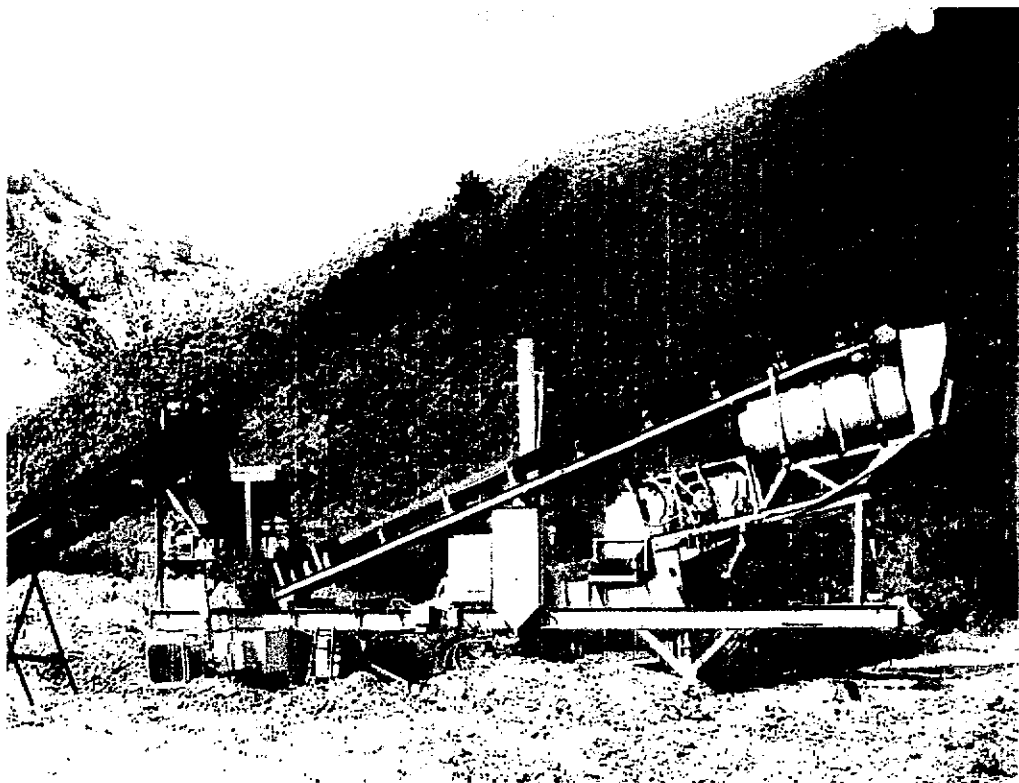


TERRA THUNDERBIRD 25/50 PORTABLE PLACER PLANT OPERATIONS MANUAL



OPERATIONS MANUAL

THUNDERBIRD 25/50 PORTABLE PLACER PLANT

The Terra Mining Products, Inc. Thunderbird 25/50 Portable Placer Plant is designed for volume testing or small mining operations with the processing of auriferous (gold bearing) gravels. Placer gold is gold that has been released by natural events and is included with gravels. This placer gold is normally recoverable by specific gravity. The capacity of the plant is regulated by the capacity of the recovery system. The percentage of $\frac{1}{4}$ " minus material in the head feed is the determining factor. The 25/50 therefore has a maximum capacity of fifty tons per hour (50tph). This is considering the capacity of the other components included in the plant system.

Terra Mining Products, Inc. has extensive experience designing and manufacturing placer gold processing and recovery systems for the mining industry all over the world.

The THUNDERBIRD PORTABLE PLACER PLANT consists of a RECEIVING HOPPER (Feed Hopper) with a HINGED GRIZZLY for the removal of oversized material. This receiving hopper (feed hopper) may be fed directly by hydraulic excavator or by a combination of a skid mounted variable speed feed hopper in combination with a feed conveyor. The material fed into this combination would be discharged into the feed hopper mounted on the plant.

There is a VARIABLE SPEED BELT FEEDER that controls the amount of material being discharged from the feed hopper. The feed hopper has a SWING GATE with a weight attachment at the discharge to further control the rate of the discharged material. The material from the variable speed belt feeder is discharged onto the FEED CONVEYOR. This conveyor is hinged to allow for travel. Side boards are included on the feed conveyor to prevent material (larger rocks) from falling off the conveyor and becoming a hazard. The material is carried up the feed conveyor and discharged via a FEED CHUTE into a REVOLVING SCRUBBER.

The revolving scrubber is designed to scrub the gravels, break up cemented aggregates and emulsify clays before discharge onto a TWO (2) DECK INCLINED VIBRATING WET SCREEN.

The incline wet screen is there to provide wash/rinse of the aggregate while being sized for distribution to the heavy media recovery units.

The larger gravels ($\frac{5}{8}$ " plus) are discharged into a NUGGET TRAP SYSTEM before discharge onto a SIDE DISCHARGE CONVEYOR. The $\frac{5}{8}$ " minus material is discharged into a PRIMARY RECOVERY SUMP. This sump is to provide immediate evaluation of the current head feed for values. This recovery sump will be discussed further in detail.

All the $\frac{5}{8}$ " material and water are now discharged onto the ROUGHER JIG.

The top of the jig hutch is equipped with a stainless steel screen with 1/8" openings. On top of this screen are "SHOT TRAYS". These trays contain "BEDDING MATERIAL". This is normally 1/8"x 3/8" steel shot or any other material having a specific gravity of 6 to 8.

This unit is designed to provide separation of the heavier media (gold and black sands). The advantages of a jig recovery system are many fold. Increased gold recovery by 40% where most of the recovery has been in the 150-300 mesh size. Increased production time because the jig is a self cleaning, producing a constant concentrate. The jig has low water requirements that can be operated with an ore pulp density that can vary up to 40% solids by weight. There is immediate feedback of production as the jig concentrates are discharged for immediate evaluation. There is a return on investment as a jig recovery system is returned through increased production and gold recovery along with less "clean-up" time, less water consumption (smaller pumps/lower water availability). The concentrates are discharged into a SUMP. A SUBMERSIBLE SLURRY PUMP is placed inside the sump to pump the concentrates up into a RECEIVING DEWATERING BIN. This concentrate dewatering bin discharges onto a FINISHING JIG to further concentrate and separate the placer gold from the heavy black sands and other heavy concentrates.

The rougher jig discharges the lighter sands, gravels and water into a MULTI BAY SLUICE BOX. This unit is used as a "tattle-tail" to insure no values have escaped and to compensate for surging of feed or power shutdown of the rougher jig allowing values within the system not being lost.

ELECTRICAL POWER for the plant system is provided by a self contained DIESEL POWERED GENERATOR with sufficient capacity to power all the components. This component is mounted on a carrier for shipment only and is to be removed for operation. GUARDING of all necessary units has been done in compliance of MSHA requirements. All the components, the feed hopper, feed conveyor, rotary scrubber, incline wet screen, rougher jig, concentrate bin, multi-bay sluice box, stand pipe, concentrate hopper, hoses, pumps, generator and electrical controls are all mounted or contained for travel on a SINGLE AXLE TRAILER. This trailer is equipped with air brakes, travel and brake lights and a very important component leveling screw jacks on all four corners to provide total leveling in all directions for operations of the plant system.

OPERATION and SPECIFICATIONS: consisting of the following:

FEED HOPPER (fig. 1): The feed hopper is structurally attached to the carrier. This unit consists of a four (4) sided steel hopper. Mounted on the top of this hopper is a hinged grizzly. This hinged grizzly is to "grizzle off" the oversized material. The spacing is set normally at 6", however additional bars may be added to increase the size of the grizzled material and to reduce the size of material being fed to the recovery system. The hinged grizzly may be dumped by raising the side of the hinged grizzly opposite the hinges until the retained oversize slides off. There are retention bars to eliminate the grizzly from folding completely over the side. Dumping is normally done using the hydraulic excavator that is being used to feed the plant. If a separate feeder/conveyor feed system is being used then there will not be any oversized material to be dumped off this grizzly.

VARIABLE SPEED BELT FEEDER (fig. 2): This component consists of an electric motor, V belt driven adjustable 36" conveyor. The conveyor has a self cleaning adjustable tail pulley and a lagged head pulley. The variable speed is controlled by a reduced voltage vari- control mounted on the carrier beside the electrical NEMA ENCLOSURE.

Feed control of the discharging gravel ore is further adjusted by the use of the weighted hinged "SWING FEED GATE" (fig. 3).

The amount of weight in the "swing gate" hopper and the extended "WEIGHT ROD" (fig. 3a) also provides a leveling of the discharging ore eliminating surging of volume because of grouping of the larger pieces of ore. An adjustable belt scraper is included to scrape the belt of sticky ore at the discharge point.

FEED CONVEYOR (fig. 4): This conveyor is electric motor, shaft mounted reducer, V belt driven. The tail pulley is self cleaning and adjustable, the head pulley is lagged. The conveyor is hinged at a point to lower the conveyor for travel. Side boards are provided from the point of reception of feed ore to the discharge into the FEED CHUTE (fig. 18) of the rotary scrubber. Support of the feed conveyor is attached at the tail pulley end, mid conveyor and off the main support frame of the rotary scrubber. A belt scraper and flap is provided at the discharge end to insure all fed ore enters the rotary scrubber.

ROTARY SCRUBBER (fig. 5): This component is designed to rotate at a slow speed. The scrubber is driven by an electric gear head motor and spring loaded roller chain. Four (4) grease bearing support rolls coupled with a retention ring allow aligned rotation of the scrubber. Inside the feed end of the scrubber is a section of 1-1/2" grade 8 bolts with double nuts. The pattern of the bolts is designed in a series of chevrons. The purpose of these intrusive bolts is to provide a section for breaking up cemented or decomposing ore, emulsification of clay type material and to tumble the ore providing a scrubbing action. Water is provided to the scrubber at the feed end by the control of a gate valve. The water and all the washed/scrubbed ore is then discharged onto an inclined wet screen.

INCLINE WET SCREEN (fig.6): The incline wet screen is a 3'x 8'two (2) deck screen. The screen is V belt driven by an electric motor that has a spring tension mount to eliminate drive belt slippage and the drive belt jumping off. A WATER MANIFOLD with individual valves and spray bars is provided to further wash and rinse the ore as it is being sized prior to discharge off the screen decks. The top deck of the inclined wet screen is normally fitted with "punch plate" acting as a screen to size the larger 2" plus sized ore off to the nugget traps. The bottom deck is normally fitted with a 5/8" wire screen decking cloth. This screen cloth is retained by side clamp bars that hold the screen cloth over the screen rubber covered rails. The material off the top of the screen cloth (overs) is discharged into the nugget traps for nugget retention before discharge onto the side discharge conveyor. The material that goes through the screen cloth (throughs) along with all the waste water are discharged over the primary trap that is utilized for immediate evaluation of a small amount of placer ore. This immediate evaluation trap is provided with a discharge pipe and screw type pipe cap to allow removal of the material for evaluation.

ROUGHER JIG (fig.7): The Terra rougher jig includes a hutch (cell) that contains water. There is a stainless steel screen with 1/8" openings mounted at the top of the hutch. Situated over the stainless steel screen are the "shot trays" containing the "jig shot". The jig is provided with an electric variable speed motor and an ADJUSTABLE STROKE MECHANISM (fig. 7a) to control the speed and stroke for infinite operation of the jig. A tire of specific capacity is provided to act as a diaphragm. This TIRE DIAPHRAGM (fig.7b) is located outside the jig hutch and is driven in and out horizontally by the ECCENTRIC MOTION MECHANISM (fig. 7c).

On the "in stroke", the water in the hutch is expanded. This action causes the "jig shot" to move up in the "shot trays" causing the particles of ore to intermix with the "jig shot" to sort by specific gravity. The heavier particles move to the bottom of the "shot trays" while the lighter particles are on top and are carried away by the surface water to the "tattle-tail sluice" or to waste.

On the "out stroke" the heavier particles are pulled down through the "jig shot". Heavy particles 1/8" and smaller (cons) are discharged constantly and controlled out of the bottom of the jig hutch through an adjustable BARREL VALVE. The larger gold is retained on the top of the stainless steel screen under the "JIG SHOT" for later clean up. This clean up is achieved by use of a strong rectangular MAGNET that is sized to fit the "jig shot trays". The magnet is used to remove the "jig shot" from each tray, dumped onto a surface that allows the steel shot to once again be removed by the magnet and leaving the large gold and nuggets too be recovered. Depth of the feed, pulsation frequency (speed), stroke length and water volume are the main conditions and variables that are used to adjust the jig for optimum operation and recovery of placer gold, diamonds, gemstones or any other gravity recovered metals such as tin.

ADJUSTMENT OF THE JIG STROKE: Adjustment of the stroke to either lengthen or shorten the stroke is achieved by repositioning the bolt pattern of the TWIN DISC ATTACHMENT (fig. 7d). The “twin disc attachment consists of two (2) matching 8” discs with matching bolt patterns that face each other. There is a drive shaft that runs through the center of these discs that is attached to the main driven shaft from the electric motor V belt system. The JIG DRIVE ARM (fig. 7e) is attached to the twin disc drive and the DIAPHRAGM PLATE (fig. 7f). The horizontal in /out motion results in the jig diaphragm contracting and expanding which in turn causes the rougher jig to pulsate.

CONCENTRATES SUMP (fig. 8): This concentrate sump is 4’Wx 6’Lx 2’D. It is placed under the rougher jig to receive the concentrates produced by the jig. A 4” pipe side discharge fitting with a gate valve is provide to control any water overflow to waste.

SUBMERSIBLE SLURRY PUMP (fig. 9): A 3 hp. submersible slurry pump with electrical control is provided to pump the rougher jig concentrates up into the concentrates bin.

CONCENTRATES BIN (fig. 10): The concentrates bin is attached to the carrier. The purpose of the concentrates bin is to receive and dewater the rougher jig concentrates. An overflow discharge pipe is supplied to return the overflow waste water back to the concentrates sump. The concentrates bin is equipped with a barrel valve to control the discharge onto either a TERRA PULSATOR FINISHING JIG (fig. 11), or a finishing jig of other design, spirals, tables or any other type of finishing recovery unit.

TERRA MULTI-BAY SLUICE (fig 12): The purpose of the “tattle-tail” multi-bay sluice box has multiple uses. 1. It allows the waste water to exit the plant under a controlled method. 2. The multi-bay sluice allows the operators to check the efficiency of the rougher jig by seeing if gold values are being recovered by the sluice. 3. That the multi-bay sluice does not require electrical power so, in the event there is an electrical supply problem the multi-bay sluice will not be effected and will continue to operate until the electrical problem is resolved without loosing any gold values The multi bay sluice is behind the rougher jig to receive all the wastewater, overflow and lighter materials from the rougher jig. The unit consists of a “raceway”, “undercurrent” and four (4) sluice bays. Each sluice bay is equipped with “gold carpet”, “riffles” and side bars with wedges. The sluice box discharges into a side discharge FLUME. This flume has a screw type adjustment to raise or lower the angle of the discharge flume to compensate for volume of water and material.

STANDPIPE (fig.13) The standpipe is provided to supply a constant volume of water at a pressure of 15 to 20 psig for use to power the Terra Pulsator Finish Jig. The standpipe is designed to tip down for travel. It is fitted with a "fill pipe fitting" at the bottom, an overflow hose to direct overflow to the sluice discharge flume. Flexible discharge hoses with valves are provided to provide water from the standpipe to the Terra Pulsator Jig

WATER MANIFOLD(fig14): A water manifold with a necessary valves and fittings is provide to supply water to all components requiring fresh water (rotary scrubber, 2-deck incline screen spray bar water manifold, rougher jig, standpipe and wash-down hose).

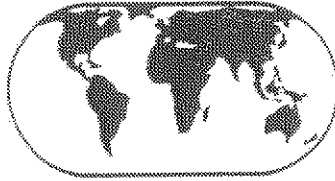
WATER SUPPLY: A separate water pump of 50 to 75 gpm. capacity @ 50 to 60 psig. is recommended to provide sufficient water and water pressure to efficiently operate the plant compensating for any conditions. A hose or pipe line is the connected to the plant water manifold. It is recommended that a shut-off control valve for this water line also be installed.

DIESEL GENERATOR (fig.15): The ISUZU diesel 35 KW self contained with fuel tank, skid mounted generator package is available to provide electrical power to all the electrical motors and controls included within the portable plant system. An S/O cord of sufficient capacity is also provided to go from the skid mounted diesel package to the electrical control panel that is mounted on the portable plant. A ground rod is also provided to ground the generator.

ELECTRICAL CONTROL PANEL (fig.16): The electrical control panel consisting of all bar fuse starters and controls are enclosed in a NEMA 12 water tight electrical enclosure is mounted on the carrier. There are exterior stop/start buttons listing all components. It is recommended that the components are started in sequence, water pump first and the feeder and feed conveyor last There is also a "KILL SWITCH" for immediate emergency shut-down. A ground rod is also provided to ground the plant system to conform to MSHA regulations.

CARRIER (fig.17): A single axle trailer is provided to carry and integrate all the components and systems for both travel and operation. The carrier is equipped with a single axle/dual tires, air brakes lines, tank glands, running / directional lights, fifth wheel pin and four (4) each screw type leveling jacks with pads. The leveling jacks are required to level all directions of the plant to insure proper optimum performance and recovery. It is recommended that a fifth wheel dolly be provide for on site moving.

(NOTE: see following pages for photos of the various figures)



TERRA MINING PRODUCTS, INC.

