

Development and Planning of a Quarry Location with Initial Mine Development and High-quality Chipping Plant in the Ukraine

by Prof. Dr.-Ing. Dipl.-Wirt.-Ing. Martin Kirschbaum
KIPROCON Dr. Kirschbaum Project-Consulting
Zeitz | Germany

During the past years companies have increasingly been investing in East Europe, in order to benefit from the chances of markets with increased demand. In addition to existing operations, greenfield projects are also increasingly being developed. A multitude of questions and investigations, which exceed the extent of investigations in-country projects, have to be answered in the decision and planning phase. Usually the opening up of East-European countries is joined with a legal and social structural change, so that in parts the legal security, market knowledge and binding public plannings are missing.

In the current document some aspects of this set of problems is discussed at the example of development and planning of a quarry location with initial mine development and high quality chipping plant in the Ukraine.

Initial Situation and Procedure

Due to the changes in the political system, as well with regard to the planned renewals and expansions of the entire infrastructure in the Ukraine and the bordering states, there is a high demand for construction material, particularly for rubble, chippings and sands. Despite the consequences of the international financial crisis, which led to a transient break-in of the construction sector, a medium to long-term increased demand is expected, due to the regional-geological circumstances, a high basic demand and a multitude of infrastructural projects (e.g. European Football Championship, 2010, Olympic Winter games 2014 in Sochi, highways, railroad networks).

In the public sector various investment programmes are under way, particularly under the aspect of industrial core areas and due to the transit character of the Ukraine. These projects are partly funded by international finance institutions like the EBRD and the World Bank. Commissioned by a German investor group that is planning

to use the chances arising from the above-mentioned situation, a suitable location for production of construction material with a granite deposit near Korosten, Zhytomyr region of the Ukraine was developed, as per picture 1. In particular, a high-performance open cast mining and processing operation, along with the required infrastructure has been planned. The various possible options of project development and marketing, based on local conditions are discussed in the current document. ►



Pic. 1:
General map showing the position of the location to be developed

Basics of Market Review and Required Range of Products

The products of the quarry operations are either used directly or as aggregates for concrete and asphalt in civil engineering above ground (e.g. buildings, bridges), below ground (e.g. roads), track construction (e.g. roadbed, slab tracks), hydraulic construction (e.g. shoreline stabilization) and other construction areas (e.g. filler, fertilizer). They are subject to extensive quality control with fundamental aptitude testing and a multi-level control system of surveillance in in-house laboratories and certified outside institutes. In order to be used in the public sector, an authorization of the respective regional government authority is necessary. Apart from locally used grain sizes, rock-specific characteristics like for example hardness, polished stone value and frost resistance are of vital importance. Natural stone products are bulk goods with high freight costs, the distribution range of which is limited by the means of transport and the competitive environment. Particularly in the Ukraine and in Russia, raw materials are transported for up to 1,000 km, depending on the available deposits and the regional geology. The need for raw material is, among others, dependant on the population, the transport infrastructure (new construction, maintenance, development tendencies), the public spending behaviour, and further financing forms (e.g. PPP projects). In the cross-border transport, different country-specific standards and classifications of grain fractions might have to be considered.

Country-specific product groups that are being manufactured are:

for Poland

- *Gryz (Chippings): 2/5 mm, 5/8 mm, 8/11 mm, 11/16 mm, 2/8 mm, 8/16 mm, 16/25 mm*
- *Tluczen (Rubble): 31,5/63 mm*
- *Miezcenka (Mixed): 0/31,4 mm, 0/45 mm, 0/63 mm*
- *Amourstone: 80/150 mm, 150/450 mm*
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for Ukraine und Russia

- *Sand 0/5 mm*
- *Chippings 5/10 mm, 5/20 mm, 20/40 mm, 40 – 70 mm*
- *others*

It is for this reason that the materials preparation technology needs to be set according to target markets.

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Since the geological distribution of suitable deposits for the production of rubble and chippings is mainly limited to the North and West- Ukraine, the market ranges over the entire Ukraine. The relative closeness of the Zhytomir region to the Kiev metropolitan area, which can also be reached by road, is noteworthy. A basic requirement for the needed logistics for supplying the entire Ukraine and exporting to Poland and Russia is usage of railroad.

In addition to the Kiev metropolitan area, there are also a number of regional metropolises in the surroundings of the location to be examined (see location map in the annex), which leads to sustainable market potential.

The Polish market offers interesting medium and long-term potential for the construction and aggregate industry, and particularly Eastern Poland and the Warsaw region are increasingly being supplied with imports from the Ukraine.

The West and South Russian market is also traditionally being covered by the Ukraine. Here a complementing market potential exists, since in the Russian Federation the logistics is also mainly based on railways.

The market prices for rubble, chippings and sands at the above-mentioned places of usage are currently at 95 UAH in Kiev (price of 1 Ukrainian Griwna UAH = 0,0933 €, this means approximately 8,86 €/t) and in the surroundings it lies at 90 UAH. In order to assess the location, it is therefore necessary to determine the price ex works, i.e. the market price minus the transport and handling costs to the location of use. A basic corporate concept to enter the market needs to be developed from these outline data.

Selected Criteria for the Examination and Information Requirements at the Location and for the Deposit

Apart from the legislative regulations, the actual features and characteristics, as well as the state (quality) of the location factors are decisive. The location factors include the geo-genic prevailing deposit, particularly the direct environment with spatial planning and actual specific land-use, the local supply and transport infrastructure, as well as the qualitative and quantitative labor potential and offer. Each location planning must carefully be prepared and examined, in order to achieve highest possible safety in planning, operation and investment. The general requirements to be investigated are outlined in the following chapter:



The location near the small town of Korosten has the following characteristics, which need to be taken into consideration in planning:

- **Locality:** The location lies in the West Ukraine in Oblast Zhytomir, near the small town of Korosten, approximately 180 km west of Kiev.
- **Local public infrastructure/transport infrastructure:** The site lies in the outskirts area and has a connection to paved local roads and the nationwide long-distance transport road network. There is a railway loading possibility in the radius of 3 km.
- **Planning law:** This is a mining area with Ukrainian mining law. A so-called pre-license for geological exploration is necessary for the exploration, and for the consequent mining a main license, corresponding to an authorization, is needed.
- **Topographic shape:** The area is a typical plain landscape.
- **Utilization:** The site currently encompasses approximately 140 ha and has partly been used as factory area, quarry and embark point. The operation was stopped after the breakdown of the Soviet Union in 1991/1993, since no employer took responsibility and the staff was not paid, which is typical for the country. The newly cast mine which is to be developed with infrastructure and processing plans will be opened approximately 2 km from the factory area on "green fields". These areas are currently being used for forestry and agriculture.
- **Environment and Brownfields:** Following local inspection, no suspicious areas were detected. The future open cast mine area has a sandy base, which has been used as driving school drill ground for chain vehicles. Based on additional local investigations, ammunition or other contaminations are not to be expected. Following the researches, no environmental risks, archaeological sites or nature protection areas. The nearest Immission location (built-over areas) are in a distance of approximately 2,000 m. This is a considerable distance, since the required minimum distance in the Ukraine is 500 m from the designated village area.
- **Land/properties:** The land is owned by the state and is leased for 49 years, as it is mostly the case in the Ukraine. An expansion of the areas is easily possible. A purchase option should be negotiated for the case of privatization.
- **Deposit:** The deposit consists of granite, which is a utility. A geological exploration with a sufficient number of core drillings has been recently conducted on a partial area of 44 ha. Representative samples were also examined by a certified institute in Germany. According to local and EU-standards, the rocks can be used in building construction, civil engineering, track and road construction. The proven mineable deposits in this partial area are a minimum of 61.900.000 t, with an overburden of 2.045.000 m³. This results

in favorable overburden conditions, in case of a mining of 1,5 Mio t/a a lifetime of 41 years. The possibility of expanding the area and depth is also given.

- **Quarry type:** The mine development form to be considered is a typical "Kesselbruch"(counterbore field) (, i.e. mining in depth. The relation of overburden to exploitable mineral is a minimum of 1:30, 5 and is economically very cost-effective. Based on hydro geological explorations and local researches, there is not danger of unplanned water inflow, groundwater or flooding.
- **Special features:** In case of appropriate mining process selection, no atypical or special risks are expected from the technical and economical point of view.
- **Suitability of material:** Following appropriate processing, the existing rocks are unrestrictedly suitable for the production of mineral mixes, simple chippings for asphalt and concrete according to EU standards (export to Poland). According to valid Ukrainian norms the material is suitable for all construction and application areas.

Requirement profile for Planning the Location and Plant

Apart from a suitable deposit, the basis of the construction material production is an open cast mine (quarry), a downstream processing plant, as well as the required supply and transport infrastructure.

As a basis for the local planning of location, the required and targeted production capacity was set with special consideration of the following points.

- **Sustainability and Fluctuations in the Demand of the Target Markets:** The sustainable and long-term demand of the planned target markets can be subject to extreme fluctuations, particularly in the observed regions with accumulated needs. This is due to the fact that the market is first overheated and available production capacities are too little or too old. Following a distinct boom phase, which often leads to increase in capacity, usually a stable market slump occurs, which leads to considerable amount and price collapses. An example is the situation of the past 20 years in East Germany.
- **Demand for Products and Product Ranges with Different Standards:** As outlined above, the planned location in the Ukraine will supply not only the in-country market, but also the Russian and Polish market, which considerably differ in standard grainings and construction methods.

- **Layout an Operation Time:** *Based on the regional climatic conditions with distinct periods of frost, mud and heat, the available production time during the year is limited to 200 days, not considering Saturdays and Sundays. Currently there are no unfavorable legislations, like for example prohibition of work during Saturdays, Sundays or during the night, so that there are reserve times for production or maintenance and repair. A load factor of the production systems of 0.85 (3 shift 0,75) was taken into consideration, in order to capture unproductive downtimes and turn-on and off times. Based on the target production and the shift models, a considerable span results from required hourly outputs for the plant layout, or from the possible production amount per hour at given capacity results.*
- **Investment Budget and Strategy:** *The costs for investment significantly rise with the factors hourly capacity, availability and endurance strength of the technical equipment, as well as the construction types, which are mobile, semi-mobile or stationary. It was taken into consideration that jumps in dimension and size of the applied machine technique and systems do not cause unfavorable jump-fixed costs and unnecessary operational additional expenses (e.g. wear, energy, oil amounts).*

Since the regions to be supplied show considerable boom characteristics, possible fluctuations of the demand or basic changes in foreseeable future have been included. Therefore the basic principle of optimal timely utilization and adaptation was strictly applied in planning. Hereby the mechanical engineering and organization was dimensioned in a way that the desired yearly tonnage can be produced in a 2 shift operation at optimum intensity. Fluctuations can be absorbed by adapting the time load, e.g. in a 1 shift or 3 shift operation.

Already in the planning phase, the operation of the location was conceptually designed in an optimal and cost-minimized way through general goals and requirements, which are defined in the following:

- *Optimization and equalization of the production rate and range*
- *Optimization of the daily and seasonal time utilization ratio of the plant*
- *High quality and extensive refining of products*
- *High machine availability through, among others, optimization of maintenance and repair*
- *Optimization of direction of mine development and utilization of deposits*
- *Improvement of the environmental situation*
- *Good logistics, loading and stock-pile managing*
- *Sustainable safeguarding of economic results, in connection with low production costs*

The goals are basically realized through the following organizational measures:

- **Open cast mine:** *Optimizing the direction of mine development, development of deepest bench, introduction of several prepared pits for quality control, optimum handling of overburden and road construction*
- **Processing:** *Optimization, objectification and equalization of the entire sequence and production control, automation and optimization of capacity utilization of key equipment, introduction of a process automation system, avoiding design flaws*
- **Quality control:** *Optimization of quality control systems, active control in open cast mining and processing plants, reducing reaction times in disturbances, appropriate documentation in the plant and on the construction site*
- **Maintenance:** *Introduction of a preventive maintenance and repair system, design changes in flaws, optimization of warehousing, continuous examination and, if necessary, improvement of quality, methods and cost structure in the spare-part and supply sector, reduction of reaction and implementation times in procedural and machine disturbances*
- **Controlling:** *Suitable and sensitive reporting, benchmarking, introduction of fully developed control systems*
- **Organisation:** *Relocation of production- and maintenance times, production in day shifts 1, 1.5 or 2 and scheduled maintenance with a small team in the 2nd shift or night shift reduce unproductive times (overlaps in breaks, optimization of changes in shifts, start-up and shut-down of technical equipment, etc.), reduction of winter repair times*
- **Personnel:** *Working with permanent staff, including administration and management, training and qualifying of personnel*
- **Leadership:** *Creation of an effective organization and leadership structure with exact definition of responsibilities, areas of responsibilities and assignments*

From the technical point of view the used machines and plants were designed based on the following requirements:

- *Dimensioning and endurance strength are chosen appropriately, since they significantly determine the factors performance characteristics (power reserves), economical service life, as well as the residual value of the equipment.*
- *Standardized and typecasts components, as well as a modular design with easy accessibility of the components achieves ease of maintenance and repair.*

- A high operational availability is achieved through optimizing the internal factors of production organization, minimizing the needed set-up and unproductive times (e.g. for relocation or blasting), as well as constructive factors like for example long maintenance intervals with short maintenance times.

Furthermore external cost –determining factors like e.g. short-term availability of spare parts and mechanics, as well as the possible need for special tools (e.g. hydraulic presses, motor testers, etc.) are considered in the calls for bids.

- Optimum consumption data of the machines, the secured possibility of using low-cost raw material, additives and lubricants, as well as energy carriers, the usage of standardized and universally available spare and wear parts are considered as main aspects for an economical operation.
- User-friendly diagnosis and control systems, as well as an appropriate automation serve as data basis and instruments for exact control, invoicing and target/performance comparison.
- The intersections between partial systems are designed in a way that the different operating characteristics (e.g. continuous and discontinuous), capacities, as well as amounts or sizes of material streams do not lead to disturbances in parts or in the entire system. Appropriately dimensioned buffer units were applied for decoupling in case of very different characteristics.

Planning Data and Steps

The conducted market analyses and evaluations of economic efficiency were discussed intensely with investors and translated into a corporate investment concept. The aspired market volume is 1.500.000 t/year in the target regions Ukraine, East Poland, West Russia. The planned amount is to be produced in two shifts, so that timely adjustments can be made to react to additional or lower demand. Considering the local climate data, it is expected that without weekend works, there are 200 assured production days. The basic technical parameters are summarized in the following picture.

The implementation of the observations with regard to planning, which have been discussed for far, as well as the outlined criteria with regard to the need of investigations and requirement criteria calls for a multitude of steps. The basic tasks and steps are made clear in picture 3.

Selected Aspects of the Conducted Open Cast Mine Planning

In the following chapter, selected aspects of the open cast mine planning, which have formed the basis of the required specific call for bids for the purchase of equipment, services and plants, are discussed.

Selection of Mine Development and the Initial Mine

The deliberations on planning, which are partly presented here, are based on the location, as well as the geometry of the licensed authorized field. Picture 4 shows the boundary lines, position of the exploratory drillings, as well as the distribution of the iso-lines of overburden. The top ground surface lies at a level between 170 m and 182 sea level. The maximum mining depth is currently limited by approvals to the level > 86 m above sea level. Therefore under an overburden thickness of 3 to 12 m, there is a minimum of 84 m of mineable rocks. According to Ukrainian regulations, the maximum bench distance cannot exceed 14 m.

Active Benches have to be planned at 75° to 80° and end-benches at 55°. Taking into consideration these basic parameters an exploitation over several benches is planned, where 6 benches are for exploitation of raw material and one bench is for overburden.

The location of the processing plant, as well as the required stocks is placed at the south-western border, outside the authorized field, since it has the shortest distance to the road, 200m. Furthermore the authorized field tapers out in the western part, with overburden thickness of more than 9 m. The initial mine is located in the area of drilling 2, with a low overburden. In order to quickly produce quality muck, the initial mine is planned with two benches, with a bench high of 14 m each. While the first bench might still have weathered material, high quality material can be expected in the 2nd bench.

The first phase of the mining development to approximately 3 ha is implemented with sub-contractors with mobile processing plants, as well as with dumper operation. The incoming waste material is mainly used as filling material and the rocks of the first bench are processed and marketed as aggregates. ►

Pic. 2:
Technical basic parameters of
the location planning

Planungsgrößen/ planning parameters



Aufgabematerial / feed material		Granit
Aufgabekörnung / feed size	mm	0 - 1.000
Produktion Auslegungsgröße / production mass	t/ a	1.500.000
Produktionstage pro Jahr (Mo. - Fr.) / production days per year	d/a	200
Produktionsstunden / Tag (Mo. -Fr.) / production hours per day	h/d	16
Produktionsstunden pro Jahr (effektiv) / production hours per year	h/a	3200
Produktionsmenge pro Tag (effektiv) / production mass per day	t/d	7.500
Produktionmenge pro Stunde (effektiv) / production mass per hour	t/h	469
Verfügbarkeitsfaktor / availability factor	%	85
Maschinenauslegung t/d / h/d / 0,85 / machine feed rate	t/h	550
Anlagenleistung - Primärbrechstufe / plant feed rate primary	t/h	650
Anlagenleistung - Sekundärbrechstufe / plant feed rate secondary	t/h	550 + Kreislauf (circuit)
Anlagenleistung - Feinsplitte / feed rate fine material	t/h	ca. 300
Lagerkapazität pro Einzelkörnung / stock capacity per product (activ)	t	ca. 1000
Vorbrechanlage / primary chrusher		Mobilgerät/ mobil chrusher
Transport VB-Anlage zur Aufbereitung / transport to plant		Bandanlage/ belt conveyor
LKW - Verladung / truck loading	%	10
Bahn - Verladung / train loading	%	90

Project: UKRAINE

1 To Do List	production feed, products sort and mass, quality, type of plant, transportation systems
2 basic steps	step 1: subcontractor with mobil plant, definition of products: mass and quality step 2: layout and design planning of stationary plant with basic data and cost calculation
3 clarification of properties, leases	
4 clarification of available infrastructure	
5 clarification of marketing, distribution and joint venture partners	
6 definition and development of schedule	
<i>step 2: layout and design of new plant</i>	
7 definition of basic data	
8 design and calculation of flow sheet	
9 definition and calculation feed rate plant and machines	
10 design of plant layout	
11 definition of plant location	with consideration to areas for quarry, transportation, stockpiles, storage
12 definition of infrastructure at operational areas	power supply, watermanagement, social building, office building, workshops etc.
13 definition of internal traffic and connection to public area	
14 definition and calculation of train loading	cost and investment analysis, comparison of variants
15 detail planning and construction tender	

Pic. 3:

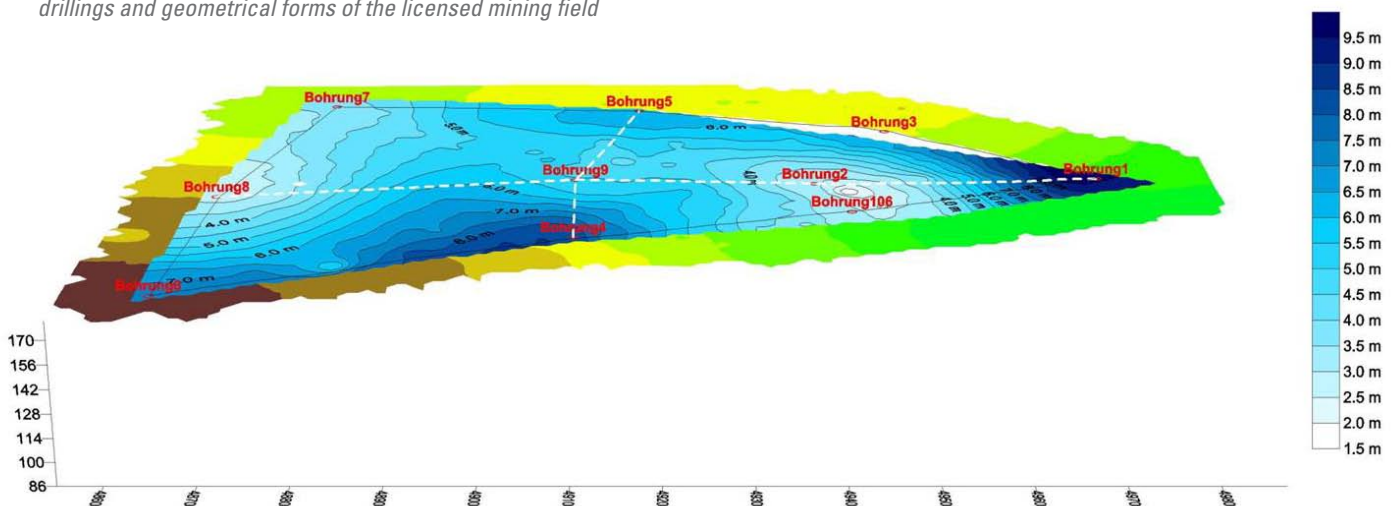
Main planning steps of location development

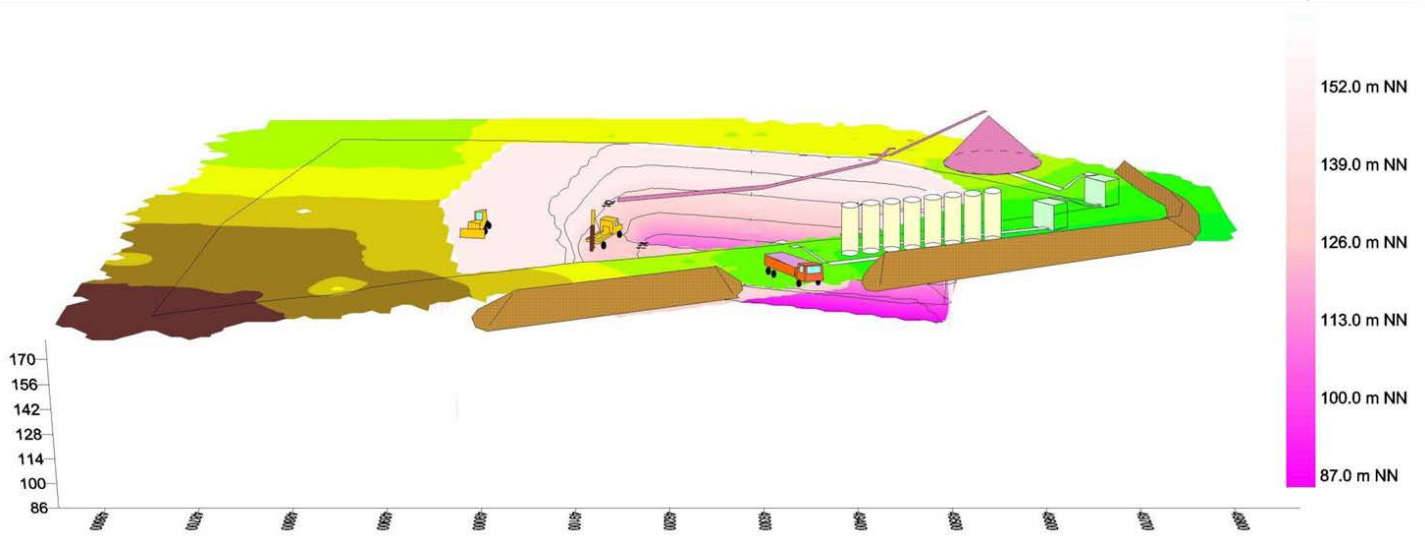
In the second operation phase the normal operation starts on 2 benches with the expansion of the open cast mine in the southern and northern direction, while the main mining direction is to the west. The overburden is then disposed annually to the required extent, and heaped up as anti-noise barrier or transported to an outside dump. Picture 5 visualizes the planning concept of the development phase with choice of location.

Since handling of explosives currently underlies special regulations, the loosening process is done by large-diameter borehole blastings through sub-contractors. In order to minimize intersection problems, the drilling is also subcontracted to the blasting company. The geological conditions and geometrical dimensions of the deposit allow for applying a mobile primary crusher system with downstream belt conveyors. There is no need for special measures of primary screen separation, due to the existing qualities at the primary crusher, but it is foreseen for

Pic. 4:

3D visualization of the overburden thickness, location of the exploratory drillings and geometrical forms of the licensed mining field





Pic. 5:
3 D visualization of basic location and initial mine planning

possible fault zones. The reference point of conveyance for this operation phase is the 2nd extraction bench, i.e. the primary crusher unit is positioned here and is fed with a backhoe. With this system relocations between benches should be minimized, due to the required extra work involved, therefore so-called group extracting method is applied. Hereby the berm width between the 1st and 2nd bench is minimized to 3 to 5 m and the blastings are planned in a way that the main portion of the muck directly falls on the 2nd bench and is loaded there.

The intermediary berm divides the bench in two sections of 14 m each and leads to increased stability. The permanent ramp system with the access road to the open cast mine and conveyor belt will be established in the northern part.

The stockpile with pre-crushed material of 0 mm to 300 mm and approx. 10.000 t active volume is foreseen outside the open cast mine, in order to decouple mining and processing.

System Selection of Mining and Mobile Equipment

Typically the following equipment is needed for an operation with the above-mentioned parameters in the extraction area:

- **Loading equipment:** Dredger, wheel loaders and possibly Loading-crawler are applied in hard rocks. The applied dredgers can be layed out as backhoe or dipper version

and are available on the market as well-engineered systems in all current sizes. Apart from the high breaking off forces with a muck that is interlocked, Here the characteristic is the easy possibility of secondary crushing of boulders through usage of a steel ball. Although mobility is given, it is disadvantageous to often change the locations of application on various benches without transport equipment, since the cruising speed is low and wear at the crawler track is high. Wheel loaders are considerably more mobile and can be installed much quicker to changing loading locations, but they have the disadvantage that the entire machine weight has to be moved in loading. Due to the shovel width high mechanical strains and wear occur in interlocked muck or in case of unevenness of the bench.

In small-sized excavated material the wheel loader has a greater flexibility than the dredger. It is also possible to boulder with balls, but this requires slightly more experience of the machine operator. Loading-crawler are only applied in exceptional cases and will not be discussed further in this article. Basically the equipment sizes have to be dimensioned in a way that the required loading and bouldering performance is achieved and the shovel size is adapted to the transport/supply unit and grain size of muck. In practice 4 to 6 loadings have proven to be optimal. In connection with the planned primary crusher system and the required extraction performance of approximately 650 t/h, a hydraulic dredger with backhoe equipment in the 80 to 100 ton category.

- **Mobile Primary Crusher Unit:** Usually the mobile primary crusher units of the operation are equipped with own crawler-typed undercarriages. There is a multitude of proven system solutions from different manufacturers and

various combinations of screening and crushing aggregates with corresponding adjustment options for the typical site dimensions of the reviewed hard rock ranges. Variability with regard to the required processing techniques is assured. In laminar mining, mobile primary crusher units can flexibly and securely be applied over several benches, up to an entire height of approximately 30 m, in so-called group-mining. The operation mode can be both mobile and quasi stationary. The mobile operation mode is characterized by the fact that the location of the primary crusher and the loading equipment can be changed at any time, whereas in the quasi-stationary operation the location of the unit is only changed in certain intervals. The changes which result from the mining progress are bridged through a wheel loader, mostly in the land and carry operation mode. In the current case a track-mounted primary crusher system with connected lock-link system is chosen.

- **Transport system:** In the present combination, a continuous, i.e. a conveyor belt is most suitable as a transport system. The advantages of a conveyor belt are above all the cost-efficient, continuous transport over long distances with low maintenance costs. Since the material is already pre-crushed and as such the size range of the goods to be transported is determined, the dimensioning can be done with high certainty. Ascending and descending slopes do not pose particular difficulties, and in the main gates level differences due to special configurations are possible, so that costly ramp systems with possible deposit losses can be minimized. In the conveying path two basic areas need to be differentiated. While the main conveying path should remain at the same location for a longer time, suitable and short conveyor roads need to be added. These roads should be mobile in their direct connection and to be changed with little effort. Therefore particular emphasis should be given to a flexible connection of the primary crusher to the continuous conveyor. Corresponding system solutions are offered in the market.
- **Reclaiming:** Special equipment is needed for stockpiling and loading on trucks or trains. In order to do so, wheel loaders that are offered in various sizes are suitable. For the existing location 3 wheel loaders of the 5,5 m³ category with a loading capacity of 400 t/h each are required. 2 of the equipment take care of the reclaiming, as well as stockpiling work of the finished products, if necessary. One device is foreseen as auxiliary device for loading on trains.

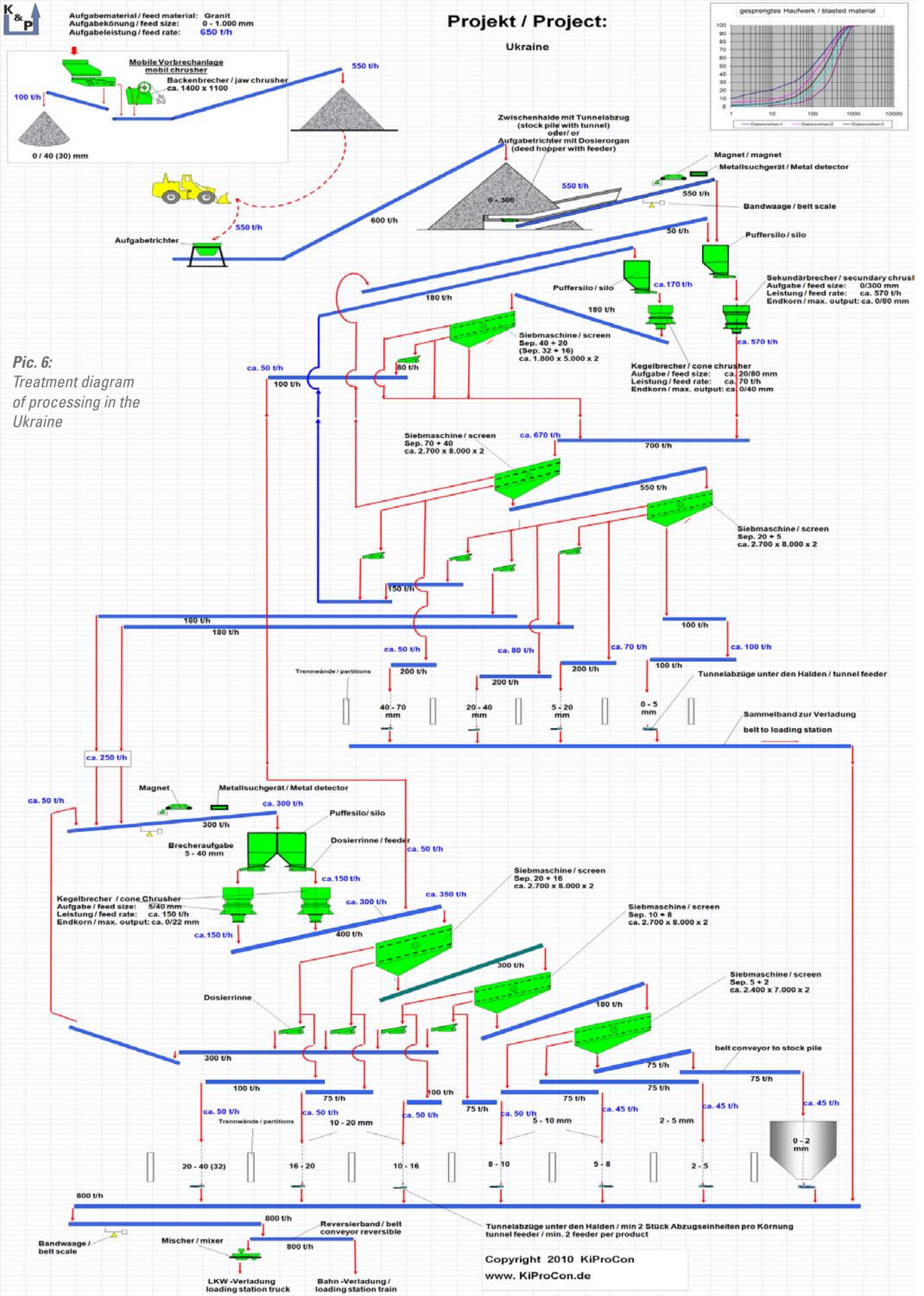
System Planning of the Processing Plant

The processing plant processes the pre-crushed rocks to marketable products. The processing is mainly based on multi-stage grading and crushing processes. The needed technical systems can be conducted mobile or stationary. Stationary plants need a higher capital expenditure, but offer more space for storage capacity and more functional constructions. In the current case the decision was made for an open quasi-stationary plant with single crusher- and precious grit treatment.

Since apart from the Ukrainian and Russian market, Poland should also be supplied according to EU norms, the single crusher treatment is adjusted to the production of local norms and the precious grit treatment is adjusted to EU standard products.

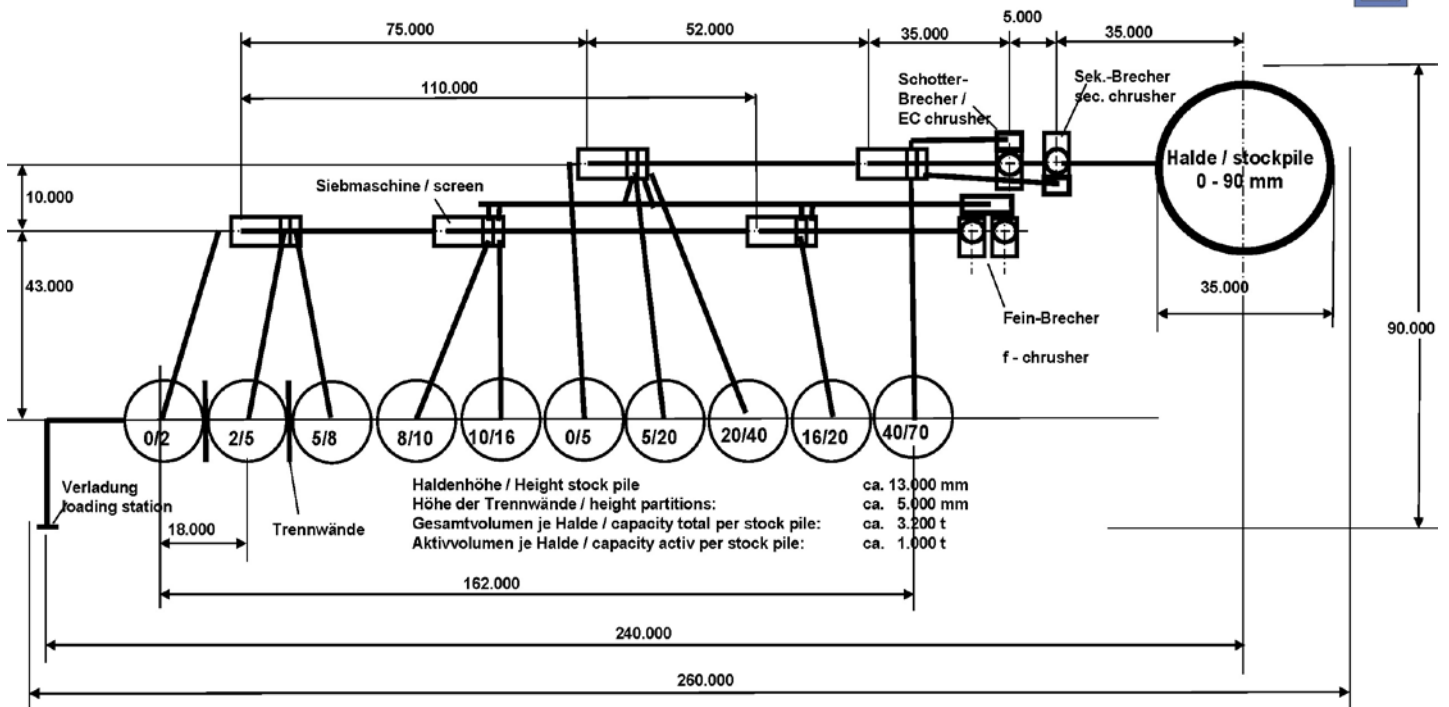
In picture 6 the process design, that was developed for the location, is presented in detail.

The mobile primary crusher system described above feeds the stockpile through conveyor belts with approx. 550 t/h of pre-crushed rocks of a size between 0 and 300 mm. With 10,000 tons, the active buffer volume is slightly more than a 2 shift daily production, and sufficiently decouples extraction and processing. The 1st secondary crusher is dimensioned as cone crusher with approx. 608 t/h throughput. Grain sizes of > 70 mm are fed to this crusher in a closed circuit with approx. 55 t/h. In order to actively influence the production and grading of the Ukrainian standard grainings, a further cone crusher is envisaged for possible consecutive crushing of grainings of 40 mm to 70 mm. In case needed, the 5 – 20 mm and 20 to 40 mm grainings are fed to the cutting crushers directly through a buffer silo, or they are stored as final granulation for selling in boxes with deducted subsurface. Since the maximum feeding size of grainings lies at < 40 mm bis 50 mm, separate consecutive crushing of the grainings 40 mm to 70 mm is required. Apart from the sand 0 = 2 mm, the cuttings which are produced with a capacity of approx. 300 t/h, are stored in open boxes with deducted subsurface. Grainings of > 20 mm can be additional gritting in a closed circuit. The boxes of finished material allow for overburden thicknesses of 13 m, with which a total quantity of approx. 3,200 t per box at approx. 1,000 t calculated with deducted subsurface amount as an asset. Picture 7 shows the layout of the overall plant. In order to optimize loading on trucks and trains, all boxes of finished product were arranged in one line about a tunnel with deducted subsurfaces.



Pic. 6:
 Treatment diagram
 of processing in the
 Ukraine

Projekt / Project: UKRAINE



Platzbedarf / requierd area: ca. 100 x 280 m

Pic. 7:
Layout of the processing

Summary

This article explains selected aspects of the development and planning of a location of an open cast mine with initial mine development and chipping plant in the Ukraine. The special and significantly higher demands in planning and implementation of foreign investments result from the local legal and cultural conditions, as well as from the usually active change in structure. Old standards, laws and planning standards under public law are often only partly valid and in transition phases, whereas there is a lack of practical experience and interpretation for new standards.

The fact that the supply and business markets change dynamically makes the situation more difficult. In summary this means increased uncertainty and calls for flexible action alternatives in connection with an effective risk management. A comprehensive planning, which takes into consideration all listed basic criteria and corporate action alternatives is indispensable for foreign investment.

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Prof. Dr.-Ing. Dipl.-Wirt.-Ing. Martin Kirschbaum

Born: 1961 in Linz/Rhein

Study:

- Mining and industrial engineering and management at RWTH Aachen until 1990

Conferral of a doctorate:

- RWTH Aachen at Prof. Hoberg on the subject process automation and process optimisation in processing arrangements 1991

Business:

- since 1990 Basalt AG, different executive positions in the development of East-Germany
- 1997 chief representative Basalt AG
- 1998 - 2003 corporate officer Basalt AG, Ressorts for East-Germany, Technology, Ressources, Abroad activities

Self-employed:

- since 11/2003 with consulting and engineering on mining branche, processing and Stone and soil material

Key aspects of activity:

- Technical and economic optimisation of processing processes expires in the gravel and hard stone industry
- processing of mineral raw-material
- Economic and technical assessment of companies in the area of raw-material and building-material production, business benchmarking of production, conveyor processes and processing
- Company conversion, location development and location adaptation of mining and building material companies, in particular in former GUS states
- Technical planning of mine arrangements, opencast mining arrangements and processing arrangements

Prof. Dr.-Ing. Dipl.-Wirt.-Ing. Martin Kirschbaum
KiProCon Dr. Kirschbaum Project-Consulting GmbH & Co.KG
An der Marktbrücke 1
D 07554 Korbußen
Tel.: +49(0) 36 60 2 - 51 43 0

| Kirschbaum@Kiprocon.de | www.KiproCon.de |