

## Design Specification for a Portable Winch

The following example PDS, although longer than the PDS's you will produce for your projects, contains many aspects of a commercial PDS and was written with advice from a winch design company. A real design brief for a winch would contain many more aspects than outlined here. A PDS for family motor car for example, would have many more categories specific to the product and would require several large manuals to list the 'problem' in detail.

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## Portable Winch

### Design Brief

From internal market research, it has been decided that IWC need to design a general purpose winch to sell to the cable and pipe laying market sector. The winch should be portable but have mounting points for the end user. It is important that the winch sits within our current range of 'Excel General Purpose winches'.

### Performance

- 1.1 Lift / lower a load of 2.5 tonnes (+/- 10%).
- 1.2 Draw in cable in at a rate of 0.2 m/s.
- 1.3 The winch drive should cut out when the load exceeds 10% of the specified load.
- 1.4 Drive to stop lowering load when only 1.5 metres of cable remains on winch drum.
- 1.5 Winch should operate with forward, reverse, stop and inch facility.
- 1.6 Any braking system employed, should produce a braking torque of 150% the full load torque.
- 1.7 Winch should have a manual device to control the brake release and load descent in the event of a power failure.
- 1.8 In the event of the winch 'overrunning', a manual safety relay/braking device should operate within 1 second or before the load exceeds a speed of 3m/s.
- 1.9 The product should be portable but with the option for permanent mounting.
- 1.10 The product must use a portable power source, preferably a diesel engine.
- 1.11 The weight of the product must be sufficient to aid the stability of the product.
- 1.12 Efficiency of the unit should be high, preferably in the area of 20 - 30%.
- 1.13 The drum should hold 50m of cable.

## **2.0 Environment**

2.1 The winch drive and power unit should be power unit.

2.2 The unit will be mainly used in European weather conditions. But we could expect sales of about 2% unit volume to the Far East.

2.3 Temperature ranges:

-28 degree C - European  
12 - 44 degree C - Far East

2.4 The product may experience humid conditions.

2.5 Corrosion resistance may be considered by the use of special materials or surface protection methods.

2.6 Any noise from the equipment should not exceed 95 dB at a distance of 1.0m.

2.7 The winch will be stored in suppliers warehouses before sales.

## **3.0 Product Life Span**

3.1 Product will be on the market for 10 years.

3.2 Spare parts will be available for a further 5 years after that.

## **4.0 Life in Service**

4.1 Should withstand an operating period of 1 hr uninterrupted use per day for 5 years.

4.2 Life in service should be assessed against the criteria outlined in the Performance and Environment categories.

## **5.0 Shelf Life**

5.1 The product will be stored on-site for up to 1 month before dispatched.

5.2 Our Far East distributor may store the product for several months.

## **6.0 Target Costs**

6.1 The product should have an end-user cost of £5500 within Britain.

6.2 The cost of manufacture should be less than £2750.

6.3 The cost of packaging and shipping should be no more than 15% of the manufacturing cost.

## **7.0 Quantity**

7.1 150 units in the first year, increasing to 800 within four years.

## **8.0 Maintenance**

8.1 To be maintenance free except for light lubrication once a month and a recommended service every two years.

8.2 Parts requiring lubrication should be accessible within 15 minutes without the use of special tools or equipment.

8.3 All fasteners used should comply with BS6105.

8.4 Spares should be available for 5 years after the product is replaced with a new model.

8.5 No special tools should be required for maintenance.

## **9.0 Marketing**

9.1 Initially to be manufactured for the European market but our Far Eastern distributors in Singapore, Hong Kong and Australia will be able to find a market for the product.

9.2 The winch should be operating against equivalent models which include the following companies:

- Swansom - England
- Oholom - Sweden
- Winderhock - Germany

9.3 Applicable markets:

- Telecom - Cable laying
- Gas and Electricity operators
- Pipe laying services
- Civil Engineering Operations

9.4 Summary of market requirements:

- Portable winch which can be attached to vans and low loaders
- Use portable power source
- To be used in all weather
- To allow one man operation
- To have at least 40m of cable
- To pull 2000kg

## **10.0 Packaging**

10.1 Packaging / transport cost should be kept to a minimum and preferably below 5% of the unit cost.

## **11.0 Size and Weight Restrictions**

11.1 Weight should not exceed 500 kg.

11.2 Length not to exceed 2500 mm.

11.3 Width not to exceed 2000mm.

11.4 Height not to exceed 2000mm.

## **12.0 Shipping**

12.1 Product will be shipped by road within Europe.

12.2 Product will be shipped by sea to Far Eastern markets.

## **13.0 Manufacturing Processes**

13.1 Capacity is available for current market demand within scope to increase production to 200 per year without investment / expansion.

13.2 Motors, transmissions, bearing and ropes are bought in from the following suppliers:

### **Drives:**

- Electric Motors - Brook Compton
- Diesel Engines - Gardener
- Hydraulic Motors - Hydrostatic Transmission Ltd

### **Bearings:**

- RHP Bearings

### **Transmissions:**

- Couplings - Wellman Bibby
- Worm Gears - Reynold
- Planetary Gears - David Brown (PPG Divisions)
- In-Line Gears - David Brown Radicon Ltd
- V-belts - Fenner

### **Ropes:**

- Bridon

13.3 Castings and injection moulds produced by external suppliers.

## **14.0 Aesthetics**

14.1 The form can follow function.

14.2 If cost dictates, the winch should look attractive to improve our perception within the market.

## **15.0 Ergonomics**

15.1 Controls to be mounted in an accessible position, relative to the operator i.e. waist height - around 1m, to accommodate 95% of the working population.

15.2 All controls should be hand operated, requiring one-hand operation with a maximum force of 1.5 N/m<sup>2</sup>

15.3 One man should be able to operate the product.

## **16.0 Customer Requirements**

See *Marketing*

## **17.0 Competition**

17.1 The winch will be operating against equivalent models which include the following companies:

- Swansom - England
- Oholom - Sweden
- Winderhock - Germany

## **18.0 Quality and Reliability**

18.1 Quality should be such that winches should not generally fail within a period of three years and only 1 in 50 should fail within the first year.

18.2 No winch should fail in the area of the safety overload device.

## **19.0 Standards and Specifications**

19.1 Standards to be adhered to:

- BS 5000 part 99 Motor Performance
- BS 6105 and BSEN 20898(1) Bolts
- BS 6322(2) & BS 4320 Nuts and washers
- BS 7676 and BS 4517 Gears
- BS 3019 Welding
- BS 5989 Bearings
- BS 2754 Electrical Insulation
- BS 5646 pt4 Bearing Housing

- BS 4235 Keys and Keyways
- BS 7664 Painting
- BS 1399 Seals

## **20.0 Company Constraints**

20.1 None - except those outlines in Manufacturing and Processes.

## **21.0 Processes**

21.1 All components to be of metric form and comply with ISO 4900 for limits and fits.

## **22.0 Safety**

22.1 No winch should fail in the area of the safety overload device.

22.2 Winch should not operate when maintenance is being carried out.

## **23.0 Testing**

23.1 Testing is to be carried out on 5% of units.

23.2 All cables should be tested to BS3621.

## **24.0 Legal**

24.0 Possible litigation lies in the user injuring them by having access to moving parts during winch operation.

## **25.0 Installation**

N/A

## **26.0 Documentation**

26.1 Product should be supplied with a user manual covering winch operation and maintenance.

26.2 Suppliers require maintenance and repair manual.

## **27.0 Disposal**

27.1 Plastic parts should be separable and marked to aid disposal.