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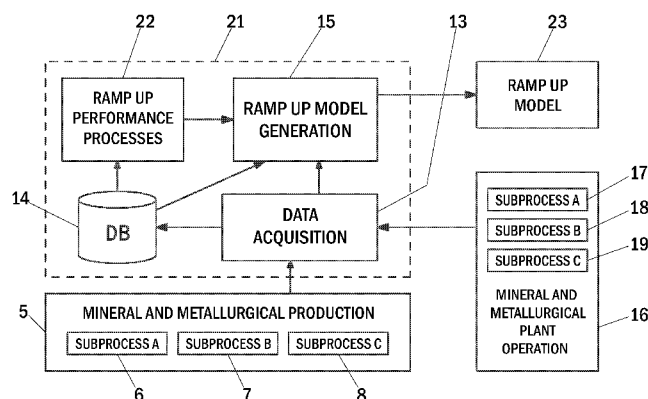
(54) Title: A METHOD AND A SYSTEM FOR MANAGING OF RAMP UP OF A MINERAL AND METALLURGICAL PRO-
CESSING PLANT OR EQUIPMENT FOR OBTAINING METALS

Fig. 5

(57) **Abstract:** The present invention relates to the field of mineral and metallurgical processes in general, and more particularly to a method and system for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals. A system for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to the present invention comprises a ramp up data acquisition server (13), a database (14) and a ramp up model generation server (15), wherein: said ramp up data acquisition server (13) is configured to acquire mineral and metallurgical ramp up data records from mineral and metallurgical production subprocesses (6-8), and said ramp up model generation server (15) is configured to receive mineral and metallurgical ramp up data records from said ramp up data acquisition server (13) and/or from said database (14), to generate a group of mineral and metallurgical ramp up configuration units, said ramp up configuration units defining the functionality of a mineral and metallurgical processing plant or equipment ramp up management system (12), (21) based on the collected mineral and metallurgical ramp up process records; to calculate (26), (28) mineral and metallurgical ramp up performance indicator data (29); and to generate (27), (31) a mineral and metallurgical ramp up model (27), (31).



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A METHOD AND A SYSTEM FOR MANAGING OF RAMP UP OF A MINERAL AND METALLURGICAL PROCESSING PLANT OR EQUIPMENT FOR OBTAINING METALS

FIELD OF THE INVENTION

5 The present invention relates to the field of mineral and metallurgical processes in general, and more particularly to a method and system for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals.

BACKGROUND OF THE INVENTION

10 The mineral and metallurgical processes deal with discovering ore body and taking the ore out from the nature, with extracting minerals and metals from ore and finally with returning the land to its natural state.

 In the following, the prior art will be described with reference to the accompanying Figure 1, which shows a flow diagram of a mineral and metallurgical process according to the prior art.

15 Figure 1 shows a flow diagram of a mineral and metallurgical process according to the prior art. A mineral and metallurgical process according to the prior art comprises the process blocks for ore recovering process 1, mineral processing process 2, and metallurgical processing process 3.

20 In a mineral and metallurgical process according to the prior art the ore recovering process 1 is carried out first. In ore recovering process 1 the ore is recovered out from the nature e.g. by mine blasting or mine excavation. After the ore recovering process 1 the recovered ore is forwarded to mineral processing process 2. In mineral processing process 2 there are comminution processes, e.g. crushing processes and grinding processes first carried out.

25 After comminution processing the sizing processing and concentration processing may be carried out. After the mineral processing process 2 the ore is forwarded to metallurgical processing process 3. In metallurgical processing process 3 metallurgical technologies are used for obtaining or extracting metal compounds from their ores utilizing aqueous chemistry.

30 The prior art method and systems for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals typically rely on separate control systems for each separate process. The prior art solutions for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals have a very limited scope only

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covering a particular subprocess. There are currently no commercially available platforms being sold on the market today covering mineral and metallurgical processing plant or equipment ramp up management.

5 The mineral and metallurgical processes for obtaining metals have huge operational expenditure costs. Possible optimization of operations has a potential to save a lot of capital and natural resources.

The problem therefore is to find a solution for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals which can provide a faster and more reliable ramp up process as well
10 as provide better support for the ramp up deployment.

There is a demand in the market for a method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals which method would provide a faster and more reliable ramp up process as well as would provide better support for the ramp up deployment
15 when compared to the prior art solutions. Likewise, there is a demand in the market for an system for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals which system would have a faster and more reliable ramp up process as well as would provide better support for the ramp up deployment when compared to the prior art solutions.

20 BRIEF DESCRIPTION OF THE INVENTION

An object of the present invention is thus to provide a method and an apparatus for implementing the method so as to overcome the above problems and to alleviate the above disadvantages.

25 The objects of the invention are achieved by a method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals, which said method comprises steps of:

- acquiring mineral and metallurgical ramp up data records from mineral and metallurgical production subprocesses and/or from mineral and metallurgical plant operation subprocesses;
- 30 - generating a group of mineral and metallurgical ramp up configuration units, said ramp up configuration units defining the functionality of a mineral and metallurgical processing plant or equipment ramp up management system based on the collected mineral and metallurgical ramp up data records;
- calculating mineral and metallurgical ramp up performance indicator
35 data, said ramp up performance indicator data being configured to forward the

defined functionality associated with at least one mineral and metallurgical ramp up configuration unit of the generated group of mineral and metallurgical ramp up configuration units; and

- generating a mineral and metallurgical ramp up model on the basis of the received mineral and metallurgical ramp up performance indicator data and the received mineral and metallurgical ramp up configuration units.

Preferably, said method comprises steps of monitoring performance indicator data of mineral and metallurgical production subprocesses and/or from mineral and metallurgical plant operation subprocesses; and detecting mineral and metallurgical ramp-up development units, said ramp-up development units being triggered by said performance indicator data; so that in the step of ramp up configuration units generating, said ramp up configuration units define the said functionality based on the collected mineral and metallurgical ramp up data records and on the detected mineral and metallurgical ramp-up development units.

Preferably, said method comprises steps of receiving ramp up optimization process data records from an at least one optimization process unit; generating a group of ramp up optimization process configuration units, said ramp up optimization process configuration units defining the functionality of an at least one optimization process; so that in the step of calculating, said ramp up performance indicator data is configured also to forward the defined functionality associated with at least one ramp up optimization process configuration unit of the generated group of ramp up optimization process configuration units.

Preferably, in the step of acquiring said ramp up data records contain information and data both on the current status and on the planned status after the ramp up of the mineral and metallurgical production subprocesses and/or from mineral and metallurgical plant operation subprocesses.

Preferably, in the step of calculating also mineral and metallurgical ramp up performance process data is calculated; and in that in the step of ramp up model generating, mineral and metallurgical ramp up model is generated also on the basis of the received mineral and metallurgical ramp up performance process data.

Preferably, in said method the said ramp up optimization processes include one or more of the following processes: a mineral and metallurgical site ramp up optimization process, a plant ramp up optimization process, a ramp

up process optimization process, a ramp up sub-process optimization process, an equipment ramp up optimization process, a ramp up financial optimization process, a capital expenditure optimization process, a business optimization process, a project flow optimization process, a ramp up deployment optimization process, a supply chain optimization process, a ramp up benchmark optimization process, a mineral and metallurgical site benchmark optimization process, a plant benchmark optimization process, a process benchmark optimization process, a sub-process benchmark optimization process, an equipment benchmark optimization process, an earned value analysis optimization process, a ramp up logistics optimization process, a project delay analysis optimization process.

Preferably, in said method the said mineral and metallurgical production subprocesses include one or more of the following processes: a crushing process, a grinding process, a screening process, a classification process; a flotation process, a gravity separation process, an electrostatic separation process, a magnetic separation process, a dewatering process, a leaching processes, a filtering process, a thickening process, a solvent extraction process, a stripping process, an electrowinning process, an electrorefining process, precipitation process, a smelting process, an anode casting process, a furnace process, a calcination process, a roasting process, an agglomeration process, a direct reduction process, a smelting reduction process, a gas cooling process, a gas cleaning process, an aluminum production process, a precious metals production process, a ferroalloys production process, a sulphuric acid plant process, an industrial water treatment process, a waste to energy process, oil wining process, a thermal process.

Preferably, in said method the said mineral and metallurgical plant operation subprocesses include one or more of the following processes: an ore acquiring process, an ore blasting process, a feed creation process, a feed preparation process, product logistics management process, a customer business plan process, a resource management process, a quality management process, a legal requirement management process, an environmental constraint management process.

Preferably, in the step of ramp up model generating, said mineral and metallurgical ramp up model is generated also on the basis of the analysis carried out with ramp up performance processes, said ramp up performance processes including one or more of the following ramp up performance processes:

a supply chain analysis process, a benchmark evaluation process, an earned value analysis process, a quality analysis process, a delay evaluation process, a downtime value analysis process, a customer financial cost/sales analysis process, a capital expenditure and value proposition alignment process.

5 Preferably, in the step of ramp up model generating, said mineral and metallurgical ramp up model is generated also by carrying out ramp up modelling processes, said ramp up modelling processes including one or more of the following ramp up modelling processes: a customer value tree modelling process, an investment planning process, a capital expenditure planning process,
10 a business optimization process, a future prognostics process, a supply chain management process, a time-to-market process, a benchmarking process, a cost reduction process, an environmental modelling process, a risk modelling process.

 Preferably, the said method comprises a step of implementing the
15 said mineral and metallurgical ramp up model.

 Furthermore, the objects of the invention are achieved by a system for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals, said system comprising a ramp up data acquisition server, a database and a ramp up model generation server, wherein:

20 - said ramp up data acquisition server is configured to acquire mineral and metallurgical ramp up data records from mineral and metallurgical production subprocesses and/or from mineral and metallurgical plant operation subprocesses, and to forward said mineral and metallurgical ramp up data records to said database and/or to ramp up model generation server, and

25 - said ramp up model generation server is configured:
 - to receive mineral and metallurgical ramp up data records from said ramp up data acquisition server and/or from said database,

 - to generate a group of mineral and metallurgical ramp up configuration units, said ramp up configuration units defining the functionality of a
30 mineral and metallurgical processing plant or equipment ramp up management system based on the collected mineral and metallurgical ramp up data records,

 - to calculate mineral and metallurgical ramp up performance indicator data, said ramp up performance indicator data being configured to forward the defined functionality associated with at least one mineral and metallurgical ramp up configuration unit of the generated group of mineral and metallurgical ramp up configuration units; and
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- to generate a mineral and metallurgical ramp up model on the basis of the received mineral and metallurgical ramp up performance indicator data and the received mineral and metallurgical ramp up configuration units.

Preferably, said ramp up model generation server is configured to receive detected mineral and metallurgical ramp-up development units, said ramp-up development units being triggered by monitored performance indicator data of mineral and metallurgical production subprocesses and/or from mineral and metallurgical plant operation subprocesses.

Preferably, said ramp up model generation server is configured to receive ramp up optimization process data records from an at least one optimization process unit, to generate a group of ramp up optimization process configuration units, said ramp up optimization process configuration units defining the functionality of an at least one optimization process, so that said ramp up performance indicator data is configured also to forward the defined functionality associated with at least one ramp up optimization process configuration unit of the generated group of ramp up optimization process configuration units.

Preferably, the said ramp up data records contain information and data both on the current status and on the planned status after the ramp up of the mineral and metallurgical production subprocesses and/or from mineral and metallurgical plant operation subprocesses.

Preferably, in said system the said ramp up optimization processes include one or more of the following processes: a mineral and metallurgical site ramp up optimization process, a plant ramp up optimization process, a ramp up process optimization process, a ramp up sub-process optimization process, an equipment ramp up optimization process, a ramp up financial optimization process, a capital expenditure optimization process, a business optimization process, a project flow optimization process, a ramp up deployment optimization process, a supply chain optimization process, a ramp up benchmark optimization process, a mineral and metallurgical site benchmark optimization process, a plant benchmark optimization process, a process benchmark optimization process, a sub-process benchmark optimization process, an equipment benchmark optimization process, an earned value analysis optimization process, a ramp up logistics optimization process, a project delay analysis optimization process.

Preferably, in said system the said mineral and metallurgical production subprocesses include one or more of the following processes: a crushing

process, a grinding process, a screening process, a classification process; a flotation process, a gravity separation process, an electrostatic separation process, a magnetic separation process, a dewatering process, a leaching processes, a filtering process, a thickening process, a solvent extraction process, a stripping process, an electrowinning process, an electrorefining process, precipitation process, a smelting process, an anode casting process, a furnace process, a calcination process, a roasting process, an agglomeration process, a direct reduction process, a smelting reduction process, a gas cooling process, a gas cleaning process, an aluminum production process, a precious metals production process, a ferroalloys production process, a sulphuric acid plant process, an industrial water treatment process, a waste to energy process, oil wining process, a thermal process.

Preferably, in said system the said mineral and metallurgical plant operation subprocesses include one or more of the following processes: an ore acquiring process, an ore blasting process, a feed creation process, a feed preparation process, product logistics management process, a customer business plan process, a resource management process, a quality management process, a legal requirement management process, an environmental constraint management process, an occupational safety and health constraint management process.

Preferably, the said ramp up model generation server is configured to receive analysis carried out with ramp up performance processes, said ramp up performance processes including one or more of the following ramp up performance processes: a supply chain analysis process, a benchmark evaluation process, an earned value analysis process, a quality analysis process, a delay evaluation process, a downtime value analysis process, a customer financial cost/sales analysis process, a capital expenditure and value proposition alignment process.

Preferably, the said ramp up model generation server is configured to generate said mineral and metallurgical ramp up model also by carrying out ramp up modelling processes, said ramp up modelling processes including one or more of the following ramp up modelling processes: a customer value tree modelling process, an investment planning process, a capital expenditure planning process, a business optimization process, a future prognostics process, a supply chain management process, a time-to-market process, a

benchmarking process, a cost reduction process, an environmental modelling process, a risk modelling process.

Preferably, the said database is integrated to the said ramp up model generation server or to the said ramp up data acquisition server. Preferably, the said ramp up model generation server and the said ramp up data acquisition server are realised as one server. Further preferably, the said database is integrated to the said one server.

Furthermore, the objects of the invention are achieved by a use of said system for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a flow diagram of a mineral and metallurgical process according to the prior art;

Figure 2 shows a schematic block diagram of one embodiment of a system for mineral and metallurgical process ramp up data handling according to the present invention;

Figure 3 shows an architectural block diagram of one embodiment of a system for mineral and metallurgical process ramp up data handling according to the present invention;

Figure 4 shows an architectural block diagram of another embodiment of a system for mineral and metallurgical process ramp up data handling according to the present invention;

Figure 5 shows an architectural block diagram of a third embodiment of a system for mineral and metallurgical process ramp up data handling according to the present invention;

Figure 6 shows an architectural block diagram of a fourth embodiment of a system for mineral and metallurgical process ramp up data handling according to the present invention.

Figure 7 shows a flow diagram of one embodiment of a method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to the present invention;

Figure 8 shows a flow diagram of another embodiment of a method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to the present invention;

Figure 9 shows a flow diagram of one embodiment of a method for optimized managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to the present invention;

Figure 10 shows a flow diagram of a third embodiment of a method
5 for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to the present invention.

Figure 11 shows a flow diagram of a fourth embodiment of a method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to the present invention.

10 Figure 12 shows a flow diagram of another embodiment of a method for optimized managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to the present invention.

Figure 13 shows a flow diagram of one embodiment of an implementation of a ramp up of a mineral and metallurgical processing plant or
15 equipment for obtaining metals according to the present invention.

The prior art drawing of Figure 1 has been presented earlier. In the following, the invention will be described in greater detail by means of preferred embodiments with reference to the accompanying drawings of Figures 2 to 13.

20 DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a method and system for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals, which provides a faster and more reliable ramp up process as well as provides better support for the ramp up deployment when compared
25 to the prior art solutions.

The mineral and metallurgical processes for obtaining metals typically deal with discovering ore body and taking the ore out from the nature, with extracting minerals and metals from ore and finally with returning the land to its natural state. First the ore body is discovered after which the extent, location and value of the ore body is estimated. Typically, mathematical resource
30 estimation is carried out to estimate the size and grade of the deposit. Next, a pre-feasibility study and a feasibility study are conducted to evaluate the economics, the financial viability, and the technical and financial risks of the ore deposit and of the project for obtaining metals.

After the decision to develop the mine has been taken, a planning phase of the mineral and metallurgical processing plant is started. The planning phase includes the evaluation of the economically recoverable portion of the deposit, the metallurgy and ore recoverability, marketability of the ore concentrates, engineering concerns, milling and infrastructure costs, finance and equity requirements, and an analysis of the proposed mine from the initial excavation all the way through to reclamation.

The next phase mine buildings and processing plants are built, and any necessary equipment is obtained. After this, the operation of the mine to recover the ore is started and continued as long as it is economically feasible. Once all the ore that the mine can produce profitably has been recovered, the land used by the mine is reclaimed suitable for future use.

The technological scope of a mineral and metallurgical processing plant or equipment for obtaining metals of the present invention includes metals and mining processes from ore body to final metal product (like cathodes, castings, etc.) and the side processes connecting to the metals and mining side products, including sulfuric acid, effluents. Some of the typical mineral and metallurgical processes for obtaining metals can be divided to ore recovery processes, mineral processing processes and hydrometallurgical processes. One of the first processes in mining and metallurgy is the recovery of the ore out from the nature. Typical ore recovery processes are mine blasting and mine excavation. Mine blasting is the controlled use of explosives and other methods such as gas pressure blasting, pyrotechnics or plasma processes, to remove the ore out from the nature. Typically blasting produces particles in the size having a diameter of 500 mm or more. Mine excavation processes include surface mining and underground mining. In surface mining, including e.g. strip mining, open-pit mining and mountaintop removal mining, soil and rock overlying the mineral deposit are first removed. In underground mining the overlying rock is left in place, and the mineral removed through shafts and/or tunnels.

One of the most common processes in mining and metallurgy is the mineral processing of ore. Typical mineral processing processes are comminution processing, sizing processing and concentration processing. When processing material for the selective or collective recovery of valuable material components, the processes concerned are preceded by comminution processing i.e. mechanical crushing or disintegration of the material in a manner to free the valuable components, one from the other. Comminution is particle

size reduction or disintegrating of materials. Comminution is achieved by, crushing and grinding. After comminution the components are then mutually isolated with the aid of known separation methods, this isolation being contingent on differences in color, shape, density or in differences in their respective surface active and magnetic properties, or other properties.

Crushing is particle size reduction of ore or rock materials by using crushing devices i.e. crushers. Crushers e.g. jaw crushers, gyratory crushers or cone crushers are used to reduce the size, or change the form, of materials so that pieces of different composition can be differentiated. In the crushing process the crushing devices hold material being crushed between two parallel or tangent solid surfaces of a stronger material and apply sufficient force to bring said surfaces together. Typically in a crushing process particles having a diameter up to 1000 mm are crushed to particles having a diameter of 5 mm or more.

Grinding is particle size reduction of ore or rock materials in grinding mills. In hard rock mining and industrial mineral operations the demands for comminution processing equipment such as grinding mills are very high both in terms of grinding efficiency and energy consumption. Typically in a grinding process particles having a diameter up to 1000 mm are grinded to particles having a diameter of 0,010 mm or more. This conventional grinding of materials results in considerable wear on the grinding bodies present in the mill, due to the hardness of the rock concerned, therewith also resulting in considerable costs for the provision of such grinding bodies.

Sizing is the process for separation of particles according to their size. The most typical sizing process is screening, or passing the particles to be sized through a screen or number of different screens. Sizing classification processes exploit the differences in settling velocities exhibited by particles of different size. Classification equipment may include ore sorters, gas cyclones, hydrocyclones, rotating trommels, rake classifiers or fluidized classifiers.

Concentration is the process for increasing the concentration of the valuable mineral in the concentrate. Gravity separation is the separation of two or more minerals of different specific gravity by their relative movement in response to the force of gravity and one or more other forces, one of which is resistance to motion by a viscous medium such as heavy media, water or, less commonly, air. Other concentration processes are flotation, electrostatic separation, magnetic separation and dewatering.

One of the last processes in mining and metallurgy is the hydrometallurgical processing. Hydrometallurgical technologies are used for obtaining or extracting metal compounds from ores, concentrates, and recycled or residual materials. Hydrometallurgical processes involve the use of aqueous chemistry
5 for the recovery of metals from ores, concentrates, and recycled or residual materials. Hydrometallurgy is typically divided into three general areas: leaching, solution purification and recovery technologies.

Leaching involves the use of aqueous solutions, which contain a lixiviant brought into contact with a material containing a valuable metal. There
10 are a number of leaching process options available for the hydrometallurgical treatment of ores and concentrates. In the leaching process, oxidation potential, temperature, and pH of the solution are important parameters. There are several versatile leaching methods ranging from chloride to sulfate leaching and from atmospheric to pressure leaching. Leaching technologies include the
15 leaching of e.g. zinc, copper, nickel, cobalt, gold, arsenic, silver, molybdenum, manganese and synthetic rutile.

Typical solution purification processes are filtering process, thickening process, solvent extraction process and stripping process. In a solvent extraction process, the pregnant leach solution is first mixed into emulsion with
20 the stripped organic stream and after mixing allowed to separate in a settler. The valuable metal will be exchanged from the pregnant leach solution to the organic phase stream. The resulting streams will be a loaded organic phase stream and a raffinate stream. In a stripping process, the loaded organic phase is then mixed into emulsion with stripping liquor and allowed to separate in a
25 settler. In stripping the metal will be exchanged from the organic phase to the stripping liquor. The resulting streams will be a stripped organic phase stream and a rich stripping liquor stream.

Recovery processes are final hydrometallurgical processes and may include e.g. electrowinning processes and precipitation processes. Metals suitable for sale as raw materials are often directly produced in the metal recovery
30 process. In an electrowinning process, a current is passed from an inert anode through a liquid solution containing the metal so that the metal is extracted as it is deposited in an electroplating process onto the cathode. Precipitation in hydrometallurgy involves the chemical precipitation of either metals and their
35 compounds or of the contaminants from aqueous solutions.

Optimization in the context of a mineral and metallurgical processing plant and equipment can be seen as using different analytical methods for finding alternatives with the most cost effective or highest achievable performance under the given constraints in the process execution or in the process ramp up and constantly adjusting the optimized process by maximizing desired factors and minimizing undesired ones.

Figure 2 shows a schematic block diagram of one embodiment of a system for mineral and metallurgical process ramp up data handling according to the present invention. The system for mineral and metallurgical process ramp up data handling according to the present embodiment comprises a mineral and metallurgical ramp up data analysis block 4, a mineral and metallurgical production block 5, a feed creation block 9, a feed preparation block 10 and a product logistics block 11. Said mineral and metallurgical ramp up data analysis block 4 has an interface for acquiring data from said mineral and metallurgical production block 5 as well as from different mineral and metallurgical production subprocesses 6-8. Said ramp up data acquired from the said mineral and metallurgical production block 5 as well as from the said mineral and metallurgical production subprocesses 6-8 contains information and data both on the current status and on the planned status after the ramp up of the mineral and metallurgical production subprocesses 6-8 and of the mineral and metallurgical production 5 as a whole. The said mineral and metallurgical production block 5 can be any kind of mineral and metallurgical production facility, e.g. a mineral and metallurgical site, a mineral and metallurgical plant, a mineral and metallurgical process, a part of a mineral and metallurgical process, or a mineral and metallurgical equipment.

Said mineral and metallurgical production subprocesses 6-8 may include one or more subprocesses 6-8 for comminution processes, e.g. crushing process, grinding process; sizing processes, e.g. screening process, classification process; concentration processes, e.g. flotation process, gravity separation process, electrostatic separation process, magnetic separation process, dewatering process; hydrometallurgical processes; leaching processes; solution purification processes, e.g. filtering process, thickening process, solvent extraction process, stripping process; recovery processes, e.g. electrowinning process, electrorefining process and precipitation process; pyrometallurgical processes, e.g. smelting process, anode casting process, furnace process, calcination process, roasting process, agglomeration process, direct reduction

process and smelting reduction process; other mineral and metallurgical sub-processes, e.g. a gas cooling process, a gas cleaning process, an aluminum production process, a precious metals production process, a ferroalloys production process, a sulphuric acid plant process, an industrial water treatment process, a waste to energy process, oil wining process, a thermal process.

The mineral and metallurgical ramp up data analysis block 4 according to the present embodiment has also an interface for acquiring data from said feed creation block 9 and/or said feed preparation block 10 and/or a product logistics block 11. Said feed creation block 9, said feed preparation block 10 as well as said product logistics block 11 contain information and data both on the current status and on the planned status after the ramp up of the feed creation block 9, of the feed preparation 10 and of the product logistics 11 as a whole. This means that effectively mineral and metallurgical ramp up data analysis block 4 can acquire data from said the mineral and metallurgical processes all the way from the ore blasting process to the producing process of the final product.

The mineral and metallurgical ramp up data analysis block 4 according to the present embodiment analyses the acquired data, said analysis including data quality analysis, data pre-processing and data structuring. The said mineral and metallurgical ramp up data analysis block 4 forwards structured mineral and metallurgical ramp up data as an output.

Figure 3 shows an architectural block diagram of one embodiment of a system for mineral and metallurgical process ramp up data handling according to the present invention. The system for mineral and metallurgical process ramp up data handling according to presented embodiment comprises a mineral and metallurgical processing plant or equipment ramp up management system 12. Said mineral and metallurgical processing plant or equipment ramp up management system 12 comprises a ramp up data acquisition server 13, a database 14 and a ramp up model generation server 15. Said ramp up data acquisition server 13 of the mineral and metallurgical processing plant or equipment ramp up management system 12 according to the presented embodiment has an interface for acquiring ramp up data from said mineral and metallurgical production block 5 as well as from different mineral and metallurgical production subprocesses 6-8. Said ramp up data acquired from the said mineral and metallurgical production block 5 as well as from the said mineral and metallurgical production subprocesses 6-8 contains information and data

both on the current status and on the planned status after the ramp up of the mineral and metallurgical production subprocesses 6-8 and of the mineral and metallurgical production 5 as a whole. The said mineral and metallurgical production block 5 can be any kind of mineral and metallurgical production facility, e.g. a mineral and metallurgical site, a mineral and metallurgical plant, a mineral and metallurgical process, a part of a mineral and metallurgical process, or a mineral and metallurgical equipment.

Said mineral and metallurgical production subprocesses 6-8 may include one or more subprocesses 6-8 for comminution processes, e.g. crushing process, grinding process; sizing processes, e.g. screening process, classification process; concentration processes, e.g. flotation process, gravity separation process, electrostatic separation process, magnetic separation process, dewatering process; hydrometallurgical processes; leaching processes; solution purification processes, e.g. filtering process, thickening process, solvent extraction process, stripping process; recovery processes, e.g. electrowinning process, electrorefining process and precipitation process; pyrometallurgical processes, e.g. smelting process, anode casting process, furnace process, calcination process, roasting process, agglomeration process, direct reduction process and smelting reduction process; other mineral and metallurgical subprocesses, e.g. a gas cooling process, a gas cleaning process, an aluminum production process, a precious metals production process, a ferroalloys production process, a sulphuric acid plant process, an industrial water treatment process, a waste to energy process, oil wining process, a thermal process.

The mineral and metallurgical ramp up data acquisition server 13 according to the present embodiment has also an interface for acquiring mineral and metallurgical ramp up data from a mineral and metallurgical plant operation block 16 as well as from different mineral and metallurgical plant operation subprocesses 17-19. Said ramp up data acquired from the said mineral and metallurgical plant operation block 16 as well as from the said mineral and metallurgical plant operation subprocesses 17-19 contains information and data both on the current status and on the planned status after the ramp up of the mineral and metallurgical plant operation subprocesses 17-19 and of the mineral and metallurgical plant operation 16 as a whole.

Said mineral and metallurgical plant operation subprocesses 17-19 may include one or more subprocesses 17-19 for ore handling processes, e.g. ore acquiring process, ore blasting process, feed creation process and feed

preparation process; product logistics management processes; mineral and metallurgical external processes, e.g. customer business plan process, resource management process, quality management process, legal requirement management process, environmental constraint management process.

5 Said ramp up data acquisition server 13 of the mineral and metallurgical processing plant or equipment ramp up management system 12 according to the presented embodiment may be used to receive ramp up data from said mineral and metallurgical plant operation subprocesses 17-19 as well as from said mineral and metallurgical production subprocesses 6-8 and
10 the underlying layers, to analyse the acquired data, said analysis including data quality analysis, data pre-processing and data structuring, and forwards structured mineral and metallurgical ramp up data to the said database 14 and/or to the said ramp up model generation server 15 as an output.

 The ramp up model generation server 15 of the mineral and metallurgical processing plant or equipment ramp up management system 12 according to another embodiment receives structured mineral and metallurgical ramp up data from the said ramp up data acquisition server 13 or from the said database 14. Thereafter, the said ramp up model generation server 15 generates a ramp up model 20 for the ramp up of the mineral and metallurgical processing plant or equipment for obtaining metals. The ramp up model generation server 15 according to the presented embodiment may also carry out ramp up modelling processes in the generation of the ramp up model 20.
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 Said ramp up modelling processes of the ramp up model generation server 15 may include one or more ramp up modelling processes, e.g. customer value tree modelling processes, investment planning processes, capital expenditure planning processes, business optimization processes, future prognostics processes, supply chain management processes, time-to-market processes, benchmarking processes, cost reduction processes, environmental modelling processes and risk modelling processes. The ramp up model generation server 15 generates as an output a ramp up model 20 for the ramp up of the mineral and metallurgical processing plant or equipment for obtaining metals or for the ramp up of a mineral and metallurgical process for obtaining metals.
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 The said database 14 may also be integrated to the said ramp up model generation server 15 or to the said data acquisition server 13. The said ramp up model generation server 15 and the said data acquisition server 13
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may also be realised as one server. The said one server may also comprise the said database 14 as an integrated unit.

Figure 4 shows an architectural block diagram of another embodiment of a system for mineral and metallurgical process ramp up data handling according to the present invention. The system for mineral and metallurgical process ramp up data handling according to presented embodiment comprises a mineral and metallurgical processing plant or equipment ramp up management system 12 and an at least one optimization process unit 41. Said mineral and metallurgical processing plant or equipment ramp up management system 12 comprises a ramp up data acquisition server 13, a database 14 and a ramp up model generation server 15. Said ramp up data acquisition server 13 of the mineral and metallurgical processing plant or equipment ramp up management system 12 according to the presented embodiment has an interface for acquiring ramp up data from said mineral and metallurgical production block 5 as well as from different mineral and metallurgical production subprocesses 6-8. Said ramp up data acquired from the said mineral and metallurgical production block 5 as well as from the said mineral and metallurgical production subprocesses 6-8 contains information and data both on the current status and on the planned status after the ramp up of the mineral and metallurgical production subprocesses 6-8 and of the mineral and metallurgical production 5 as a whole. The said mineral and metallurgical production block 5 can be any kind of mineral and metallurgical production facility, e.g. a mineral and metallurgical site, a mineral and metallurgical plant, a mineral and metallurgical process, a part of a mineral and metallurgical process, or a mineral and metallurgical equipment.

Said mineral and metallurgical production subprocesses 6-8 may include one or more subprocesses 6-8 for comminution processes, e.g. crushing process, grinding process; sizing processes, e.g. screening process, classification process; concentration processes, e.g. flotation process, gravity separation process, electrostatic separation process, magnetic separation process, dewatering process; hydrometallurgical processes; leaching processes; solution purification processes, e.g. filtering process, thickening process, solvent extraction process, stripping process; recovery processes, e.g. electrowinning process, electrorefining process and precipitation process; pyrometallurgical processes, e.g. smelting process, anode casting process, furnace process, calcination process, roasting process, agglomeration process, direct reduction

process and smelting reduction process; other mineral and metallurgical sub-processes, e.g. a gas cooling process, a gas cleaning process, an aluminum production process, a precious metals production process, a ferroalloys production process, a sulphuric acid plant process, an industrial water treatment process, a waste to energy process, oil wining process, a thermal process.

The mineral and metallurgical ramp up data acquisition server 13 according to the present embodiment has also an interface for acquiring mineral and metallurgical ramp up data from a mineral and metallurgical plant operation block 16 as well as from different mineral and metallurgical plant operation subprocesses 17-19. Said ramp up data acquired from the said mineral and metallurgical plant operation block 16 as well as from the said mineral and metallurgical plant operation subprocesses 17-19 contains information and data both on the current status and on the planned status after the ramp up of the mineral and metallurgical plant operation subprocesses 17-19 and of the mineral and metallurgical plant operation 16 as a whole.

Said mineral and metallurgical plant operation subprocesses 17-19 may include one or more subprocesses 17-19 for ore handling processes, e.g. ore acquiring process, ore blasting process, feed creation process and feed preparation process; product logistics management processes; mineral and metallurgical external processes, e.g. customer business plan process, resource management process, quality management process, legal requirement management process, environmental constraint management process.

Said ramp up data acquisition server 13 of the mineral and metallurgical processing plant or equipment ramp up management system 12 according to the presented embodiment may be used to receive ramp up data from said mineral and metallurgical plant operation subprocesses 17-19 as well as from said mineral and metallurgical production subprocesses 6-8 and the underlying layers, to analyse the acquired data, said analysis including data quality analysis, data pre-processing and data structuring, and forwards structured mineral and metallurgical ramp up data to the said database 14 and/or to the said ramp up model generation server 15 as an output.

The ramp up model generation server 15 of the mineral and metallurgical processing plant or equipment ramp up management system 12 according to another embodiment receives structured mineral and metallurgical ramp up data from the said ramp up data acquisition server 13 or from the said database 14. The ramp up model generation server 15 of the mineral and met-

allurgical processing plant or equipment ramp up management system 12 according to another embodiment receives structured ramp up optimization process data from the said at least one optimization process unit 41 or from the said database 14. The said ramp up model generation server 15 can also forward generated mineral and metallurgical ramp up model data as an output to the said at least one optimization process unit 41.

The ramp up optimization processes of the said at least one optimization process unit 41 may include one or more ramp up modelling processes, e.g. mineral and metallurgical site ramp up optimization processes, plant ramp up optimization processes, ramp up process optimization processes, ramp up sub-process optimization processes, equipment ramp up optimization processes, ramp up financial optimization processes, capital expenditure optimization processes, business optimization processes, project flow optimization processes, ramp up deployment optimization processes, supply chain optimization processes, ramp up benchmark optimization processes, mineral and metallurgical site benchmark optimization processes, plant benchmark optimization processes, process benchmark optimization processes, sub-process benchmark optimization processes, equipment benchmark optimization processes, earned value analysis optimization processes, ramp up logistics optimization processes and project delay analysis optimization processes.

Thereafter, the said ramp up model generation server 15 generates a ramp up model 20 for the ramp up of the mineral and metallurgical processing plant or equipment for obtaining metals. The ramp up model generation server 15 according to the presented embodiment may also carry out ramp up modelling processes in the generation of the ramp up model 20.

Said ramp up modelling processes of the ramp up model generation server 15 may include one or more ramp up modelling processes, e.g. customer value tree modelling processes, investment planning processes, capital expenditure planning processes, future prognostics processes, supply chain management processes, time-to-market processes, cost reduction processes, environmental modelling processes and risk modelling processes. The ramp up model generation server 15 generates as an output a ramp up model 20 for the ramp up of the mineral and metallurgical processing plant or equipment for obtaining metals or for the ramp up of a mineral and metallurgical process for obtaining metals.

The said database 14 may also be integrated to the said ramp up model generation server 15 or to the said data acquisition server 13. The said ramp up model generation server 15 and the said data acquisition server 13 may also be realised as one server. The said one server may also comprise
5 the said database 14 as an integrated unit.

Figure 5 shows an architectural block diagram of a third embodiment of a system for mineral and metallurgical process ramp up data handling according to the present invention. The system for mineral and metallurgical process ramp up data handling according to a third embodiment comprises a
10 mineral and metallurgical processing plant or equipment ramp up management system 21. Said mineral and metallurgical processing plant or equipment ramp up management system 21 comprises a ramp up data acquisition server 13, a database 14 and a ramp up model generation server 15 and a ramp up performance processes block 22. Said ramp up data acquisition server 13 of the
15 mineral and metallurgical processing plant or equipment ramp up management system 21 according to the presented embodiment has an interface for acquiring ramp up data from said mineral and metallurgical production block 5 as well as from different mineral and metallurgical production subprocesses 6-8. Said ramp up data acquired from the said mineral and metallurgical production
20 block 5 as well as from the said mineral and metallurgical production subprocesses 6-8 contains information and data both on the current status and on the planned status after the ramp up of the mineral and metallurgical production subprocesses 6-8 and of the mineral and metallurgical production 5 as a whole. The said mineral and metallurgical production block 5 can be any kind
25 of mineral and metallurgical production facility, e.g. a mineral and metallurgical site, a mineral and metallurgical plant, a mineral and metallurgical process, a part of a mineral and metallurgical process, or a mineral and metallurgical equipment.

Said mineral and metallurgical production subprocesses 6-8 may include one or more subprocesses 6-8 for comminution processes, e.g. crushing
30 process, grinding process; sizing processes, e.g. screening process, classification process; concentration processes, e.g. flotation process, gravity separation process, electrostatic separation process, magnetic separation process, dewatering process; hydrometallurgical processes; leaching processes; solution purification processes, e.g. filtering process, thickening process, solvent
35 extraction process, stripping process; recovery processes, e.g. electrowinning

process, electrorefining process and precipitation process; pyrometallurgical processes, e.g. smelting process, anode casting process, furnace process, calcination process, roasting process, agglomeration process, direct reduction process and smelting reduction process; other mineral and metallurgical sub-
5 processes, e.g. a gas cooling process, a gas cleaning process, an aluminum production process, a precious metals production process, a ferroalloys production process, a sulphuric acid plant process, an industrial water treatment process, a waste to energy process, oil wining process, a thermal process.

The mineral and metallurgical ramp up data acquisition server 13
10 according to the present embodiment has also an interface for acquiring mineral and metallurgical ramp up data from a mineral and metallurgical plant operation block 16 as well as from different mineral and metallurgical plant operation subprocesses 17-19. Said ramp up data acquired from the said mineral and metallurgical plant operation block 16 as well as from the said mineral and
15 metallurgical plant operation subprocesses 17-19 contains information and data both on the current status and on the planned status after the ramp up of the mineral and metallurgical plant operation subprocesses 17-19 and of the mineral and metallurgical plant operation 16 as a whole.

Said mineral and metallurgical plant operation subprocesses 17-19
20 may include one or more subprocesses 17-19 for ore handling processes, e.g. ore acquiring process, ore blasting process, feed creation process and feed preparation process; product logistics management processes; mineral and metallurgical external processes, e.g. customer business plan process, resource management process, quality management process, legal requirement
25 management process, environmental constraint management process.

Said ramp up data acquisition server 13 of the mineral and metallurgical processing plant or equipment ramp up management system 21 according to the presented embodiment may be used to receive ramp up data from said mineral and metallurgical plant operation subprocesses 17-19 as
30 well as from said mineral and metallurgical production subprocesses 6-8 and the underlying layers, to analyse the acquired data, said analysis including data quality analysis, data pre-processing and data structuring, and forwards structured mineral and metallurgical ramp up data to the said database 14 and/or to the said ramp up model generation server 15 as an output.

35 The ramp up model generation server 15 of the mineral and metallurgical processing plant or equipment ramp up management system 21 ac-

According to a third embodiment receives structured mineral and metallurgical ramp up data from the said ramp up data acquisition server 13 or from the said database 14. The ramp up model generation server 15 according to the presented embodiment may also carry out analysis with ramp up performance processes of the ramp up performance processes block 22 for managing the ramp up performance of the generated ramp up model 23. The said ramp up performance processes block 22 may include one or more ramp up performance processes e.g. supply chain analysis processes, benchmark evaluation processes, earned value analysis processes, quality analysis processes, delay evaluation processes, downtime value analysis processes, customer financial cost/sales analysis processes as well as capital expenditure and value proposition alignment processes.

Thereafter, the ramp up model generation server 15 generates a ramp up model 23 for the ramp up of the mineral and metallurgical processing plant or equipment for obtaining metals. The ramp up model generation server 15 according to the presented embodiment may also carry out ramp up modelling processes in the generation of the ramp up model 23.

Said ramp up modelling processes of the ramp up model generation server 15 may include one or more ramp up modelling processes, e.g. customer value tree modelling processes, investment planning processes, capital expenditure planning processes, business optimization processes, future prognostics processes, supply chain management processes, time-to-market processes, benchmarking processes, cost reduction processes, environmental modelling processes and risk modelling processes. The ramp up model generation server 15 generates as an output a ramp up model 23 for the ramp up of the mineral and metallurgical processing plant or equipment for obtaining metals or for the ramp up of a mineral and metallurgical process for obtaining metals.

The said database 14 may also be integrated to the said ramp up model generation server 15 or to the said data acquisition server 13. The said ramp up model generation server 15 and the said data acquisition server 13 may also be realised as one server. The said one server may also comprise the said database 14 as an integrated unit.

Figure 6 shows an architectural block diagram of a fourth embodiment of a system for mineral and metallurgical process ramp up data handling according to the present invention. The system for mineral and metallurgical

process ramp up data handling according to a fourth embodiment comprises a mineral and metallurgical processing plant or equipment ramp up management system 21 and an at least one optimization process unit 41. Said mineral and metallurgical processing plant or equipment ramp up management system 21 comprises a ramp up data acquisition server 13, a database 14 and a ramp up model generation server 15 and a ramp up performance processes block 22. Said ramp up data acquisition server 13 of the mineral and metallurgical processing plant or equipment ramp up management system 21 according to the presented embodiment has an interface for acquiring ramp up data from said mineral and metallurgical production block 5 as well as from different mineral and metallurgical production subprocesses 6-8. Said ramp up data acquired from the said mineral and metallurgical production block 5 as well as from the said mineral and metallurgical production subprocesses 6-8 contains information and data both on the current status and on the planned status after the ramp up of the mineral and metallurgical production subprocesses 6-8 and of the mineral and metallurgical production 5 as a whole. The said mineral and metallurgical production block 5 can be any kind of mineral and metallurgical production facility, e.g. a mineral and metallurgical site, a mineral and metallurgical plant, a mineral and metallurgical process, a part of a mineral and metallurgical process, or a mineral and metallurgical equipment.

Said mineral and metallurgical production subprocesses 6-8 may include one or more subprocesses 6-8 for comminution processes, e.g. crushing process, grinding process; sizing processes, e.g. screening process, classification process; concentration processes, e.g. flotation process, gravity separation process, electrostatic separation process, magnetic separation process, dewatering process; hydrometallurgical processes; leaching processes; solution purification processes, e.g. filtering process, thickening process, solvent extraction process, stripping process; recovery processes, e.g. electrowinning process, electrorefining process and precipitation process; pyrometallurgical processes, e.g. smelting process, anode casting process, furnace process, calcination process, roasting process, agglomeration process, direct reduction process and smelting reduction process; other mineral and metallurgical subprocesses, e.g. a gas cooling process, a gas cleaning process, an aluminum production process, a precious metals production process, a ferroalloys production process, a sulphuric acid plant process, an industrial water treatment process, a waste to energy process, oil wining process, a thermal process.

The mineral and metallurgical ramp up data acquisition server 13 according to the present embodiment has also an interface for acquiring mineral and metallurgical ramp up data from a mineral and metallurgical plant operation block 16 as well as from different mineral and metallurgical plant operation subprocesses 17-19. Said ramp up data acquired from the said mineral and metallurgical plant operation block 16 as well as from the said mineral and metallurgical plant operation subprocesses 17-19 contains information and data both on the current status and on the planned status after the ramp up of the mineral and metallurgical plant operation subprocesses 17-19 and of the mineral and metallurgical plant operation 16 as a whole.

Said mineral and metallurgical plant operation subprocesses 17-19 may include one or more subprocesses 17-19 for ore handling processes, e.g. ore acquiring process, ore blasting process, feed creation process and feed preparation process; product logistics management processes; mineral and metallurgical external processes, e.g. customer business plan process, resource management process, quality management process, legal requirement management process, environmental constraint management process.

Said ramp up data acquisition server 13 of the mineral and metallurgical processing plant or equipment ramp up management system 21 according to the presented embodiment may be used to receive ramp up data from said mineral and metallurgical plant operation subprocesses 17-19 as well as from said mineral and metallurgical production subprocesses 6-8 and the underlying layers, to analyse the acquired data, said analysis including data quality analysis, data pre-processing and data structuring, and forwards structured mineral and metallurgical ramp up data to the said database 14 and/or to the said ramp up model generation server 15 as an output.

The ramp up model generation server 15 of the mineral and metallurgical processing plant or equipment ramp up management system 21 according to a fourth embodiment receives structured mineral and metallurgical ramp up data from the said ramp up data acquisition server 13 or from the said database 14. The ramp up model generation server 15 of the mineral and metallurgical processing plant or equipment ramp up management system 12 according to a fourth embodiment receives structured ramp up optimization process data from the said at least one optimization process unit 41 or from the said database 14. The said ramp up model generation server 15 can also for-

ward generated mineral and metallurgical ramp up model data as an output to the said at least one optimization process unit 41.

The ramp up optimization processes of the said at least one optimization process unit 41 may include one or more ramp up modelling processes, e.g. mineral and metallurgical site ramp up optimization processes, plant ramp up optimization processes, ramp up process optimization processes, ramp up sub-process optimization processes, equipment ramp up optimization processes, ramp up financial optimization processes, capital expenditure optimization processes, business optimization processes, project flow optimization processes, ramp up deployment optimization processes, supply chain optimization processes, ramp up benchmark optimization processes, mineral and metallurgical site benchmark optimization processes, plant benchmark optimization processes, process benchmark optimization processes, sub-process benchmark optimization processes, equipment benchmark optimization processes, earned value analysis optimization processes, ramp up logistics optimization processes and project delay analysis optimization processes.

The ramp up model generation server 15 according to the presented embodiment may also carry out analysis with ramp up performance processes of the ramp up performance processes block 22 for managing the ramp up performance of the generated ramp up model 23 in addition to the ramp up optimization processes carried out by the said at least one optimization process unit 41. The said ramp up performance processes block 22 may include one or more ramp up performance processes e.g. supply chain analysis processes, earned value analysis processes, quality analysis processes, delay evaluation processes, downtime value analysis processes, customer financial cost/sales analysis processes as well as capital expenditure and value proposition alignment processes.

Thereafter, the ramp up model generation server 15 generates a ramp up model 23 for the ramp up of the mineral and metallurgical processing plant or equipment for obtaining metals. The ramp up model generation server 15 according to the presented embodiment may also carry out ramp up modelling processes in the generation of the ramp up model 23.

Said ramp up modelling processes of the ramp up model generation server 15 may include one or more ramp up modelling processes, e.g. customer value tree modelling processes, investment planning processes, capital expenditure planning processes, future prognostics processes, supply chain

management processes, time-to-market processes, cost reduction processes, environmental modelling processes and risk modelling processes. The ramp up model generation server 15 generates as an output a ramp up model 23 for the ramp up of the mineral and metallurgical processing plant or equipment for obtaining metals or for the ramp up of a mineral and metallurgical process for obtaining metals.

The said database 14 may also be integrated to the said ramp up model generation server 15 or to the said data acquisition server 13. The said ramp up model generation server 15 and the said data acquisition server 13 may also be realised as one server. The said one server may also comprise the said database 14 as an integrated unit.

Figure 7 shows a flow diagram of one embodiment of a method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to the present invention. With Figure 7 reference is made to an architectural block diagram presented in Figure 5. The method for managing of a mineral and metallurgical process ramp up according to presented embodiment comprises a step of acquiring 24 mineral and metallurgical ramp up data records, in which step of acquiring 24 the ramp up data acquisition server 13 of the mineral and metallurgical processing plant or equipment ramp up management system 12, 21 acquires mineral and metallurgical ramp up data records from mineral and metallurgical production subprocesses 6-8 and/or from mineral and metallurgical plant operation subprocesses 17-19. Said ramp up data records acquired from the said mineral and metallurgical production subprocesses 6-8 and/or from mineral and metallurgical plant operation subprocesses 17-19 contains information and data both on the current status and on the planned status after the ramp up of the mineral and metallurgical production subprocesses 6-8 and/or from mineral and metallurgical plant operation subprocesses 17-19.

After the step of acquiring 24 the method for managing of a mineral and metallurgical process ramp up according to presented embodiment comprises a step of generating a group of mineral and metallurgical ramp up configuration units 25. The generated mineral and metallurgical ramp up configuration units define the functionality of the mineral and metallurgical process management system 12, 21 based on the collected mineral and metallurgical ramp up data records.

After the step of generating mineral and metallurgical ramp up configuration units 25 the method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to presented embodiment comprises a step of calculating mineral and metallurgical ramp up performance indicator data 26. The generated mineral and metallurgical ramp up performance indicator data is configured to forward the defined functionality associated with at least one mineral and metallurgical ramp up configuration unit of the generated group of mineral and metallurgical ramp up configuration units. In the step of calculating in the method for managing of a mineral and metallurgical process ramp up according to presented embodiment the step of calculating 26 produces as an output both mineral and metallurgical ramp up performance indicator data.

The final step in the method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to presented embodiment comprises a step of generating mineral and metallurgical ramp up model 27. The said mineral and metallurgical ramp up model is generated 27 on the basis of the received mineral and metallurgical ramp up performance indicator data as well as the received mineral and metallurgical ramp up configuration units.

In the step of generating mineral and metallurgical ramp up model 27, said mineral and metallurgical ramp up model may be generated 27 also on the basis of the analysis carried out with ramp up performance processes 22. The said ramp up performance processes 22 may include one or more ramp up performance processes e.g. supply chain analysis processes, benchmark evaluation processes, earned value analysis processes, quality analysis processes, delay evaluation processes, downtime value analysis processes, customer financial cost/sales analysis processes as well as capital expenditure and value proposition alignment processes.

In the step of generating mineral and metallurgical ramp up model 27, said mineral and metallurgical ramp up model may be generated 27 by also carrying out ramp up modelling processes, said ramp up modelling processes including one or more ramp up modelling processes, e.g. customer value tree modelling processes, investment planning processes, capital expenditure planning processes, business optimization processes, future prognostics processes, supply chain management processes, time-to-market pro-

cesses, benchmarking processes, cost reduction processes, environmental modelling processes and risk modelling processes.

Figure 8 shows a flow diagram of another embodiment of a method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to the present invention. With Figure 8 reference is made to an architectural block diagram presented in Figure 5. The method for managing of a mineral and metallurgical process ramp up according to presented embodiment comprises a step of acquiring 24 mineral and metallurgical ramp up data records, in which step of acquiring 24 the ramp up data acquisition server 13 of the mineral and metallurgical processing plant or equipment ramp up management system 12, 21 acquires mineral and metallurgical ramp up data records from mineral and metallurgical production subprocesses 6-8 and/or from mineral and metallurgical plant operation subprocesses 17-19. Said ramp up data records acquired from the said mineral and metallurgical production subprocesses 6-8 and/or from mineral and metallurgical plant operation subprocesses 17-19 contains information and data both on the current status and on the planned status after the ramp up of the mineral and metallurgical production subprocesses 6-8 and/or from mineral and metallurgical plant operation subprocesses 17-19.

Respectively, the said method for managing of a mineral and metallurgical process ramp up according to presented embodiment comprises a step of detecting 245 mineral and metallurgical ramp up development units.

After the step of acquiring mineral and metallurgical ramp up data records 24 and detecting mineral and metallurgical ramp up development units 245 the method for managing of a mineral and metallurgical process ramp up according to presented embodiment comprises a step of generating a group of updated mineral and metallurgical ramp up configuration units 25. The generated updated mineral and metallurgical ramp up configuration units define the functionality of the mineral and metallurgical process management system 12, 21 based on the collected mineral and metallurgical ramp up data records and on the detected mineral and metallurgical ramp up development units.

After the step of generating updated mineral and metallurgical ramp up configuration units 25 the method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to presented embodiment comprises a step of calculating mineral and metallurgical ramp up performance indicator data 26. The generated mineral and

metallurgical ramp up performance indicator data is configured to forward the defined functionality associated with at least one mineral and metallurgical ramp up configuration unit of the generated group of mineral and metallurgical ramp up configuration units. In the step of calculating in the method for managing of a mineral and metallurgical process ramp up according to presented embodiment the step of calculating 26 produces as an output both mineral and metallurgical ramp up performance indicator data.

The final step in the method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to presented embodiment comprises a step of generating mineral and metallurgical ramp up model 27. The said mineral and metallurgical ramp up model is generated 27 on the basis of the received mineral and metallurgical ramp up performance indicator data as well as the received mineral and metallurgical ramp up configuration units.

In the step of generating mineral and metallurgical ramp up model 27, said mineral and metallurgical ramp up model may be generated 27 also on the basis of the analysis carried out with ramp up performance processes 22. The said ramp up performance processes 22 may include one or more ramp up performance processes e.g. supply chain analysis processes, benchmark evaluation processes, earned value analysis processes, quality analysis processes, delay evaluation processes, downtime value analysis processes, customer financial cost/sales analysis processes as well as capital expenditure and value proposition alignment processes.

In the step of generating mineral and metallurgical ramp up model 27, said mineral and metallurgical ramp up model may be generated 27 by also carrying out ramp up modelling processes, said ramp up modelling processes including one or more ramp up modelling processes, e.g. customer value tree modelling processes, investment planning processes, capital expenditure planning processes, business optimization processes, future prognostics processes, supply chain management processes, time-to-market processes, benchmarking processes, cost reduction processes, environmental modelling processes and risk modelling processes.

Figure 9 shows a flow diagram of one embodiment of a method for optimized managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to the present invention. With Figure 9 reference is made to an architectural block diagram presented in

Figure 6. The method for optimized managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to presented embodiment comprises a step of acquiring 24 mineral and metallurgical ramp up data records, in which step of acquiring 24 the ramp up data acquisition server 13 of the mineral and metallurgical processing plant or equipment ramp up management system 12, 21 acquires mineral and metallurgical ramp up data records from mineral and metallurgical production subprocesses 6-8 and/or from mineral and metallurgical plant operation subprocesses 17-19. Said ramp up data records acquired from the said mineral and metallurgical production subprocesses 6-8 and/or from mineral and metallurgical plant operation subprocesses 17-19 contains information and data both on the current status and on the planned status after the ramp up of the mineral and metallurgical production subprocesses 6-8 and/or from mineral and metallurgical plant operation subprocesses 17-19.

After the step of acquiring 24 the method for managing of a mineral and metallurgical process ramp up according to presented embodiment comprises a step of generating a group of mineral and metallurgical ramp up configuration units 25. The generated mineral and metallurgical ramp up configuration units define the functionality of the mineral and metallurgical process management system 12, 21 based on the collected mineral and metallurgical ramp up data records.

Respectively, the said method for optimized managing of a ramp up of a mineral and metallurgical process ramp up plant or equipment for obtaining metals according to presented embodiment comprises a step of receiving 42 ramp up optimization process data records and thereafter comprises a step of generating 43 ramp up optimization process configuration units.

After the step of generating mineral and metallurgical ramp up configuration units 25 and ramp up optimization process configuration units 43 the method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to presented embodiment comprises a step of calculating mineral and metallurgical ramp up performance indicator data 26. The generated mineral and metallurgical ramp up performance indicator data is configured to forward the defined functionality associated with at least one mineral and metallurgical ramp up configuration unit of the generated group of mineral and metallurgical ramp up configuration units. In the step of calculating in the method for managing of a mineral and metal-

lurgical process ramp up according to presented embodiment the step of calculating 26 produces as an output both mineral and metallurgical ramp up performance indicator data.

5 The final step in the method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to presented embodiment comprises a step of generating mineral and metallurgical ramp up model 27. The said mineral and metallurgical ramp up model is generated 27 on the basis of the received mineral and metallurgical ramp up performance indicator data as well as the received mineral and metallurgical
10 ramp up configuration units.

In the step of generating mineral and metallurgical ramp up model 27, said mineral and metallurgical ramp up model may be generated 27 also on the basis of the analysis carried out with ramp up performance processes 22. The said ramp up performance processes 22 may include one or more
15 ramp up performance processes e.g. supply chain analysis processes, benchmark evaluation processes, earned value analysis processes, quality analysis processes, delay evaluation processes, downtime value analysis processes, customer financial cost/sales analysis processes as well as capital expenditure and value proposition alignment processes.

20 In the step of generating mineral and metallurgical ramp up model 27, said mineral and metallurgical ramp up model may be generated 27 by also carrying out ramp up modelling processes, said ramp up modelling processes including one or more ramp up modelling processes, e.g. customer value tree modelling processes, investment planning processes, capital ex-
25 penditure planning processes, business optimization processes, future prognostics processes, supply chain management processes, time-to-market processes, benchmarking processes, cost reduction processes, environmental modelling processes and risk modelling processes.

Figure 10 shows a flow diagram of a third embodiment of a method
30 for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to the present invention. With Figure 10 reference is made to an architectural block diagram presented in Figure 5. The method for managing of a mineral and metallurgical process ramp up according to a third embodiment comprises a step of acquiring 24 mineral and
35 metallurgical ramp up data records, in which step of acquiring 24 the ramp up data acquisition server 13 of the mineral and metallurgical processing plant or

equipment ramp up management system 12, 21 acquires mineral and metallurgical ramp up data records from mineral and metallurgical production subprocesses 6-8 and/or from mineral and metallurgical plant operation subprocesses 17-19. Said ramp up data records acquired from the said mineral and metallurgical production subprocesses 6-8 and/or from mineral and metallurgical plant operation subprocesses 17-19 contains information and data both on the current status and on the planned status after the ramp up of the mineral and metallurgical production subprocesses 6-8 and/or from mineral and metallurgical plant operation subprocesses 17-19.

After the step of acquiring 24 the method for managing of a mineral and metallurgical process ramp up according to presented embodiment comprises a step of generating a group of mineral and metallurgical ramp up configuration units 25. The generated mineral and metallurgical ramp up configuration units define the functionality of the mineral and metallurgical process management system 12, 21 based on the collected mineral and metallurgical ramp up data records.

After the step of generating mineral and metallurgical ramp up configuration units 25 the method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to presented embodiment comprises a step of calculating mineral and metallurgical ramp up performance indicator data 28. The generated mineral and metallurgical ramp up performance indicator data is configured to forward the defined functionality associated with at least one mineral and metallurgical ramp up configuration unit of the generated group of mineral and metallurgical ramp up configuration units. In the step of calculating in the method for managing of a mineral and metallurgical process ramp up according to a third embodiment the step of calculating 28 produces as an output both mineral and metallurgical ramp up performance indicator data 29 and mineral and metallurgical ramp up performance process data 30.

The final step in the method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to presented embodiment comprises a step of generating mineral and metallurgical ramp up model 31. The said mineral and metallurgical ramp up model is generated 31 on the basis of the received mineral and metallurgical ramp up performance indicator data 29 and mineral and metallurgical ramp up perfor-

mance process data 30 as well as the received mineral and metallurgical ramp up configuration units.

In the step of generating mineral and metallurgical ramp up model 31, said mineral and metallurgical ramp up model may be generated 31 also
5 on the basis of the analysis carried out with ramp up performance processes 22. The said ramp up performance processes 22 may include one or more ramp up performance processes e.g. supply chain analysis processes, benchmark evaluation processes, earned value analysis processes, quality analysis processes, delay evaluation processes, downtime value analysis processes, customer financial cost/sales analysis processes as well as capital
10 expenditure and value proposition alignment processes.

In the step of generating mineral and metallurgical ramp up model 31, said mineral and metallurgical ramp up model may be generated 31 by also carrying out ramp up modelling processes, said ramp up modelling processes including one or more ramp up modelling processes, e.g. customer value tree modelling processes, investment planning processes, capital expenditure planning processes, business optimization processes, future prognostics processes, supply chain management processes, time-to-market processes, benchmarking processes, cost reduction processes, environmental
15 modelling processes and risk modelling processes.

Figure 11 shows a flow diagram of a fourth embodiment of a method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to the present invention. With Figure 11 reference is made to an architectural block diagram presented in Figure 5.
25 The method for managing of a mineral and metallurgical process ramp up according to a fourth embodiment comprises a step of acquiring 24 mineral and metallurgical ramp up data records, in which step of acquiring 24 the ramp up data acquisition server 13 of the mineral and metallurgical processing plant or equipment ramp up management system 12, 21 acquires mineral and metallurgical ramp up data records from mineral and metallurgical production sub-
30 processes 6-8 and/or from mineral and metallurgical plant operation subprocesses 17-19. Said ramp up data records acquired from the said mineral and metallurgical production subprocesses 6-8 and/or from mineral and metallurgical plant operation subprocesses 17-19 contains information and data both on
35 the current status and on the planned status after the ramp up of the mineral

and metallurgical production subprocesses 6-8 and/or from mineral and metallurgical plant operation subprocesses 17-19.

Respectively, the said method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to presented embodiment comprises a step of detecting 245 mineral and metallurgical ramp up development units.

After the step of acquiring mineral and metallurgical ramp up data records 24 and detecting mineral and metallurgical ramp up development units 245 the method for managing of a mineral and metallurgical process ramp up according to presented embodiment comprises a step of generating a group of updated mineral and metallurgical ramp up configuration units 25. The generated updated mineral and metallurgical ramp up configuration units define the functionality of the mineral and metallurgical process management system 12, 21 based on the collected mineral and metallurgical ramp up data records and on the detected mineral and metallurgical ramp up development units.

After the step of generating updated mineral and metallurgical ramp up configuration units 25 the method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to presented embodiment comprises a step of calculating mineral and metallurgical ramp up performance indicator data 28. The generated mineral and metallurgical ramp up performance indicator data is configured to forward the defined functionality associated with at least one mineral and metallurgical ramp up configuration unit of the generated group of mineral and metallurgical ramp up configuration units. In the step of calculating in the method for managing of a mineral and metallurgical process ramp up according to a fourth embodiment the step of calculating 28 produces as an output both mineral and metallurgical ramp up performance indicator data 29 and mineral and metallurgical ramp up performance process data 30.

The final step in the method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to presented embodiment comprises a step of generating mineral and metallurgical ramp up model 31. The said mineral and metallurgical ramp up model is generated 31 on the basis of the received mineral and metallurgical ramp up performance indicator data 29 and mineral and metallurgical ramp up performance process data 30 as well as the received mineral and metallurgical ramp up configuration units.

In the step of generating mineral and metallurgical ramp up model 31, said mineral and metallurgical ramp up model may be generated 31 also on the basis of the analysis carried out with ramp up performance processes 22. The said ramp up performance processes 22 may include one or more
5 ramp up performance processes e.g. supply chain analysis processes, benchmark evaluation processes, earned value analysis processes, quality analysis processes, delay evaluation processes, downtime value analysis processes, customer financial cost/sales analysis processes as well as capital expenditure and value proposition alignment processes.

10 In the step of generating mineral and metallurgical ramp up model 31, said mineral and metallurgical ramp up model may be generated 31 by also carrying out ramp up modelling processes, said ramp up modelling processes including one or more ramp up modelling processes, e.g. customer value tree modelling processes, investment planning processes, capital ex-
15 penditure planning processes, business optimization processes, future prognostics processes, supply chain management processes, time-to-market processes, benchmarking processes, cost reduction processes, environmental modelling processes and risk modelling processes.

Figure 12 shows a flow diagram of another embodiment of a method
20 for optimized managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to the present invention. With Figure 12 reference is made to an architectural block diagram presented in Figure 6. The method for optimized managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to
25 another embodiment comprises a step of acquiring 24 mineral and metallurgical ramp up data records, in which step of acquiring 24 the ramp up data acquisition server 13 of the mineral and metallurgical processing plant or equipment ramp up management system 12, 21 acquires mineral and metallurgical ramp up data records from mineral and metallurgical production subprocesses
30 6-8 and/or from mineral and metallurgical plant operation subprocesses 17-19. Said ramp up data records acquired from the said mineral and metallurgical production subprocesses 6-8 and/or from mineral and metallurgical plant operation subprocesses 17-19 contains information and data both on the current status and on the planned status after the ramp up of the mineral and metal-
35 lurgical production subprocesses 6-8 and/or from mineral and metallurgical plant operation subprocesses 17-19.

After the step of acquiring 24 the method for managing of a mineral and metallurgical process ramp up according to presented embodiment comprises a step of generating a group of mineral and metallurgical ramp up configuration units 25. The generated mineral and metallurgical ramp up configuration units define the functionality of the mineral and metallurgical process management system 12, 21 based on the collected mineral and metallurgical ramp up data records.

Respectively, the said method for optimized managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to presented embodiment comprises a step of receiving 42 ramp up optimization process data records and thereafter comprises a step of generating 43 ramp up optimization process configuration units.

After the step of generating mineral and metallurgical ramp up configuration units 25 and ramp up optimization process configuration units 43 the method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to presented embodiment comprises a step of calculating mineral and metallurgical ramp up performance indicator data 28. The generated mineral and metallurgical ramp up performance indicator data is configured to forward the defined functionality associated with at least one mineral and metallurgical ramp up configuration unit of the generated group of mineral and metallurgical ramp up configuration units. In the step of calculating in the method for managing of a mineral and metallurgical process ramp up according to another embodiment the step of calculating 28 produces as an output both mineral and metallurgical ramp up performance indicator data 29 and mineral and metallurgical ramp up performance process data 30.

The final step in the method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to presented embodiment comprises a step of generating mineral and metallurgical ramp up model 31. The said mineral and metallurgical ramp up model is generated 31 on the basis of the received mineral and metallurgical ramp up performance indicator data 29 and mineral and metallurgical ramp up performance process data 30 as well as the received mineral and metallurgical ramp up configuration units.

In the step of generating mineral and metallurgical ramp up model 31, said mineral and metallurgical ramp up model may be generated 31 also

on the basis of the analysis carried out with ramp up performance processes 22. The said ramp up performance processes 22 may include one or more ramp up performance processes e.g. supply chain analysis processes, benchmark evaluation processes, earned value analysis processes, quality analysis processes, delay evaluation processes, downtime value analysis processes, customer financial cost/sales analysis processes as well as capital expenditure and value proposition alignment processes.

In the step of generating mineral and metallurgical ramp up model 31, said mineral and metallurgical ramp up model may be generated 31 by also carrying out ramp up modelling processes, said ramp up modelling processes including one or more ramp up modelling processes, e.g. customer value tree modelling processes, investment planning processes, capital expenditure planning processes, business optimization processes, future prognostics processes, supply chain management processes, time-to-market processes, benchmarking processes, cost reduction processes, environmental modelling processes and risk modelling processes.

Figure 13 shows a flow diagram of one embodiment of an implementation of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to the present invention. The implementation of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals according to the presented embodiment comprises the steps of implementing 51 a mineral and metallurgical ramp up model, measuring 52 the mineral and metallurgical ramp up performance, optimizing 53 said mineral and metallurgical ramp up model, updating 54 said mineral and metallurgical ramp up model, and repeating the said above mentioned steps 51-54 until finally finishing said ramp up 55.

The presented solution for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals captures the business value of the constraints and aims to provide a solution that not only optimizes the ramp up process to the maximum but also optimizes the value stream of all incoming and outgoing materials, covering both the recovery of the ore body but and the forecasted market prices for the materials produced.

The presented system for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals will also provide best practices for ramp up operations, processes and structures. The presented system will dramatically shorten the time needed for any production

facility to reach an optimal competed ramp up. The presented ramp up model system provides enterprise support through extensive service-oriented integration approach combined with enterprise level content. This enables easy connectivity to needed enterprise level objects which is supported by processes and content.

The presented system for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals offers true end-to-end visibility of ramp up operations and modern tools for ramp up management. This enables customer enterprise to take advantage of the best available technology. The presented system also enables collection of vast amounts of data which makes continuous improvement programs possible also after the ramp up has been completed.

The presented system for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals collects and optimizes operations and maintenance, and also simultaneously optimizes the supply chain. This will reap great benefits in minimized stock value, cash to cash cycles and improved spare and wear availability.

With the help of the solution according to the present invention the manufacturers of mineral and metallurgical process equipment will be able to provide a system for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals which system has a faster and more reliable ramp up process as well as provides better support for the ramp up deployment when compared to the prior art solutions.

It will be obvious to a person skilled in the art that, as the technology advances, the inventive concept can be implemented in various ways. The invention and its embodiments are not limited to the examples described above but may vary within the scope of the claims.

CLAIMS

1. A method for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals,

characterized in that said method comprises steps of:

5 - acquiring (24) mineral and metallurgical ramp up data records from mineral and metallurgical production subprocesses (6-8) and/or from mineral and metallurgical plant operation subprocesses (17-19);

10 - generating (25) a group of mineral and metallurgical ramp up configuration units, said ramp up configuration units defining the functionality of a mineral and metallurgical processing plant or equipment ramp up management system (12), (21) based on the collected mineral and metallurgical ramp up data records;

15 - calculating (26), (28) mineral and metallurgical ramp up performance indicator data (29), said ramp up performance indicator data being configured to forward the defined functionality associated with at least one mineral and metallurgical ramp up configuration unit of the generated group of mineral and metallurgical ramp up configuration units; and

20 - generating a mineral and metallurgical ramp up model (27), (31) on the basis of the received mineral and metallurgical ramp up performance indicator data (29) and the received mineral and metallurgical ramp up configuration units.

2. A method according to claim 1, **characterized** in that said method comprises steps of:

25 - monitoring performance indicator data of mineral and metallurgical production subprocesses (6-8) and/or from mineral and metallurgical plant operation subprocesses (17-19); and

 - detecting (245) mineral and metallurgical ramp-up development units, said ramp-up development units being triggered by said performance indicator data;

30 so that:

 - in the step of ramp up configuration units generating (25), said ramp up configuration units define the said functionality based on the collected mineral and metallurgical ramp up data records and on the detected mineral and metallurgical ramp-up development units.

3. A method according to claim 1 or to claim 2, **characterized** in that said method comprises steps of:

- receiving (42) ramp up optimization process data records from an at least one optimization process unit (41);

5 - generating (43) a group of ramp up optimization process configuration units, said ramp up optimization process configuration units defining the functionality of an at least one optimization process;

so that:

10 - in the step of calculating (26), (28), said ramp up performance indicator data is configured also to forward the defined functionality associated with at least one ramp up optimization process configuration unit of the generated group of ramp up optimization process configuration units.

4. A method according to any one of claims 1 to 3, **characterized** in that in the step of acquiring (24) said ramp up data records contain
15 information and data both on the current status and on the planned status after the ramp up of the mineral and metallurgical production subprocesses (6-8) and/or from mineral and metallurgical plant operation subprocesses (17-19).

5. A method according to any one of claims 1 to 4, **characterized** in that in the step of calculating (28) also mineral and metallurgical
20 ramp up performance process data (30) is calculated; and in that in the step of ramp up model generating (31), mineral and metallurgical ramp up model (31) is generated also on the basis of the received mineral and metallurgical ramp up performance process data (30).

6. A method according to any one of claims 1 to 5, **characterized** in that the said ramp up optimization processes (41) include one or
25 more of the following processes (41): a mineral and metallurgical site ramp up optimization process, a plant ramp up optimization process, a ramp up process optimization process, a ramp up sub-process optimization process, an equipment ramp up optimization process, a ramp up financial optimization process,
30 a capital expenditure optimization process, a business optimization process, a project flow optimization process, a ramp up deployment optimization process, a supply chain optimization process, a ramp up benchmark optimization process, a mineral and metallurgical site benchmark optimization process, a plant benchmark optimization process, a process benchmark optimization process, a
35 sub-process benchmark optimization process, an equipment benchmark opti-

mization process, an earned value analysis optimization process, a ramp up logistics optimization process, a project delay analysis optimization process.

7. A method according to any one of claims 1 to 6, **characterized** in that the said mineral and metallurgical production subprocesses (6-8) include one or more of the following processes (6-8): a crushing process, a grinding process, a screening process, a classification process; a flotation process, a gravity separation process, an electrostatic separation process, a magnetic separation process, a dewatering process, a leaching processes, a filtering process, a thickening process, a solvent extraction process, a stripping process, an electrowinning process, an electrorefining process, a precipitation process, a smelting process, an anode casting process, a furnace process, a calcination process, a roasting process, an agglomeration process, a direct reduction process, a smelting reduction process, a gas cooling process, a gas cleaning process, an aluminum production process, a precious metals production process, a ferroalloys production process, a sulphuric acid plant process, an industrial water treatment process, a waste to energy process, oil wining process, a thermal process.

8. A method according to any one of claims 1 to 7, **characterized** in that the said mineral and metallurgical plant operation subprocesses (17-19) include one or more of the following processes (17-19): an ore acquiring process, an ore blasting process, a feed creation process, a feed preparation process, product logistics management process, a customer business plan process, a resource management process, a quality management process, a legal requirement management process, an environmental constraint management process.

9. A method according to any one of claims 1 to 8, **characterized** in that in the step of ramp up model generating (27), (31), said mineral and metallurgical ramp up model is generated (27), (31) also on the basis of the analysis carried out with ramp up performance processes (22), said ramp up performance processes (22) including one or more of the following ramp up performance processes (22): a supply chain analysis process, a benchmark evaluation process, an earned value analysis process, a quality analysis process, a delay evaluation process, a downtime value analysis process, a customer financial cost/sales analysis process, a capital expenditure and value proposition alignment process.

10. A method according to any one of claims 1 to 9, **characterized** in that in the step of ramp up model generating (27), (31), said mineral and metallurgical ramp up model is generated (27), (31) also by carrying out ramp up modelling processes, said ramp up modelling processes including one
5 or more of the following ramp up modelling processes: a customer value tree modelling process, an investment planning process, a capital expenditure planning process, a business optimization process, a future prognostics process, a supply chain management process, a time-to-market process, a benchmarking process, a cost reduction process, an environmental modelling
10 process, a risk modelling process.

11. A method according to any one of claims 1 to 10, **characterized** in that said method comprises a step of:

- implementing the said mineral and metallurgical ramp up model.

12. A system for managing of a ramp up of a mineral and metallurgical
15 processing plant or equipment for obtaining metals, **characterized** in that said system comprises a ramp up data acquisition server (13), a database (14) and a ramp up model generation server (15), wherein:

- said ramp up data acquisition server (13) is configured to acquire mineral and metallurgical ramp up data records from mineral and metallurgical
20 production subprocesses (6-8) and/or from mineral and metallurgical plant operation subprocesses (17-19), and to forward said mineral and metallurgical ramp up data records to said database (14) and/or to ramp up model generation server (15), and

- said ramp up model generation server (15) is configured:
25
 - to receive mineral and metallurgical ramp up data records from said ramp up data acquisition server (13) and/or from said database (14),
 - to generate a group of mineral and metallurgical ramp up configuration units, said ramp up configuration units defining the functionality of a mineral and metallurgical processing plant or equipment ramp up management system (12), (21) based on the collected mineral and metallurgical ramp
30 up data records,

- to calculate (26), (28) mineral and metallurgical ramp up performance indicator data (29), said ramp up performance indicator data being configured to forward the defined functionality associated with at least one
35 mineral and metallurgical ramp up configuration unit of the generated group of mineral and metallurgical ramp up configuration units; and

- to generate (27), (31) a mineral and metallurgical ramp up model (27), (31) on the basis of the received mineral and metallurgical ramp up performance indicator data (29) and the received mineral and metallurgical ramp up configuration units.

5 13. A system according to claim 12, **characterized** in that the said ramp up model generation server (15) is configured:

- to receive detected (245) mineral and metallurgical ramp-up development units, said ramp-up development units being triggered by monitored performance indicator data of mineral and metallurgical production sub-
10 processes (6-8) and/or from mineral and metallurgical plant operation sub-
 processes (17-19).

14. A system according to claim 12 or to claim 13, **character-
ized** in that the said ramp up model generation server (15) is configured:

- to receive ramp up optimization process data records from an
15 at least one optimization process unit (41),

- to generate a group of ramp up optimization process configuration units, said ramp up optimization process configuration units defining the functionality of an at least one optimization process,

so that said ramp up performance indicator data is configured also to
20 forward the defined functionality associated with at least one ramp up optimization process configuration unit of the generated group of ramp up optimization process configuration units.

15. A system according to any one of claims 12 to 14, **character-
ized** in that the said ramp up data records contain information and data both
25 on the current status and on the planned status after the ramp up of the mineral and metallurgical production subprocesses (6-8) and/or from mineral and metallurgical plant operation subprocesses (17-19).

16. A system according to any one of claims 12 to 15, **character-
ized** in that the said ramp up optimization processes (41) include one or
30 more of the following processes (41): a mineral and metallurgical site ramp up optimization process, a plant ramp up optimization process, a ramp up process optimization process, a ramp up sub-process optimization process, an equipment ramp up optimization process, a ramp up financial optimization process, a capital expenditure optimization process, a business optimization process, a
35 project flow optimization process, a ramp up deployment optimization process, a supply chain optimization process, a ramp up benchmark optimization process,

cess, a mineral and metallurgical site benchmark optimization process, a plant benchmark optimization process, a process benchmark optimization process, a sub-process benchmark optimization process, an equipment benchmark optimization process, an earned value analysis optimization process, a ramp up logistics optimization process, a project delay analysis optimization process.

17. A system according to any one of claims 12 to 16, **characterized** in that the said mineral and metallurgical production subprocesses (6-8) include one or more of the following processes (6-8): a crushing process, a grinding process, a screening process, a classification process; a flotation process, a gravity separation process, an electrostatic separation process, a magnetic separation process, a dewatering process, a leaching processes, a filtering process, a thickening process, a solvent extraction process, a stripping process, an electrowinning process, an electrorefining process, a precipitation process, a smelting process, an anode casting process, a furnace process, a calcination process, a roasting process, an agglomeration process, a direct reduction process, a smelting reduction process, a gas cooling process, a gas cleaning process, an aluminum production process, a precious metals production process, a ferroalloys production process, a sulphuric acid plant process, an industrial water treatment process, a waste to energy process, oil wining process, a thermal process.

18. A system according to any one of claims 12 to 17, **characterized** in that the said mineral and metallurgical plant operation subprocesses (17-19) include one or more of the following processes (17-19): an ore acquiring process, an ore blasting process, a feed creation process, a feed preparation process, product logistics management process, a customer business plan process, a resource management process, a quality management process, a legal requirement management process, an environmental constraint management process.

19. A system according to any one of claims 12 to 18, **characterized** in that the said ramp up model generation server (15) is configured to receive analysis carried out with ramp up performance processes (22), said ramp up performance processes (22) including one or more of the following ramp up performance processes (22): a supply chain analysis process, a benchmark evaluation process, an earned value analysis process, a quality analysis process, a delay evaluation process, a downtime value analysis pro-

cess, a customer financial cost/sales analysis process, a capital expenditure and value proposition alignment process.

20. A system according to any one of claims 12 to 19, **characterized** in that the said ramp up model generation server (15) is configured to
5 generate said mineral and metallurgical ramp up model also by carrying out ramp up modelling processes, said ramp up modelling processes including one or more of the following ramp up modelling processes: a customer value tree modelling process, an investment planning process, a capital expenditure planning process, a business optimization process, a future prognostics process,
10 cess, a supply chain management process, a time-to-market process, a benchmarking process, a cost reduction process, an environmental modelling process, a risk modelling process.

21. A system according to any one of claims 12 to 20, **characterized** in that the said database (14) is integrated to the said ramp up model
15 generation server (15) or to the said ramp up data acquisition server (13).

22. A system according to any one of claims 12 to 20, **characterized** in that the said ramp up model generation server (15) and the said ramp up data acquisition server (13) are realised as one server.

23. A system according to claim 22, **characterized** in that the
20 said database (14) is integrated to the said one server.

24. A use of a system according to any one of claims 12 to 23 for managing of a ramp up of a mineral and metallurgical processing plant or equipment for obtaining metals.

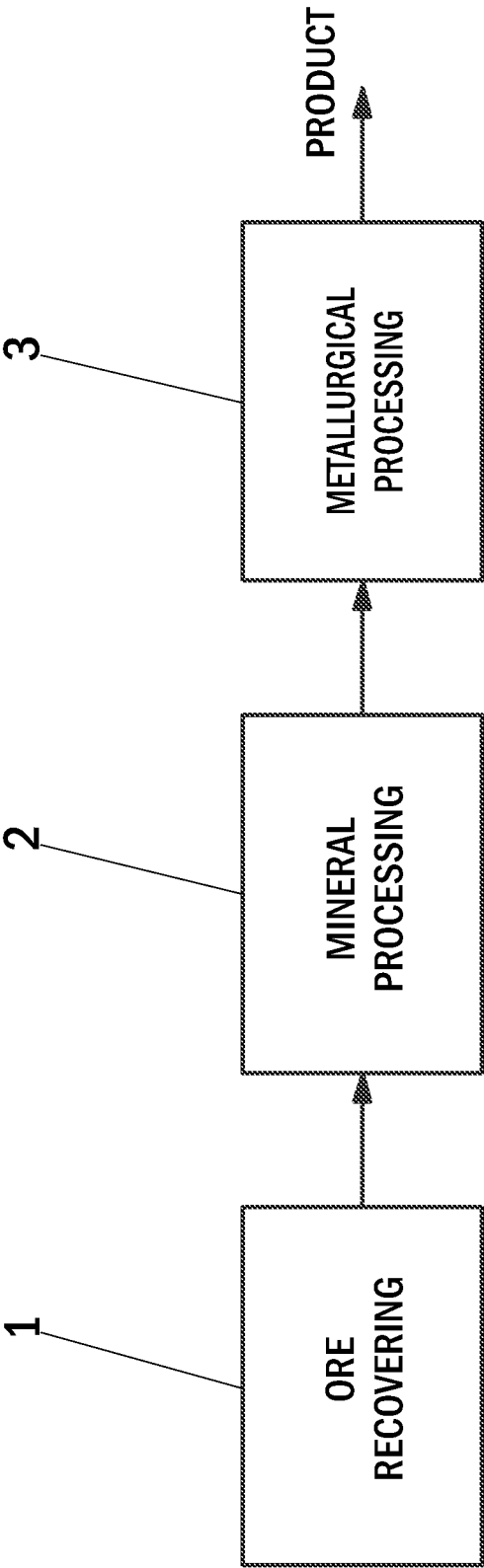


Fig. 1

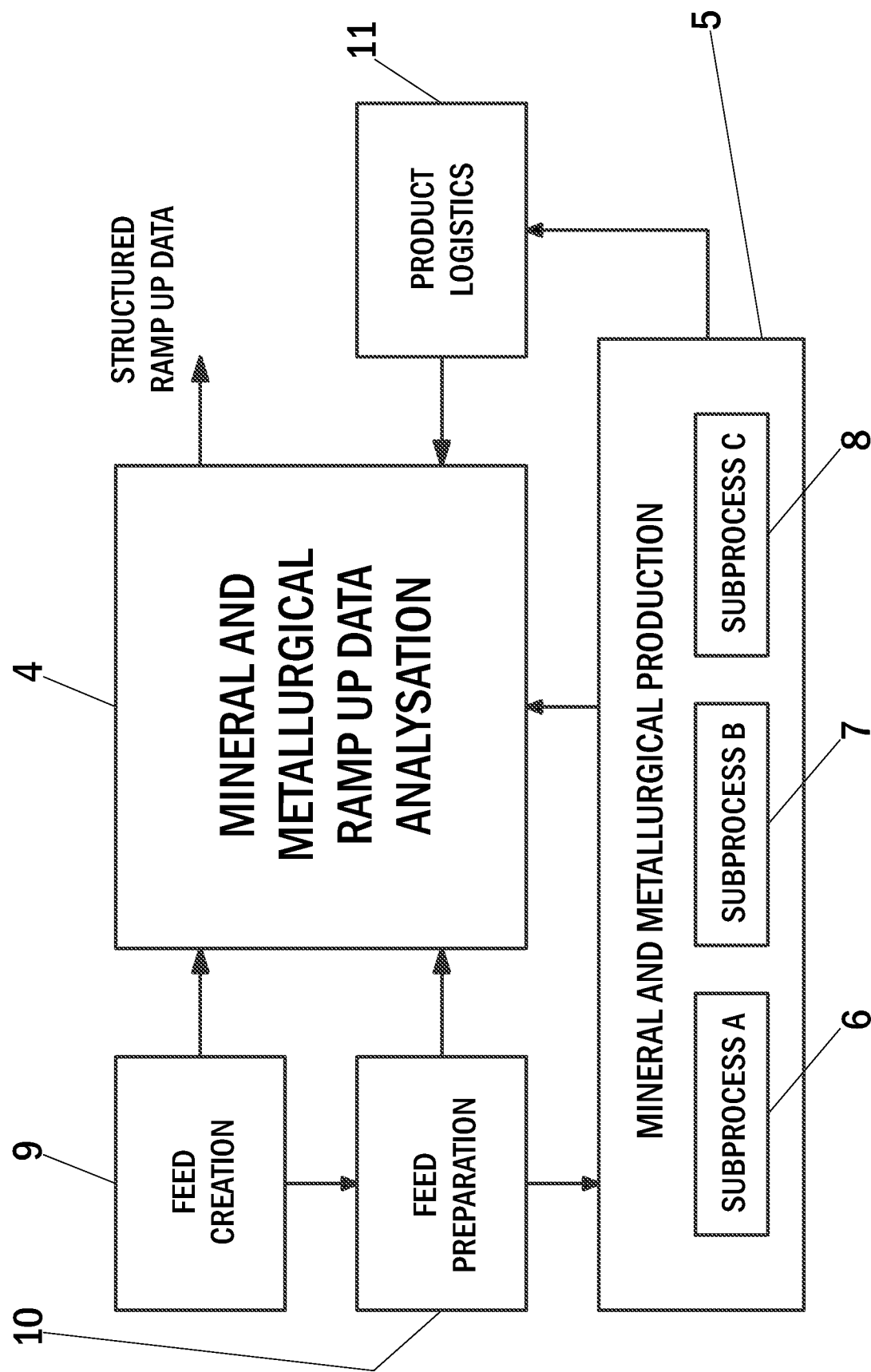


Fig. 2

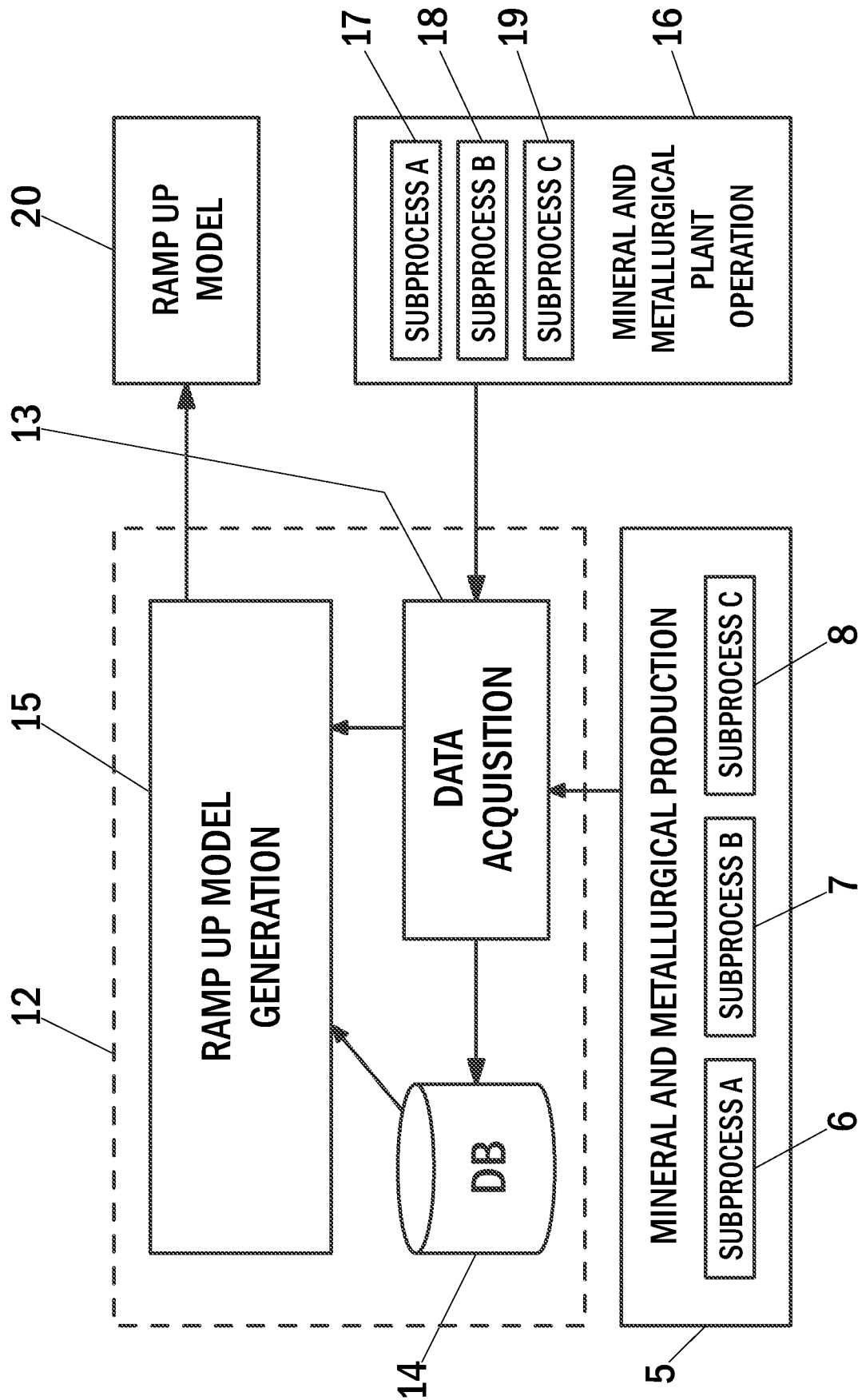


Fig. 3

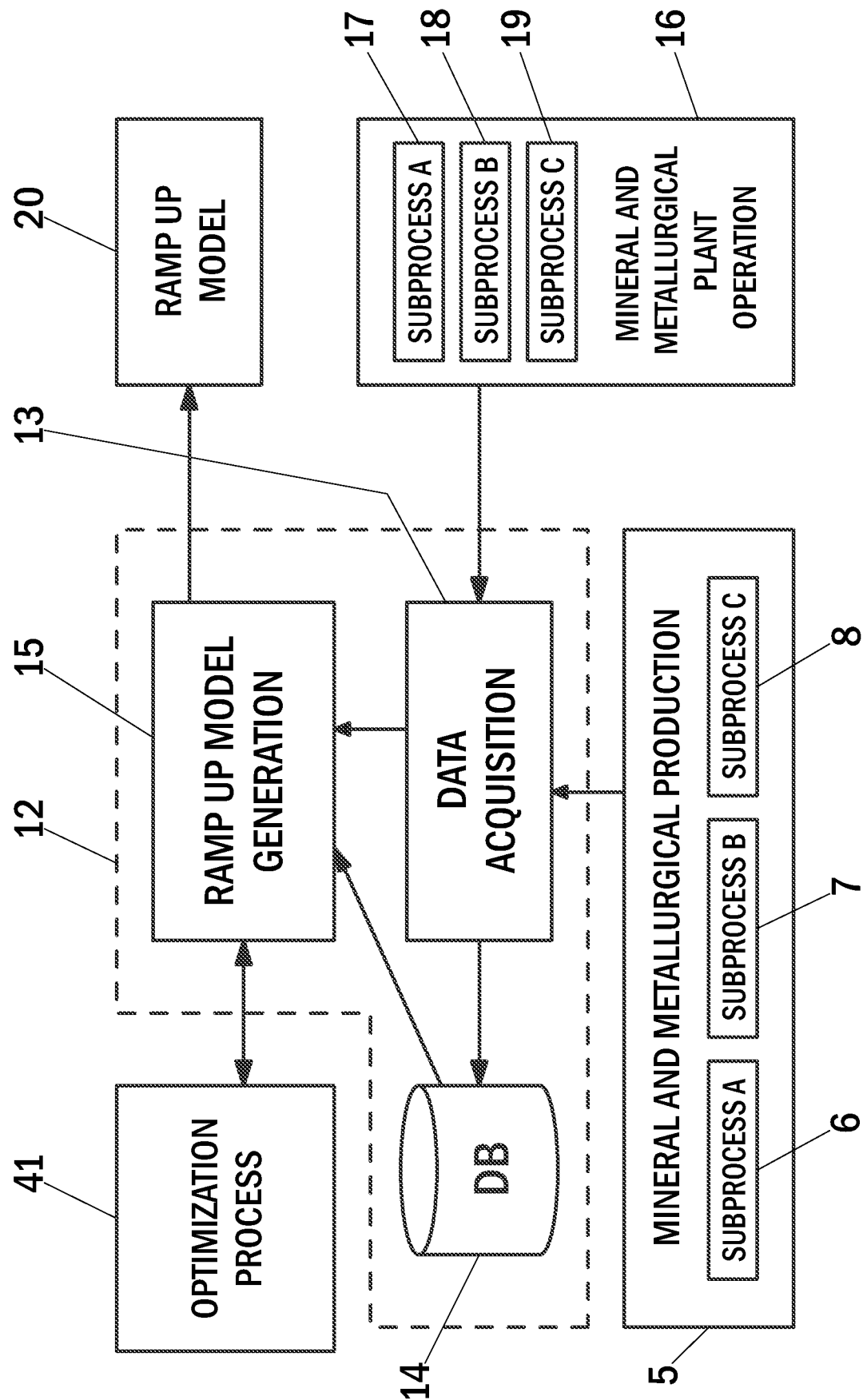


Fig. 4

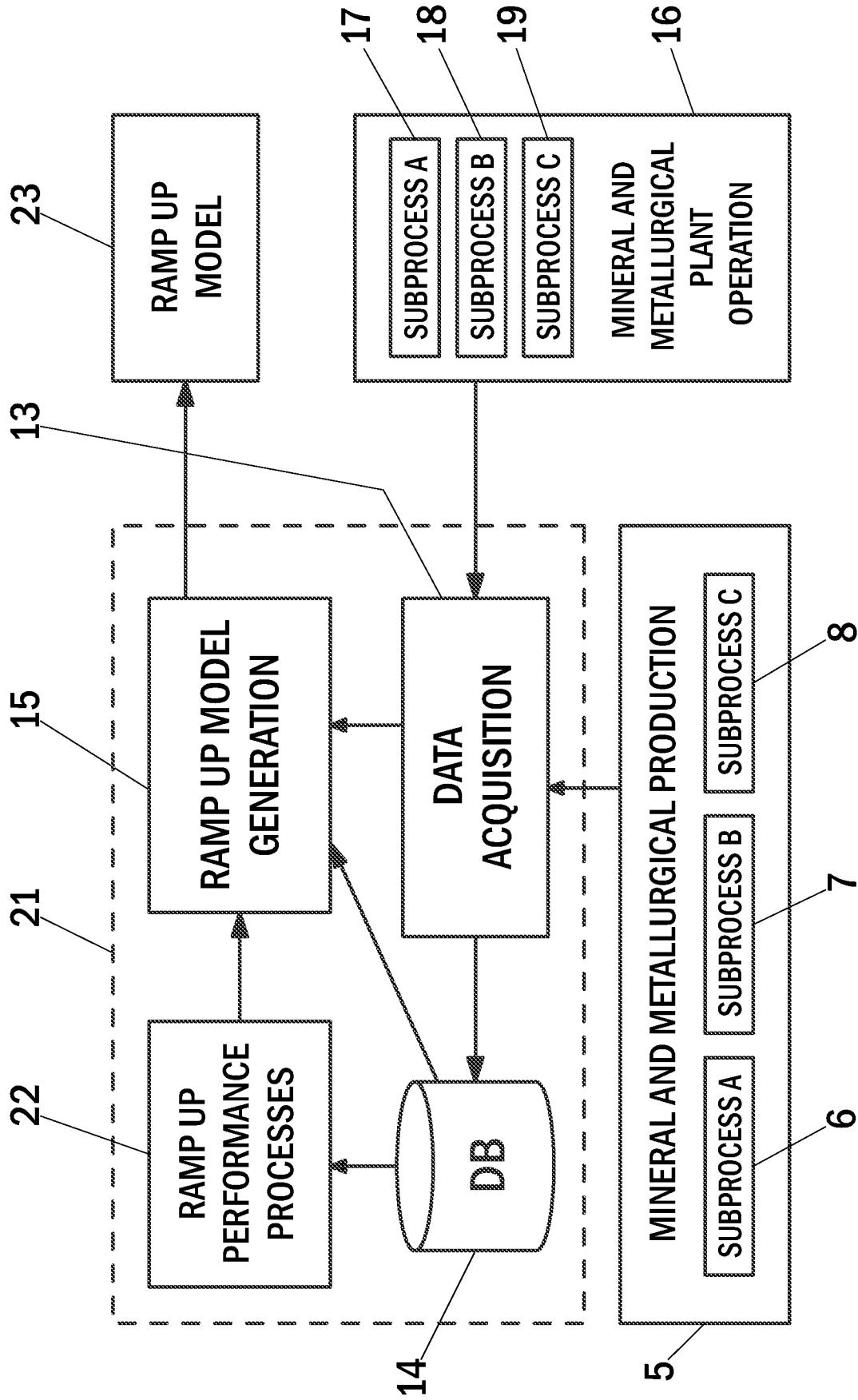


Fig. 5

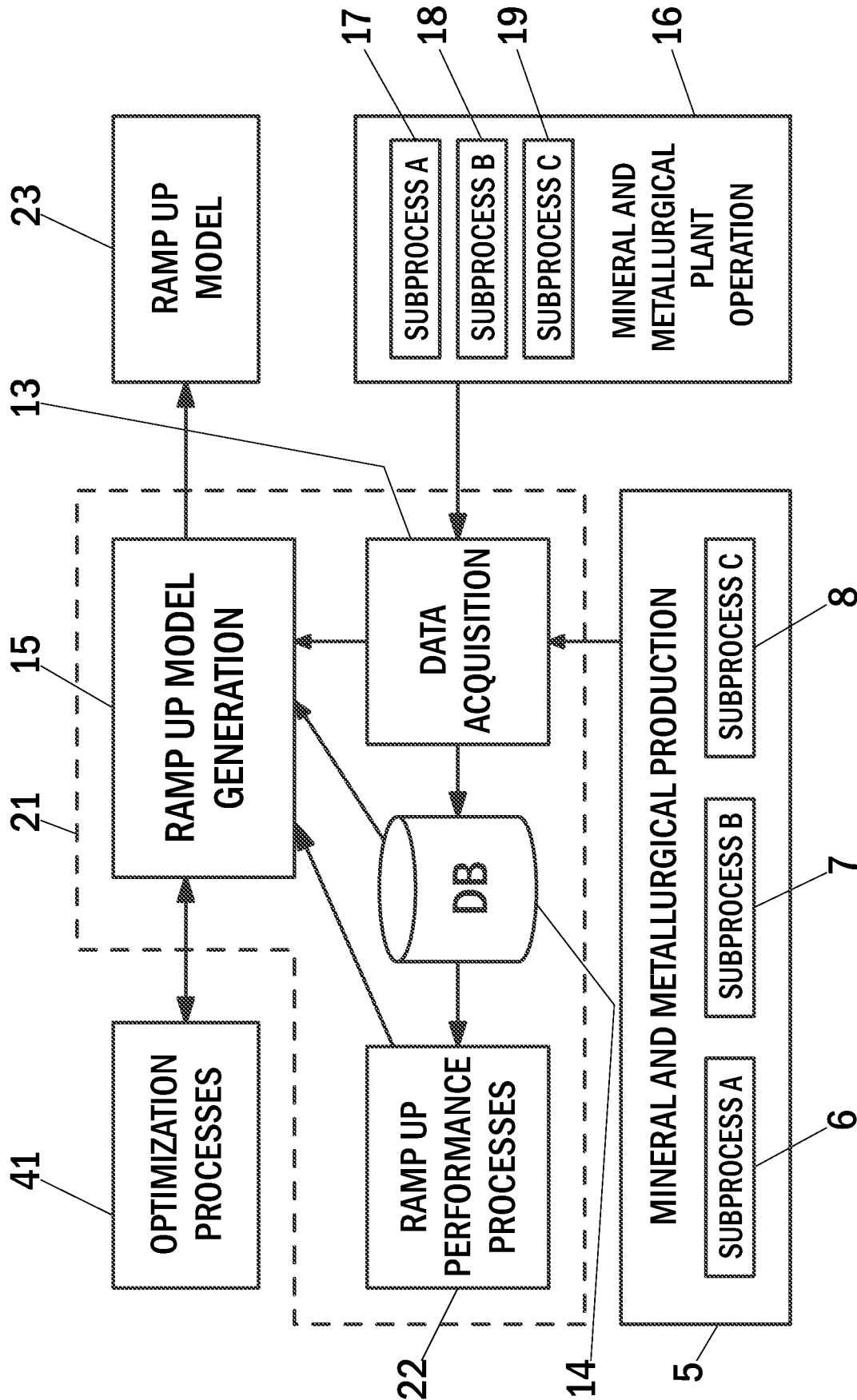
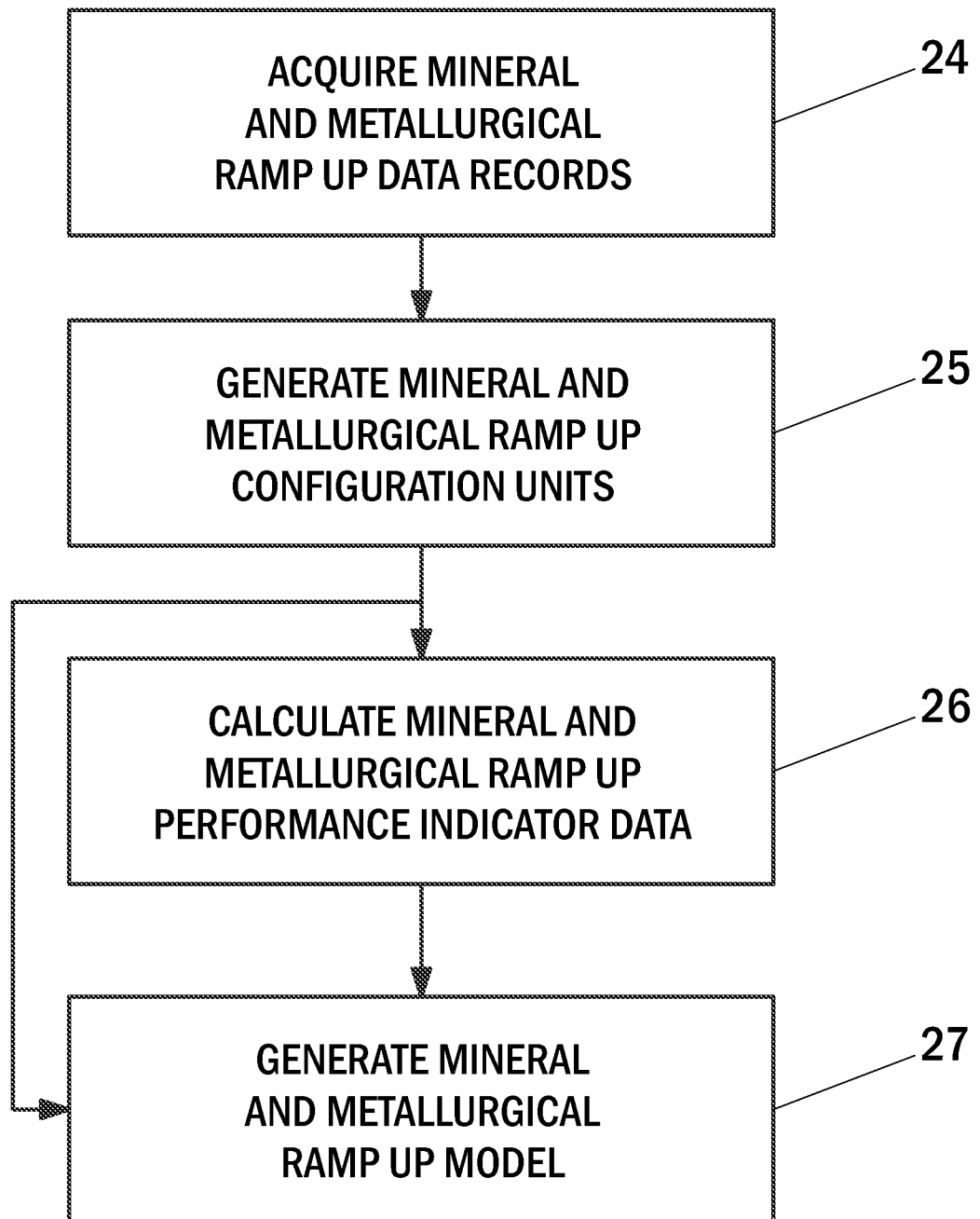
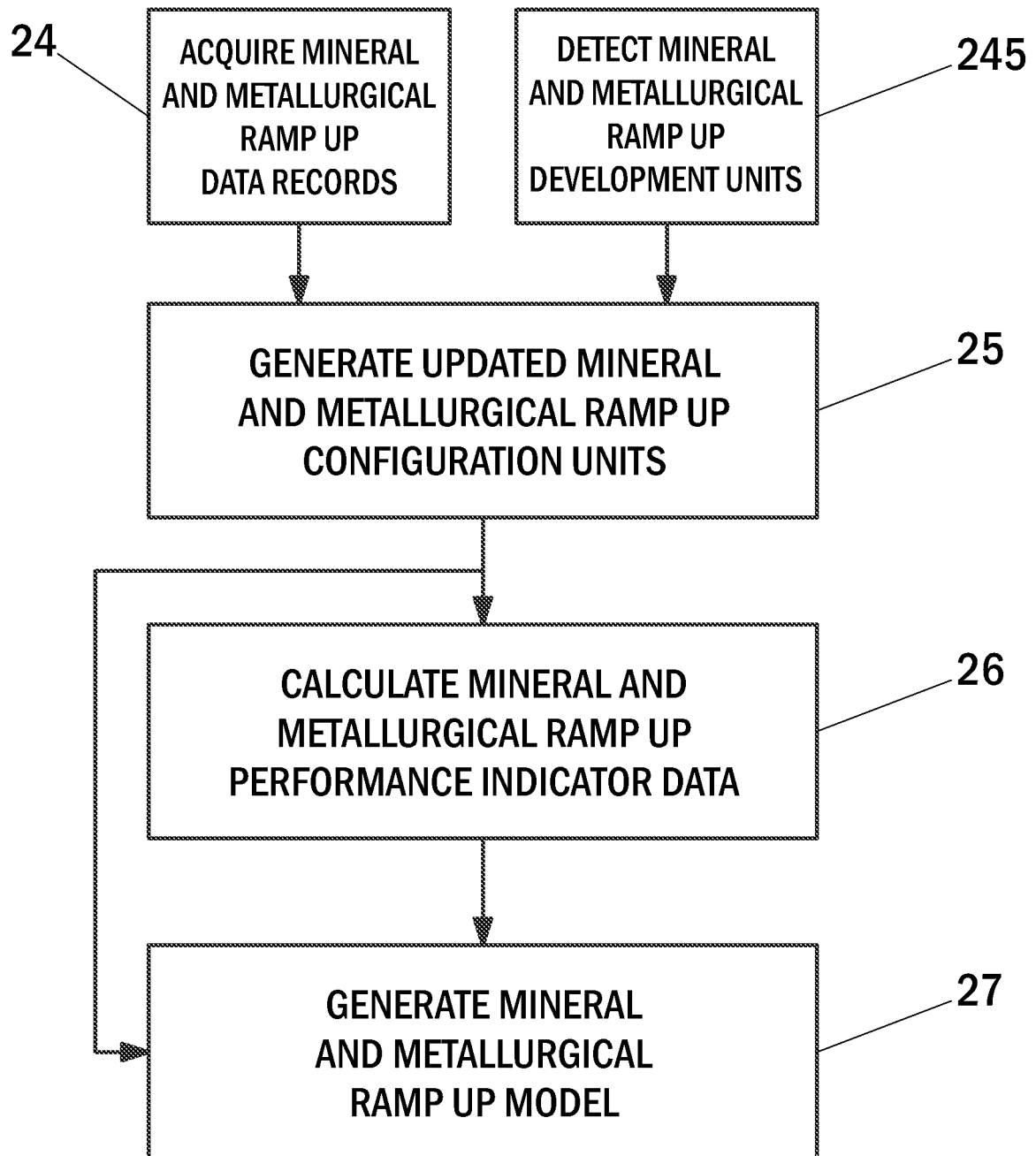


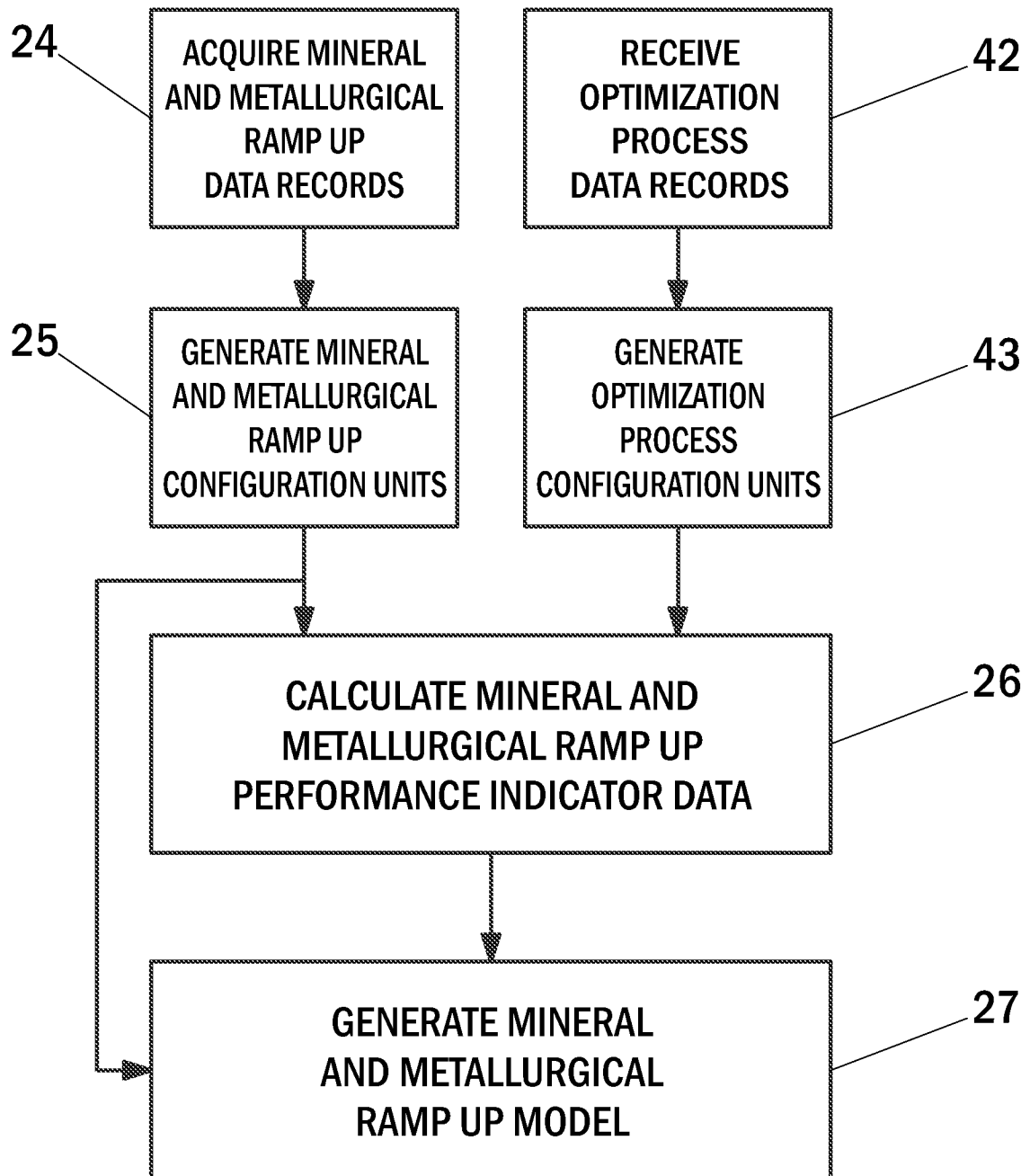
Fig. 6

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**Fig. 7**

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**Fig. 8**

**Fig. 9**

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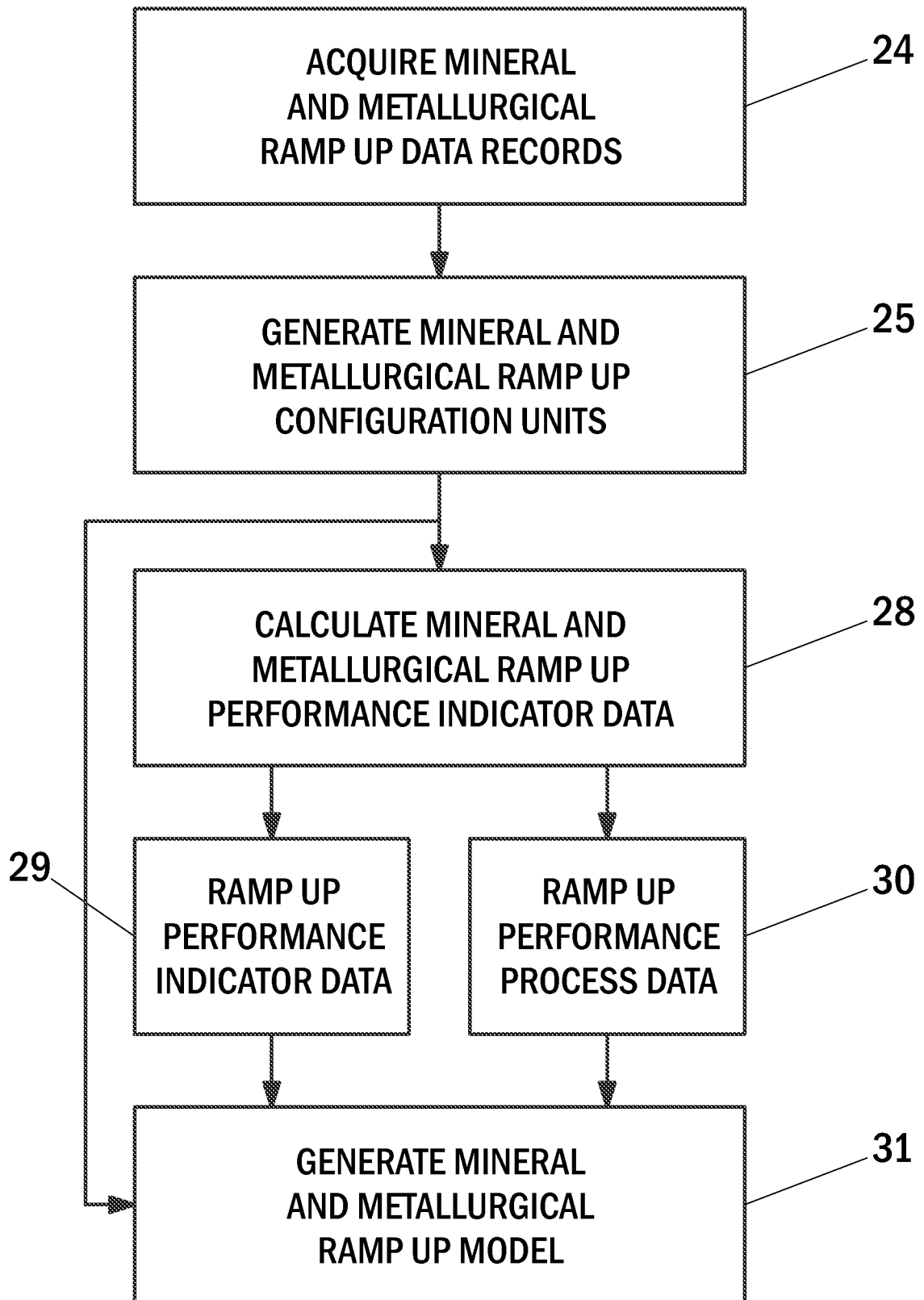


Fig. 10

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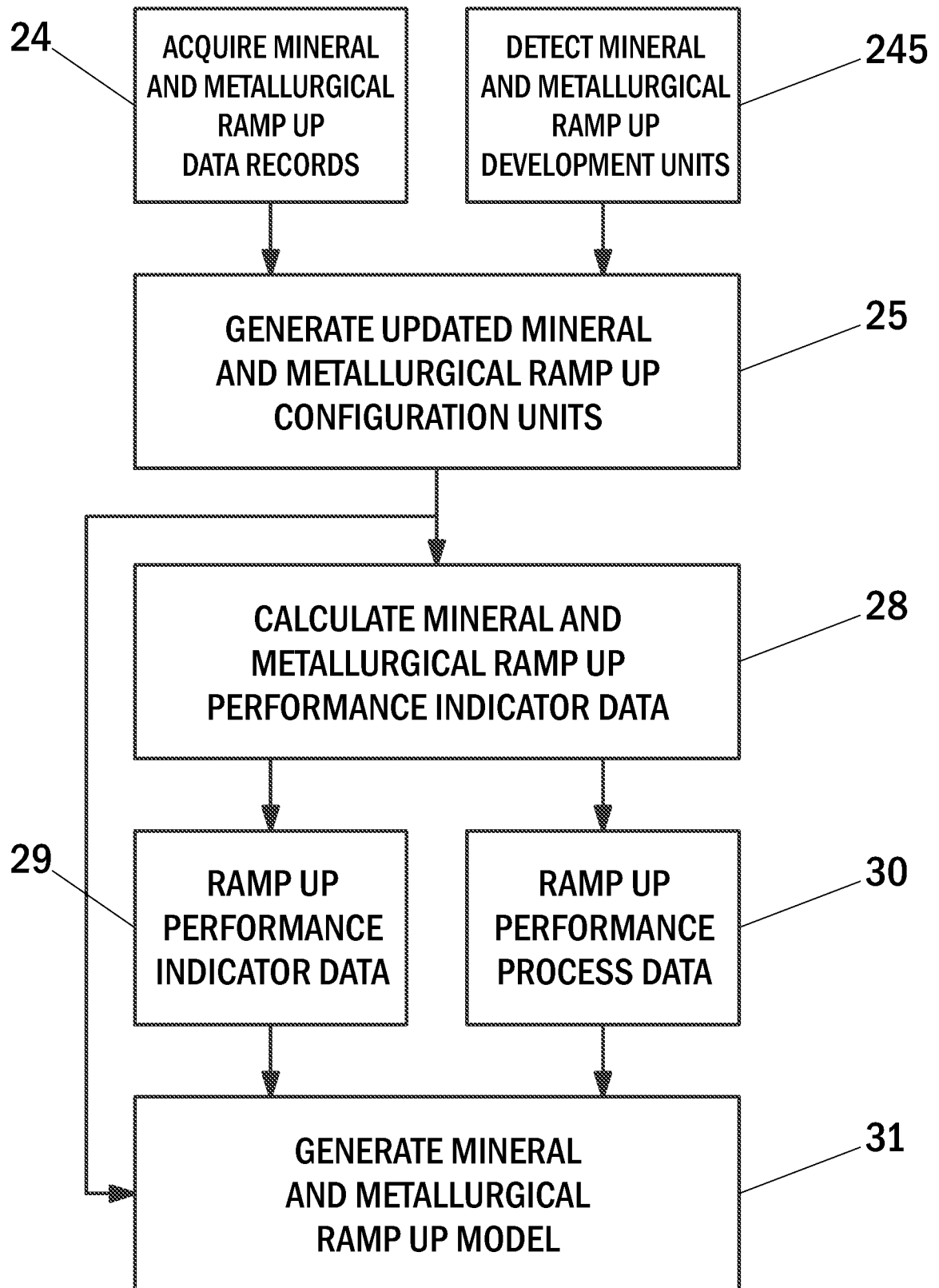


Fig. 11

12/13

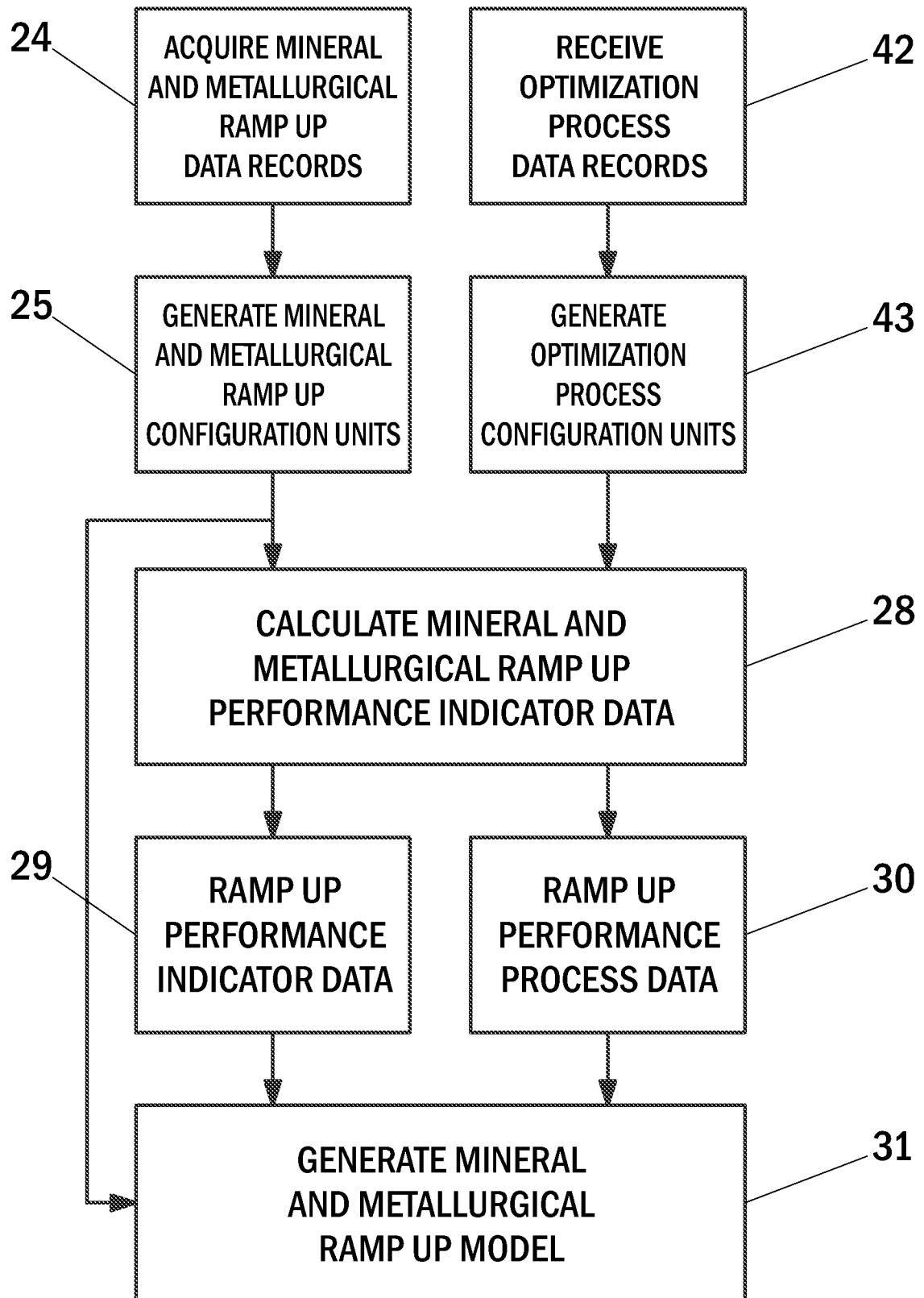
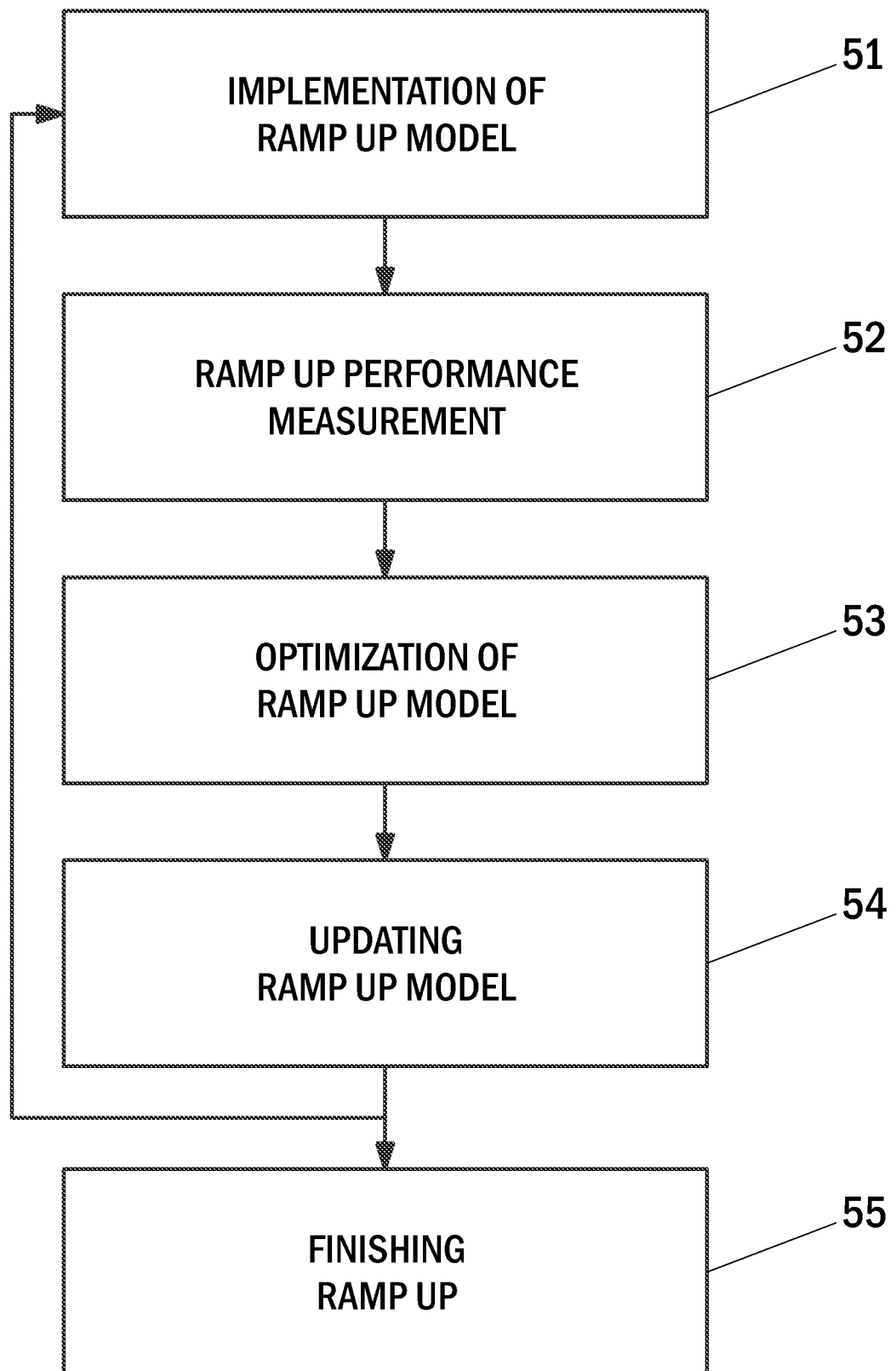


Fig. 12

13/13

**Fig. 13**

INTERNATIONAL SEARCH REPORT

International application No
PCT/FI2015/050951

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06Q10/06
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	The claimed subject-matter, with due regard to the description and drawings in accordance with Rule 33.3 PCT, relates to processes comprised in the list of subject-matter and activities for which no search is required under Rule 39 PCT. The information technology employed as an enabler for carrying out said processes is so well-known that its existence at the relevant date cannot reasonably be disputed. The claimed technical features, namely a networked computer system and a database, are therefore considered to be part of the notorious knowledge, for which no documentary evidence is deemed necessary. (see Guidelines for Search and Examination at the European Patent Office as PCT Authority, B-VIII, 2.2.1 and Euro-PCT Guide, C-III, 255) -----	

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Further documents are listed in the continuation of Box C.

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See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

21 April 2016

Date of mailing of the international search report

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