the glacier river Hornafjarðarfljót from the Vatnajökull glacier into the sea, where the harshe east coast sea wafes has tumbled the material for thousands of years and brought it to shore on the rib. The mine ios therfore totally enviromental friendlæy, since the river and the sea refills thousands ands millions of tons of material into the mine.

This report tells the story of the mine followed by a describtion of each product, which is delivered from the mine to different industries.

SELLING SAND TO SAHARA – A SUCCESS STORY OF USE OF LITLAHORN‘S AGGREGATES

Selling sand to Sahara or coffie to Brazil has often been used as an example of exceptional selling abilities – beyond all limits. For those who know Omar Antonsson and Kristin Gisladottir in Horn, Hornafjordur, this sounds like a typical day in their life. This is excactly what they are doing today in a cronicle – they are exporting sand to the Arizona desert with great success.

On their property, Horn in Hornafjordur, there is a natural resort of stone and sand aggregates in great quantums. This material, which has been tumbling for thousands of centuries by the sea after it came out of Europes biggest claciers as wellformed clasier rocks in different sizes, is unique for it‘s strenght and smoothness, and has ben used for decades as a concrete aggregate in different construction projects in the area.

The photo shows the inlet in Hornafjordur and the Stokksnes beach area in the back.

The material has been used with good results for strong and longlasting construction projects such as the US nawy radio station in Stokksnes which has lasted for ower 50 years in the harsh natural environment, roads bridges and tunnels in East-Iceland and the new aluminium smelter of ALCOA in Reydarfjordur.

During the projecting of the new road tunnel in Almannaskarð in Hornafjordur, where the concrete aggregate was mined and screened at the resort in Horn, the process plant and the mine hit the interest of an Arizona mining engineer who was trawelling in Iceland in search of a black aggregate to use for the production in his company down in Arizona. His research of natural stone resources around the world had indicated that in Iceland he might find resources of blak pearl aggregsate. But finding the material was

only ythe first chapter; he needed to find out how to transport it from the mine through Icelandic transport channels ower the sea and then across the continent of USA to Arizona. The mine in Horn and Stokksnes could be a good point, since the harbour of Hornafjordur was not far away and from there it would be possible to transport the material to USA, either through Reykjavik or direct to USA.

After a meeting with Omar Antonsson, farmer and contractor at Horn, which at this moment was selling aggregates for the road tunnel of Almannaskarð, and after a site visit at the mine, the US company decided to work further on this project and see if the mining, screening and transporting would make economic sense to both supplier and reciever of the material.

Pictures from the mining in Stokksnes.

After research of the material and processes the american company decidet to purchase a test shipment of the material and proposed also a prognosis of future requirements. The potential demand of the material showed Omar that it would be necessary to develop a lean logistics solution to bring the material to USA. Trucking it to Reykjavik for containerizing or even trucking it to Hofn, Hornafjordur, which is a 30 km roundtrip, would be a costly process for the quantums in sight. Therefore, and also because of other recuirements for the material, such as for the ALCOA project in East Iceland, encouraged Omar to establish a quay faciliti directly at the mining area of Stokksnes, which allowed him to take in 3-4000 tons vessels to transport the material in bulk directly from the mine to an appropriate port in USA for transshipment into Arizona.

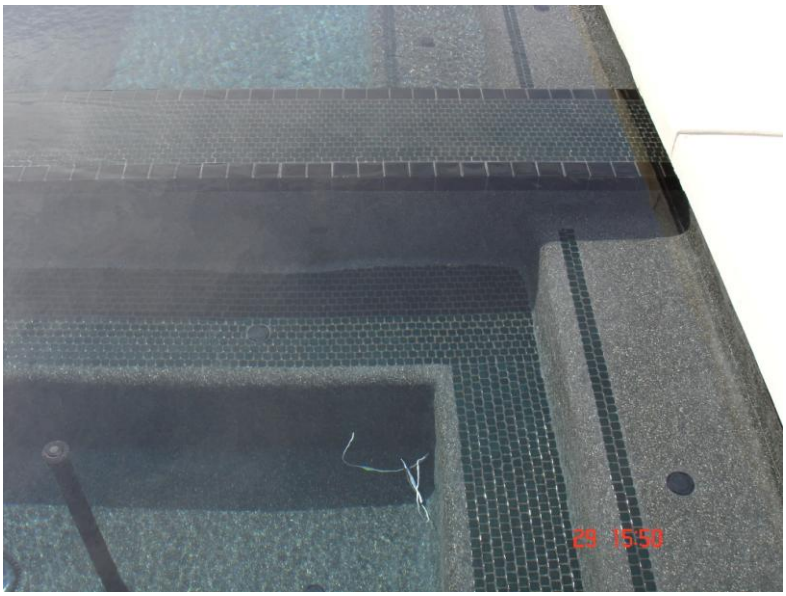
The photo shows the harbour project at Stokksnes

The harbour facility was the first private initiated port facility for decades in Iceland, and the installation of it was made in good co-operation with local autoroties, Icelandic harbor administration and the consultants of VSH consulting engineers.

The Arizona desert is big and with great amount of sands even if it is not as big as Sahara. In Arizona and other southerns states of USA it is quite common to have private pools in the garden to cool down in the heat of the

sun. These swimmingpools are increasingly beeing covered by the natural black pearl stones og Omar‘s mine, which is a great adition to the American pool aggregate company‘s sortiment of aggregates used to cover swimmingpools.

The American pool finish company has through the decades developed methodes to use pearl sand of differenct sources, colours and sizes to surface pools and jacuzzys inside. The material is blended in a special cement recipie and spread ower the inside surface of a concreted pool. The afterprocess is unique and makes it posible to clean avay the cement so that the stones make the final surface. The stone surface is both smooth, good looking and wery longlasting, since it is almost impossible to wash away so strong aggregates, which have been washed and tumled by the sea for huandreds of centuries or more. This material is amongst the most popular methods to cover pools and jaccuzzies.



Luxury pool covered by Stokksnes pearl aggregate.

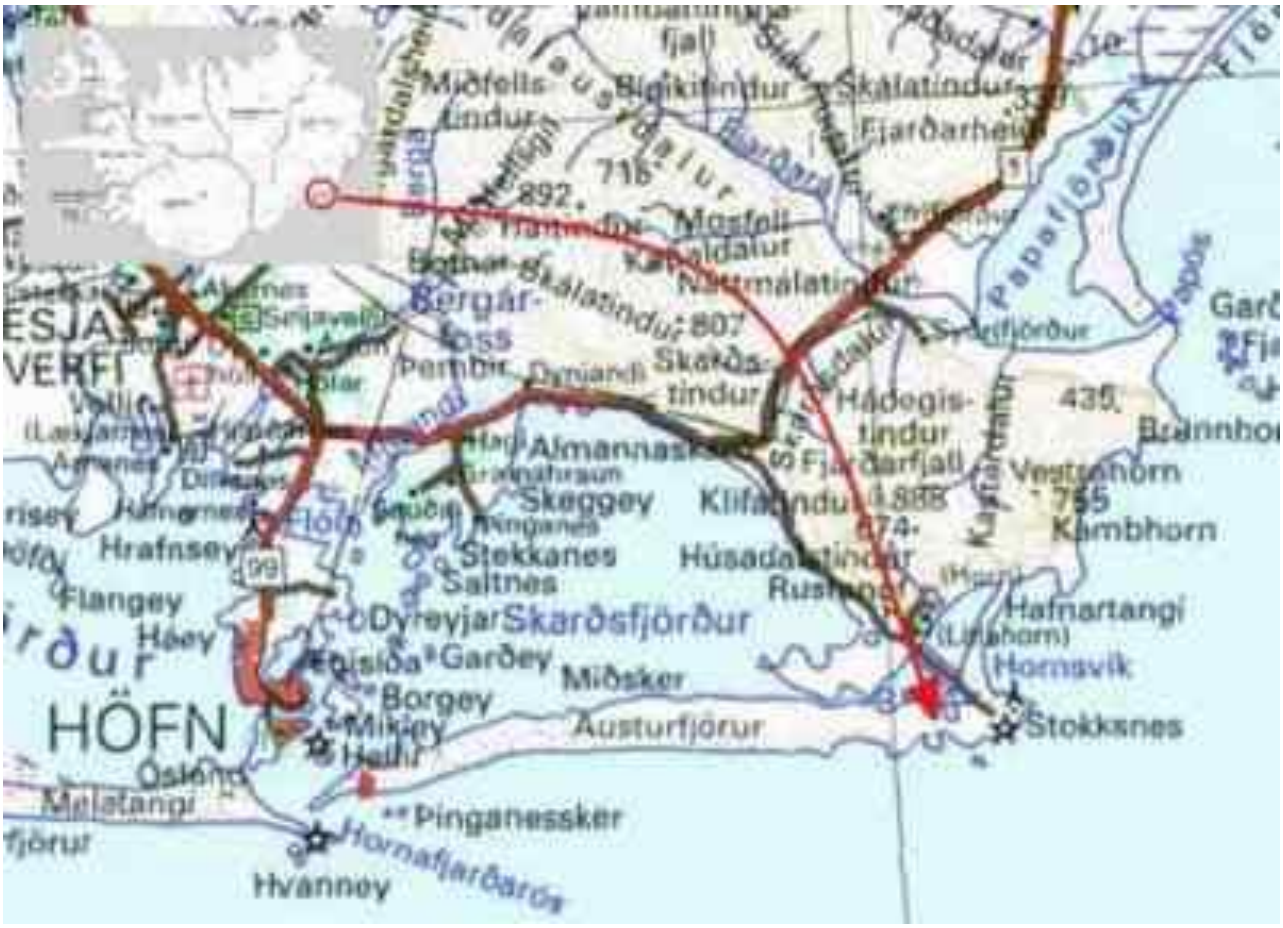
Ómar and Kristín have already sold thousands of tons of their material to Arizona in several shiploads. Litlahorn has made a long termal contract which ensures them a yearly production of thousands of tons.

Omar and Kristin are planning to develop other products out of their outstanding natural aggregates. They are now ready to deliver aggregates from their mines for flooring, concreting, surfacing buildings, road construction, and gardening/landscaping. Imagination is the only limit, that is what this couple has learned of this interesting co-oporation with the American company, which seemed in the beginning like an unrealistic dream but is today a dayly reality. Now they are „extending“ the market area from covering Southhern states of USA, extending into the Icelanding housing and landscaping market, and looking into Eoropean opportunities for supplying their aggregates.

LOCATION OF THE STOKKSNES MINE

Litlahorn ehf. offers aggregate from the Stokksnes quarry located on the east coast of Iceland. The source is from the peninsula Austurfjörur, formed by sedimentations of aggregates of marine origin.

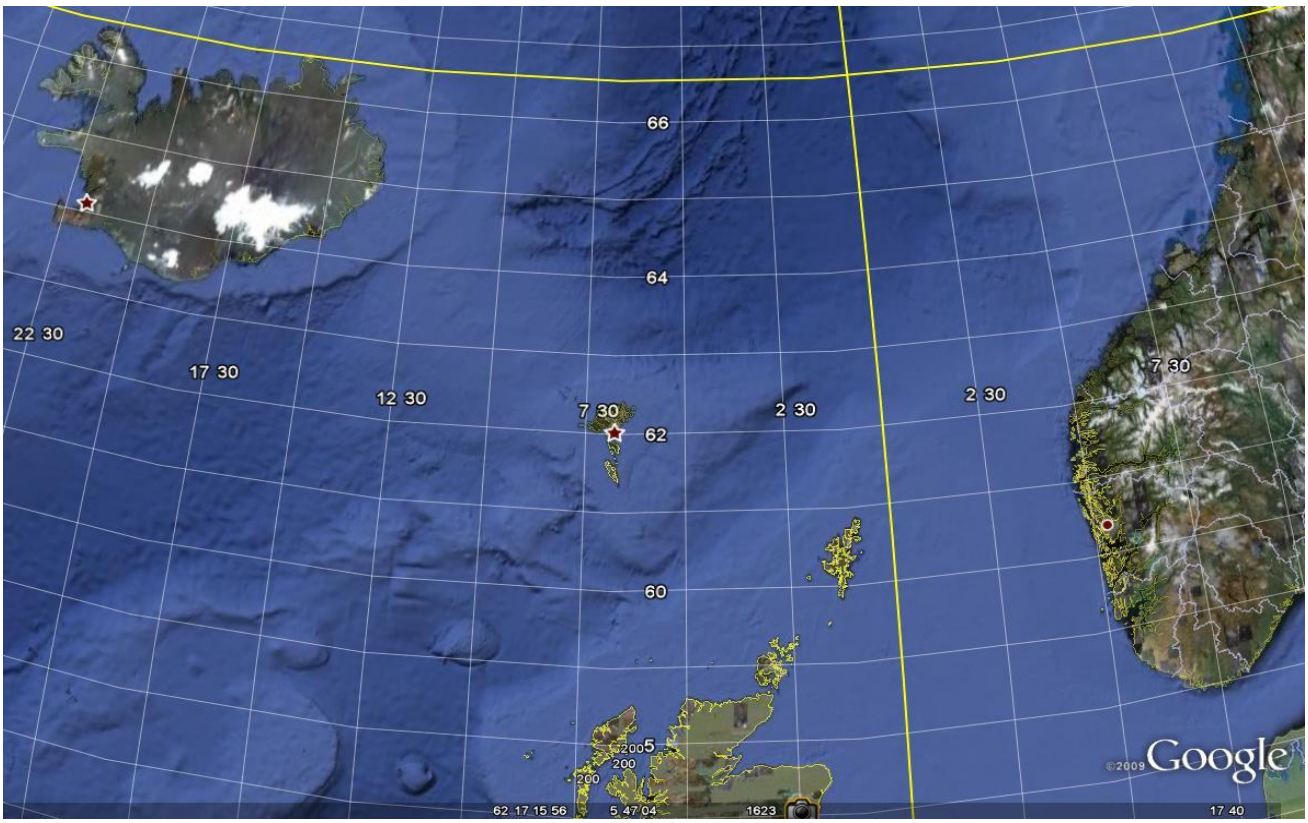
The aggregates from Stokksnes are suitable for a wide range of applications including concrete, asphalt and drainage systems as well as for decorative purposes.



Location of the Stokksnes quarry at the southeast coast of Iceland.

Even if the quarry in Stokksnes has been in use for decades, the economy of exporting aggregates has increased rapidly the past years, first in year 2007 when the new quey facility was built and then the currency rate developing of the Icelandic Krona has made Icelandic exports much more competitive than before.

Höfn is one of the closest ports of Iceland to Europe and quite close to The Faroe Islands. The sailing distance from Höfn to the Faroe Islands is only around 250 Nautical miles which is shorter distance than Norway, where the imported aggregates comes from now. So if the balance in the trade can be acheived between East coast Iceland and Faroe Islands, it should be efficient to move Stokksnes Aggregates to the Faroe Islands on a stable basis.



Map of the North atlantic showing the short distance from Hofn to The Faroe Islands.

The quay facility in Stokksnes is situated just in the inner side of the Hornafjordur inlet and should be able to service vessels of the sise 100 m LOA and 6 m depth or around 4.000 metric tons of load. Since the quay was established in 2007 there have been several shiploads of aggregates shipped out of the quarry, amongst those 6 ful vessel loads of the 1/4 screened swimming pool aggregates which has been shipped directly to the Mexican Gulf and distributed into US sites for further processing.

DESCRIBTION OF THE AGGREGATES

As described before, the Stokksnes mine is a beach rib mine in the east part of the Hornafjörður inlet. The main source of the minerals in the mine are from the Clacier Vatnajökull, which is Eorope‘s biggest glacier, and carried by the Hornafjordur flood river to the inlet where the sea has tumbled the stones and screened it in thousands of years.

The nature of the mine is such that it is wery flexible for choosing product mix based on the areas in the mine that are sourced, deep and distance from the beach. Therefore, it is possible and economic to excavate different places for different aggregstes, stockpile close to the port and mix them together afterwards according top the demand of each customer.

The production of some aggregates gives also sideproducts, i.e. fine and core aggregate while producing 1/4 swimmingpool aggregate.

Dense Basalt is the major mineral ingridient in the aggregate, upto 80%. Other minerals like Gabbro, Granofyr and Diabas are also dense, so above 90% of the minerals are similar in density. Liparit, +/- 10% is less dense mineral.

The basalt stones are wery hard and densive, and tumbled so it looks almost like glass stones. The density and smoothness of the stones makes it good for concrete mix, especially where the demand is for high smothness with low vater percentance in the mixed concrete. This has showed to be excellent in road tunnel projects both for the shotcrete and for tunnel entry shells where it is difficult to vibrate the mixed concrete in the shell form.

The Stokksnes aggregate is wery strong and has shown to be amongst the strongest aggregates in Icelandic mines according to sthrength tests such as LA test, where the Stokksnes aggregate has the LA factor 10,9 as amongst the strongest Icelandic aggregate measured.

The aggregates from the Stokksnes mine are dividet into the following basic product groups:

- Perlumöl G1, 6/16 GC 90/15. 6/16 pearl aggregate, used for concrete mix
- Perlumöl G2, 4/10 GC 85/20. 4/10 pearl aggregate, used for concrete tile mix
- Perlumöl G3, 2/5 GC 85/20. 2/5 pearl aggregate, used for outdoor cladding
- Perlumöl G4, 4/6 GC 85/20. 4/6 pearl aggregate, used for stone floors
- Perlumöl G5, 1/4 GC 85/20. 1/4 pearl aggregate, used for swimming pool cladding
- Perlusandur B1, 0/8 GA 90. 0/8 pearl sand aggregate, used for concrete mix
- Perlumöl B2, 0/11 GA 90. 0/11 pearl aggregate, used for concrete mix

Each type of aggregate is described further below.

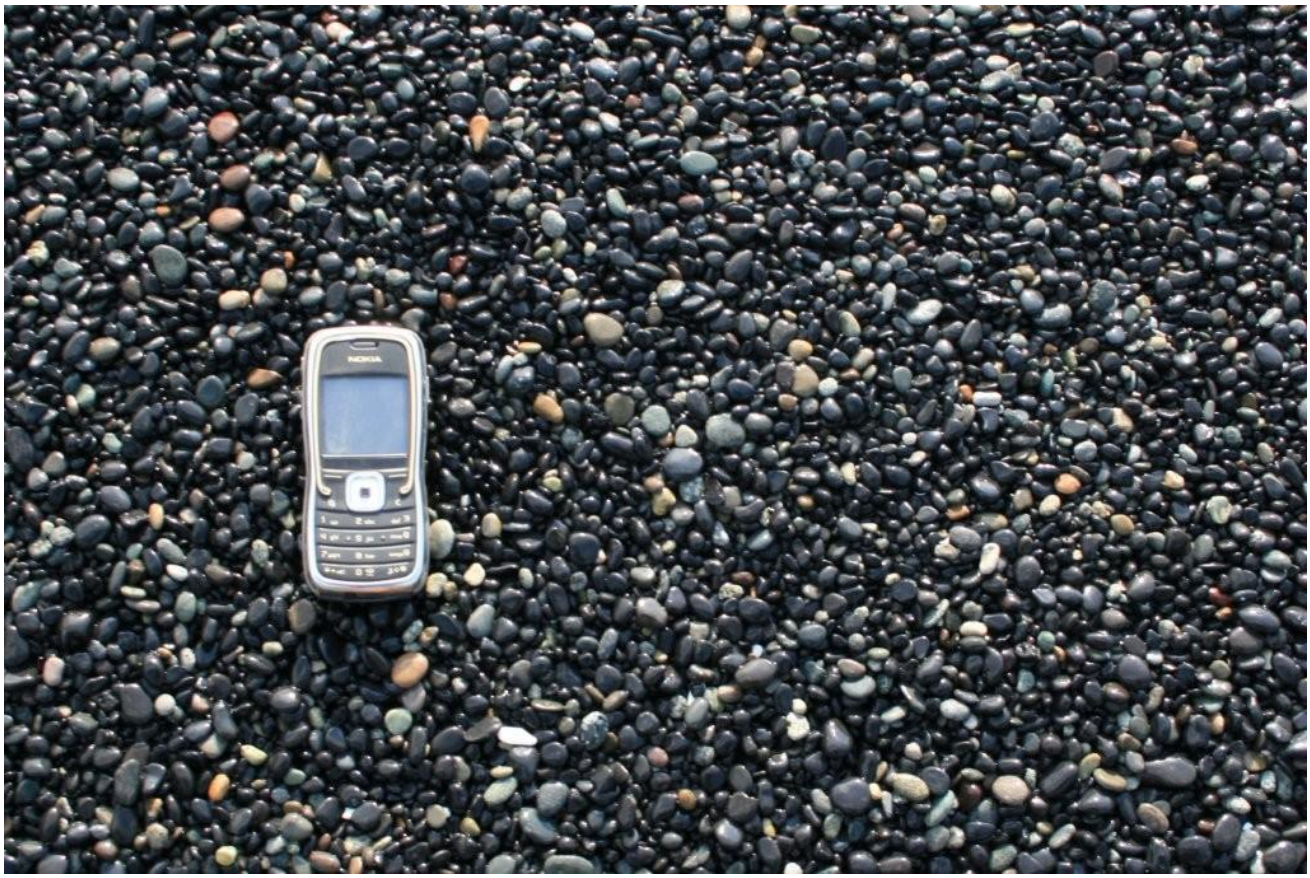
PERLUMÖL G1, 6/16 – CONCRETE AGGREGATE

Main characteristics (see also test results page 40 in test report):

- NaCl (EN 1744-1) : 0,003%
- Water content (EN 1097-5) : 1,1%
- Practical density (EN 1097-6) : 2,86 Mg/m3
- Water absorbtion (EN 1097-6) : 1,17
- Minerals (EN 932-3) : 1st. Quality 61%
- Minerals (EN 932-3) : 2nd. Quality 38%
- Minerals (EN 932-3) : 3rd. Quality 2%
- Shape (Flakiness Index, EN-933-3) : 16,8
- Strength LA (EN 1097-2) : 10,9
- Frost resistance (EN 1367-6) : 0,2

The concrete aggregate from Stokksnes is wery smooth and strong and therfore good for demanding concrete projects, such as road tunnels, bridges etc, where allowed water in the concrete mix is limited and need for smooth concrete mix and strong concrete.

PERLUMÖL G2, 4/10 – CONCRETE TILE AGGREGATE



Main characteristics (see also test results page 51 in test report):

- NaCl (EN 1744-1) : 0,001%
- Water content (EN 1097-5) : 2,1%
- Practical density (EN 1097-6) : 2,84 Mg/m3
- Water absorbtion (EN 1097-6) : 1,33
- Minerals (EN 932-3) : 1st. Quality 71%
- Minerals (EN 932-3) : 2nd. Quality 26%
- Minerals (EN 932-3) : 3rd. Quality 4%

The concrete tile aggregate from Stokksnes is wery smooth and strong and therfore good for tile concreting, where the concrete mix is relatively dry. Smooth concrete mix and strong tiles. The surface can be an issue here, too, so the wide variety of colors in the stones will be an additional feature.

PERLUMÖL G3, 2/5 – WALL CLADDING AGGREGATE

Main characteristics (see also test results page 12 in test report):

- NaCl (EN 1744-1) : 0,000%
- Practical density (EN 1097-6) : 2,80 Mg/m3
- Water absorbtion (EN 1097-6) : 1,62
- Minerals (EN 932-3) : 1st. Quality 70%
- Minerals (EN 932-3) : 2nd. Quality 26%
- Minerals (EN 932-3) : 3rd. Quality 4%

This aggregate is basically marketed by the colourful surface it gives in external wall claddings (steining), but water and frost resistance counts too in this application of the material.

PERLUMÖL G4, 4/6 – FLOORING AGGREGATE

Main characteristics (see also test results page 19 in test report):

- NaCl (EN 1744-1) : 0,000%
- Practical density (EN 1097-6) : 2,84 Mg/m3
- Water absorbtion (EN 1097-6) : 1,45
- Minerals (EN 932-3) : 1st. Quality 76%
- Minerals (EN 932-3) : 2nd. Quality 21%
- Minerals (EN 932-3) : 3rd. Quality 3%

This aggregate is beeing wery popular in the flooring industry in Iceland, especially in inddoor shopping and office epoxy-mix flooring. Again, it is basically marketed by the colourful surface it gives, which is exposed wery well in the epoxy-solution.

The material has also been used in specialised flooring solutions, such as epoxy-terrazzo and also outdoor in poly-ethylene based floor surfaces.

This aggregate and especially larger stones (i.e.4/8) can also be wery useful in landscaping and is wery good as playground gravel due to the smootrhness of the stones, which works wery well as shock-resistance.

PERLUMÖL G5, 1/4 – SWIMMING POOL AGGREGATE

Main characteristics (see also test results page 32 in test report):

- NaCl (EN 1744-1) : 0,001%
- Hummus (EN 1744-1) : 0 Slamm : 0%
- Practical density (EN 1097-6) : 2,84 Mg/m3
- Water absorbtion (EN 1097-6) : 1,57
- Minerals (EN 932-3) : 1st. Quality 71%
- Minerals (EN 932-3) : 2nd. Quality 21%
- Minerals (EN 932-3) : 3rd. Quality 8%

This aggregate has been exported in thouasnds of tons to USA in co-operation with a leading international pool surface aggregate company. The pool surfaces are built by cement-mix coat, where the cement is washed out of the surface, which makes it smood and clean, but also wery resistant to all kind of corrosion which is a big issue in swimming pool surfaces. The Stokksnes material is regarded to be amongst the best quality of all pool surface pebbles that are on the market, and the colorful surface it gives is getting wery popular, both as a stand-alone and also mixed with other colors of stone.

STEYPUSANDUR B1, 0/8 – CONCRETE SAND AGGREGATE

Main characteristics (see also test results page 56 in test report):

- NaCl (EN 1744-1) : 0,001%
- Water content (EN 1097-5) : 4,6%
- Practical density (EN 1097-6) : 2,74-2,82 Mg/m3
- Water absorbtion (EN 1097-6) : 1,7-1,78
- Minerals (EN 932-3) : 1st. Quality 60%
- Minerals (EN 932-3) : 2nd. Quality 38%
- Minerals (EN 932-3) : 3rd. Quality 2%

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STEYPUEFNI B2, 0/11 – CONCRETE AGGREGATE

Main characteristics (see also test results page 27 in test report):

- NaCl (EN 1744-1) : 0,001%
- Hummus (EN 1744-1) : 0 Slamm 0%
- Practical density (EN 1097-6) : 2,84 Mg/m3
- Water absorbtion (EN 1097-6) : 1,57
- Minerals (EN 932-3) : 1st. Quality 71%
- Minerals (EN 932-3) : 2nd. Quality 21%
- Minerals (EN 932-3) : 3rd. Quality 8%