

SECTION 14
HOW TO ATTACK INDUSTRIAL TARGETS

1401. The ultimate aim is to deny the products of industry to the enemy, and this can be achieved by breaking one or more vital links in the production chain. The outline plan will normally be made at high level; the following notes give a guide to more detailed planning. The main links, for which methods of attack are outlined in Table 31, are:

- a. Sources of raw materials, eg, mines, oilfields, water supplies. Extreme measures, such flooding mines, igniting oil wells, are outside the scope of this pocket book, but normal demolition methods can be used on the connected plant and machinery.
- b. Sources of processed materials, eg, steel works. If the product to be denied enemy comes from a series of factories, effective attack at this bottleneck may pay a high dividend.
- c. Electric power supply-If the target factories are spread over a wide area, the power stations can be attacked; all stations supplying the area should be attacked simultaneously. If production is to be stopped in a single factory or a local group of factories, the attack should be made at the factory. It is seldom worthwhile attacking the distribution system unless purely temporary interruption of output is aimed at.
- d. Petroleum fuel supplies, eg, for furnace heating, prime movers and transport. The attack, at source, ie, at refineries, is outside the scope of this pocket book, For the destruction of local piped supplies and storage see Table 29, Serials No, 8 and 13, and Table 31, Serial No.16.
- e. The source of the finished product, ie, the factory. The problem here is not so much technique as the selection of the points of attack, The following rules should be applied:
 - (1) Select driven machines in preference to driving machines; the latter will almost certainly be standard prime movers that can be replaced easily.

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(2) Among the driven machines, choose the "specials" peculiar to some particular process in the industry; they are the most difficult to replace.

(3) Having chosen the right machines, damage them beyond repair, and so thoroughly that few parts can subsequently be retrieved for use as spares. This can often be done by running them under conditions which lead to self-destruction.

(4) Where several factories of the same type are to be attacked, attack all in the same way so as to prevent subsequent cannibalization. For the same reason seek out spare machines and stocks of spare parts and destroy them also.

(5) Attack castings in preference to built-up items.

(f) The distribution system, eg, transport and the routes by which essential materials enter the factory and the finished product leaves it.- Attacks on communications will seldom have lasting effect unless geographical features are particularly favorable, eg, in mountainous country.

1402. Wherever possible take a technician with specialist knowledge of the particular industry to advise and help in the selection of points of attack.

Table 31-Some Methods of Attacking Industrial Targets

Serial No.	Target	Suggested methods of attack
(a)	(b)	
1.	Common machinery- Steam engines	With vertical type, place charges inside the castings supporting the cylinders, in the angle between the casting and the base of the cylinders. With horizontal type, place charges on the base of the cylinder and on the inside of the barrel guide For steam turbines and boilers see Serial No. 16
2.	Diesel engines	Place charges on the water jacket immediately opposite each cylinders. Be sure that jacket is full so that shock is transmitted to cylinder wall
3.	Gas engines	Place charges at the base of, or between, cylinders
4.	Fans and blowers	Cut bearing pedestal, while fan in running if possible
5.	Pumps	Place charges against angle of complicated casting, exposed gearing, etc
6.	Air compressors	With reciprocating type, place charges on water jacket over LP cylinder (of Serial No.2) . With centrifugal type, attack complicated casting
7.	Winch gear	Place charges inside and against the drum casting
8.	Common machinery - contd. Cranes	Attack winch drum, head of jib and traversing gear. If elevated (eg, dock side crane), blow out lengths from two legs on the side towards which the crane is to fall
9.	Lathes, milling machines, etc	Place charge under the saddle between the guides of the bed
	Electrical machinery in factories and sub-stations-	
10.	Transformers	The design of all transformers is basically the same, ie, a rectangular steel tank of welded plates up to $\frac{1}{2}$ " thick, containing a special insulating and cooling oil; immersed in the oil are three elaborate electric windings ; on top of the tank are three large insulators for taking the high voltage current and three smaller insulations for the low voltage current. When working, the transformer is warm and emits a high pitched hum : otherwise it is cold and silent Destruction is best effected by igniting the oil and thus burning the windings. For large transformers use a 2lb charge

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Serial No.	Target	Suggested methods of attack
		placed half way across the wide side of the tank and one third of the way up from the base. (With small transformers a 1-lb charge will suffice). If the transformer is warm the flash will ignite the oil ; if cold, incorporate an incendiary charge consisting of a can of gasoline, around which is wrapped 3 turns of detonating cord, one end of which is immersed in the gasoline, the other end being used for initiation
11.	High voltage switches	These are grouped in threes and appear as cylindrical tanks (which are filled with oil), each with two large insulators on top. Attack with 2-lb charge placed against the tank in the plane of the insulators and one-third of the way from the top of the tank. Low voltage switches and switch boards are not worth attacking
12.	AC motors	Recognized by the frame of cast iron or welded steel inside which can be seen the back of the stator wind-ings and, separated from the frame by the bearing pedestal, the three slip rings carrying the AC supply from three cables. Attack with 2-lb charges placed inside the frame against the stator windings and against the bearing pedestal. This is particularly effective if the motor is running at the time of detonation
13.	DC motors ...	Recognized by the frame of cast steel on the outside of which are the heads of the bolts which hold the electro-magnetic poles, and by the commutator and brushes. The current is supplied by two cables terminating in a junction boxes on the motor. If stationary, attack with 5-lb charge, either between two poles within the frame, or on the commutator in contact with the rotor windings, or below the main bearing. If running, blow the bearing pedestal
14.	DC generators and rotary converters	These look like DC motors and should be attacked in the same way. They may be found either driven by an engine (steam, IC, or turbine) direct or through gear, or coupled direct to an AC motor fed from the mains supply, or combined with an AC motor into one machine known as a "rotary converter" Special transformers are used conjunction with rotary converters and should also be attacked
15.	Rectifiers ...	Mercury are rectifiers are machines without moving parts with convert AC to DC. Special transformers are used in conjunction and should also be destroyed. The metal tank

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Serial No.	Target	Suggested methods of attack
		type is used in larger installations, eg. electric railways and factories using electric cranes and machine tools. It consists of a tank containing mercury vapor which in turn is held in a second larger tank, water or air being circulated between them for cooling purposes. When an load it is dangerous to touch the apparatus. Attack by sliding a charge of at least 5-lb under the steel tank by means of a length of dry timber or other insulator The glass bulb type is found in smaller installations. The bulbs and switches are contained in steel cupboards. Attack by suspending a charge, against the centre of one side of the cupboards so that the blast effect destroys the bulbs, etc.
16.	Power stations	The assistance of someone with practical knowledge of the lay-out of power stations, in the recognition of the priority targets will be invaluable. Only first priority targets are mentioned below
17.	Steam power stations	<p>a. <u>Turbines and Generators.</u> If stationary, below in the LP cylinder of the turbine (the cylinder furthest away from the steam inlet) with 5-lb charge against the side. If running destroy the pedestal of the outboard bearing of the generator. If of cast iron, charge should be 5 to 10 lb; if of fabricated steel, 15 to 20 lb, on small geared sets, attack gear box with 3-lb charge</p> <p>b. <u>Cooling Water Pumps.</u> Attack the largest casting in the plane of the impeller, For pumps of diameter less than 2', one charge of $\frac{1}{2}$lb; between 2' and 5' one charge of $1\frac{1}{2}$lb; over 5' two charges, each of $1\frac{1}{2}$lb, about $1\frac{1}{2}$' apart. There are generally more pumps than turbine sets in each power station.</p> <p>c. <u>Main Step-Up Transformers.</u> See Serial No. 10.</p> <p>d. <u>Coal Conveyors to Boiler House.</u> Destroy supporting towers or gantries, and the gear drive</p> <p>e. <u>Oil Supply System of Oil-Fired Boilers.</u> Attack pumps (see Serial No.5) and above-ground tanks with submerged charge of 1 lb per 100 cu ft of filled capacity. Under-ground tanks should be attacked with mined charges (see Tables 22 and 23).</p>

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Serial No.	Target	Suggested methods of attack
		<p>f. <u>Boilers.</u> There will always be a standby boiler to allow for maintenance. With boilers not in use, attack water feed pumps with 2-lb charge on the end cover at the LP end, fans as in Serial No. 4, and the motor if DC as in Serial No. 15. Water-tube boilers can be attacked at the header drum or super-heater with beehive or hayrick charge; fire-tube and shell-type boilers, with a 10-lb charge in the fire box. For boilers in use, attack pumps, fans, and water-tubes simultaneously as above, but with adequate safety delay for the firing party. An expert may be able to neutralize the various safety devices and so, with water pumps shut down and fans kept in operation, allow tubes to burn out</p>
18.	Hydro power stations	<p>a. <u>The Dam.</u> See Table 29, Serial No. 8 (ii), column (d)</p> <p>b. <u>The Reservoir Discharge Valve.</u> Open, and then destroy the control mechanism</p> <p>c. <u>Flow Control Valves.</u> Open, and then destroy control mechanism at the top of the penstock (the pipeline between the reservoir and the turbines). A charge of 5 to 10 lb for each valve should suffice.</p> <p>d. <u>The Penstock.</u> Cut out complete section of each pipe at lower end and attack the automatic pen- stock valve simultaneously. The thickness of steel pipe (t inches) can be roughly gauged by the formula $t = \frac{Hd}{45,000}$, where H is the maximum head of water in feet and d the diameter of the pipe in inches. Reinforced concrete pipes should be cut with charges, demolition, necklace. The decision to attack any of the above will be made at high level in view of the inevitable flooding that will result.</p> <p>e. <u>Turbines and Generators.</u> These are always direct coupled and can be treated as one machine. High pressure high speed sets are usually of the horizontal type, while medium and low heads and speeds are usually connected with vertical types. An oil relay operated governor is normal in both types, and can be recognized by vertical oil cylinders adjacent to the turbine.</p>

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Serial No.	Target	Suggested methods of attack
		<p>(1) <u>Horizontal Type</u>. If running blow the outboard bearing pedestal of generator with a 3 to 6-lb charge and the oil relay with a 3-lb charge. If stationary, destroy the oil relay and the generator windings with a series of 2-lb charges placed inside them</p> <p>(2) <u>Vertical Type</u>. If running, place 10-lb charge adjacent to main (Michell) bearing, if possible under main thrust collar, and 2 to 3-lb charges at the back of the stator windings. Attack oil relay at the same time. If stationary, insert 10 to 20-lb charge in the outflow passage immediately beneath the turbine</p>
19.	Steel works	If furnace is working, destroy cooling water pumps. If furnace is not working, the blowers for supplying HP air to the furnace, the extractor pumps for removing furnace gases, and the cast iron drums of the charging skips are good targets

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